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Researching Young Children's Everyday Uses of Technology in the Family Home

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Studies of the everyday uses of technology in family homes have tended to overlook the role of children and, in particular, young children. A study that was framed by an ecocultural approach focusing on children's play and learning with toys and technologies is used to illustrate some of the methodological challenges of conducting research with young children in the home. This theoretical framework enabled us to identify and develop a range of methods that illuminated the home's unique mix of inhabitants, learning opportunities and resources and to investigate parents' ethnotheories, or cultural beliefs, that gave rise to the complex of practices, values and attitudes and their intersections with technology and support for learning in the home. This resulted in a better understanding of the role of technology in the lives of these 3- and 4-year-old children.

RESEARCH HIGHLIGHTS

- The role of young children has been overlooked in studies of technology in the home.
- An ecocultural approach to conducting research provides a focus on children in the context of their home and guides the choice of appropriate research methods.
- The role of parents' ethnotheories in shaping their child's experiences of technology is described.
- Research methods appropriate for studying young children's uses of technology in the home are described.

1. INTRODUCTION

This paper makes a contribution to our understanding of research in home environments by drawing attention to the dearth of research that gives full account of children's perceptions and experiences in the context of technology in the home. It describes a study of 3- and 4-year-old children's play and learning with toys and technologies in family settings and how an ecocultural approach was enlisted as a framework for understanding the home's unique mix of inhabitants, learning opportunities and resources. Methods that are compatible with such an approach are discussed in terms of how we made decisions about the types of data that can help us to understand more about family interactions and activities and, consequently, about children's learning. The framework also gave shape to our interpretations of the data, enabling us to illuminate the complex of practices, values and attitudes and their intersections with technology. It concludes by speculating on some of the reasons why children seem to be absent from many studies of technology in everyday life and suggesting some of the ways in which this may be remedied.

1.1. Everyday life: but where are the children?

According to the Office for National Statistics (ONS, 2013), there were 13.3 million dependent children[1] living in 18.2 million families in the UK in 2013. There are plenty of references to families and the social structures of households in studies of technology in the home and claims are frequently made about their 'real world' nature. However, if we look for signs of these millions of children in the research literature they are curiously

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[1]Children are defined by the Office for National Statistics as aged <16 or aged 16–18 in full-time education. A family is a married, civil partnered or cohabiting couple with or without children, or a lone parent with at least one child.

invisible. Although the presence of children in the home is one of the criteria for inclusion in the sample in Swan *et al.* (2008) discussion of clutter, for instance, there is no mention of how children contribute to clutter.[2] Amongst many other examples, Pink and Leder Mackley (2013) refer to 'everyday life' in their study of energy management in 20 households with only passing reference to children; another study adopting an 'everyday life perspective' on energy impacts (Ropke and Christensen, 2012) mentions parents who drive their children to school as the only aspect of family life in this context in which children feature. Ley *et al.* (2014) describe a study of 16 households, seven of which included children, under 'real-life' conditions before and after introducing a smartphone and a media centre but do not mention children in their discussion of the effects of changes on the social dimensions of the household.[3]

Children in the preschool years are even less visible in this research literature, although they generally spend more time at home than children who are older and more independent. It is difficult to establish this with any precision as data generally focus on the duration of specific activities, such as watching television, rather than on patterns across the totality of time. In one of the few examples, Hofferth and Sandberg (2001) analysed time spent in school settings, out-of-school learning, family activities and both free and organized play, showing that American children aged 3–5 spent ~12 h per week in school and ~7 h per week in day care. Most of the rest of the time was spent at home, although some of this time was taken up by non-discretionary time, such as personal care, eating and sleeping.

Tudge *et al.* (2006, p. 1457) report that 3-year-old children in White families in Greensboro, North Carolina spent around two-thirds of their time in and around the home. The rest of the time was spent in others' homes, in childcare, or out and about. In Scotland, where our research took place, part-time preschool education is provided for all children aged between three and five so it seems probable that they also spend two-thirds of the day at home or in an alternative form of home-based childcare, such as with grandparents, and that this is considerably more time at home than it is for older children who are at school, after school clubs and spending time with friends.

Those studies that foreground relationships between children and technologies in the home, especially involving younger children, are typically written from a developmental psychology or child health perspective and point to the potential harm that the presence of technology in the home can present to children. As it focuses on screen-based media, this media effects research tends to be narrow in its scope and the experimental designs favoured by its proponents often fail to take account of the complexities of family life or offer a child's perspective on their environment. The American Academy of Pediatrics, for instance, has produced a review of such research for its latest policy statement (Strasburger and Hogan, 2013). This medicalized perspective on children's uses of technology has gained extensive publicity as it discourages families from allowing children under the age of 2 to have any screen exposure at all and it suggests that older children's screen time should be limited to <2 h a day. It also states that televisions and internet-connected devices should be kept out of a child's bedroom, usage should be monitored and a family home use plan should be produced that includes a ban on screen-based media at meals and bedtimes. As this document and its earlier iterations have been enormously influential, both in the USA and in Europe, taking account of parents' responses to such enjoinders can be an important component of building up a picture of children's access to, and uses of, technology in the home.

While the 3- and 4-year-old children who are the focus of our research interest therefore receive considerable attention from the media effects researchers as a result of concerns over their perceived vulnerabilities, this age group does not get much attention from the interaction design community. The forerunner of the ACM *Interaction Design for Children* conferences was held in Eindhoven in 2002 to address the ways in which children had been overlooked by some of the mainstream conferences, with the call for papers claiming that the field of human–computer interaction had recognized the need to invent new techniques to meet the growing interest in children as users of technology.[4] As the proceedings of the subsequent conferences reveal, there are plenty of examples of studies that take a more child-centred view, although they typically involve an emphasis on designing for or with children through design sessions in schools and clubs and they have not generally translated into more widespread studies of technologies in the home. But it remains the case that while the participatory approach often favoured in this field is to be welcomed, and has become the new orthodoxy over the years, the child may still remain conceptually isolated from the parents and siblings that co-construct a context of use.

This is borne out by Yarosh *et al.* (2011) content analysis of 137 full papers that appeared in the proceedings of *Interaction Design and Children* between 2002 and 2010. Analysis showed that there was a strong emphasis on social interaction and learning but less than a fifth (18%) focused on preschool children. 'Family connectedness' was addressed by only 4% of papers, although they claimed that there is evidence of an increasing trend in this area. They concluded that there is a

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[2]See Stevenson and Prout (2013) and Finlay *et al.* (2012) for alternative portrayals of children's role in the creation of household clutter and some of the implications.

[3]No particular criticism is implied: this is noteworthy across a broad range of research literature. Based on the first 10 results from the ACM Digital library using 'technology' and 'everyday' as search terms, and then searching within the document for 'children', other examples include the following studies that make a point of selecting families with children as part of the sample, but do not seek their views or endeavour to consider the findings from a child's perspective: Brown and Stockman (2013), Khan *et al.* (2010) and Sohn *et al.* (2012).

[4]See the call for papers for the first Interaction Design and Children Workshop ('Conference' in subsequent years) published in *Interactions*, May–June 2002, p. 7. A special issue of papers from that workshop was published by *Interacting with Computers* in 2003.

need for researchers working in this field to be 'more explicit about their theoretical perspectives', particularly with reference to how children learn, think and relate to others, to 'partner more closely with the parents and teachers who affect how children adopt and use technologies' and to give more emphasis to 'designing for the entire social ecology that needs to be in place for the child to successfully learn and connect' (Yarosh *et al.*, 2011, p. 143). The discussion here speaks to all three of these concerns and while design issues were not part of the rationale of the study at its inception, and are not discussed here, it aims to inform the work of researchers who are interested in interaction design for young children and families.

1.2. Putting children at the centre

Interest in the influence of the home learning environment has grown in recent years as a result of recognition of the ways in which children's lives and developmental trajectories are influenced by family factors (for example, Melhuish *et al.*, 2008), particularly the notion of parents as the child's first teachers (Wagner and Clayton, 1999). The funding of quantitative, longitudinal cohort studies such as Growing Up in Scotland, the Millennium Cohort and Growing Up in Australia[5] demonstrates a high level of interest in sources of data that can be used to inform government policy on early intervention, particularly findings that suggest that modest investment when children are young will pay off with reduced crime and increased employment in adulthood. This intensified research interest in children's everyday lives at home has since extended beyond these social policy and educational considerations. As products that are designed for the domestic market, such as touchscreen devices, decline in cost and are perceived to be usable by children[6] they become increasingly attractive to parents as a source of entertainment and education through low-cost apps and subscription video on demand services, stimulating data collection by Ofcom, the independent regulator for the UK communications industries, and market research by producers of children's digital media.

Given the significant proportion of time children spend in a domestic environment, it seems self-evident that they and their families should receive more research attention than they do currently. This oversight has not been restricted to technology studies: Qvortup (2009) describes how Anne-Marie Ambert claimed in 1986 that children were missing from sociological studies. A new approach to studying children (e.g., James *et al.*, 1998) shifted attention from its stronghold in developmental psychology and a focus on atypicalities to sociological ways of thinking about childhood and children's everyday lives.

Indeed, in the course of describing her studies of 'real' children, Engel (2005, p. 36) makes the point that, with some important exceptions (such as Piaget's diaries), 'there are remarkably few careful and full records of children in real situations, functioning in real time'.

We are at a relatively early stage of putting children, particularly very young children, at the centre of our studies of technology at home. This paper addresses this lack of children's visibility by proposing an ecocultural approach as a framework for thinking about some of the issues involved in conducting studies of children's and families' everyday lives. The discussion is based on *Young Children Learning with Toys and Technology at Home* (hereafter *Toys and Technology*), a study that had the overall aim of providing a rich description of 3- and 4-year-old children's everyday uses of technology.

2. THE RESEARCH STUDY: 'TOYS AND TECHNOLOGY'

This 3-year ESRC-funded project produced a detailed account of young children's encounters with leisure and work technologies at home with a particular emphasis on the learning that might be supported by the human and technological resources to be found there. We developed household case studies by making between six and nine repeat visits to 14 families that included a 3- or 4-year-old child. The families were recruited from nurseries in an area of social deprivation in central Scotland and were assessed in terms of two broad bands of high and low socio-economic status (with seven families in each) as measured by the parents' employment and educational qualifications. Our repeat visits enabled us to establish some degree of trust and, as a result, all of these families maintained their full involvement in the study throughout the 16-month duration of fieldwork. This also meant that we were able to develop relationships with the children, making it more straightforward to elicit their perspectives.

We produced a broad classification of 'high' and 'low' levels of technology ownership based on a tour of the house and confirmed by interview but this is applicable only to this sample of families and does not refer to any external measures. As became clear from our analysis, these levels of ownership were shaped to some extent by socio-economic status and children's individual preferences as well as previous experiences with technology by caregivers[7] and their beliefs about its educational potential. Nevertheless, by the time they started school at age 5, all the children in the study had encountered devices such as desktop and notebook computers, mobile phones, MP3 players, televisions and games consoles and the products or outputs—such as DVDs, websites, games and interactive stories—that are viewed, read, played or created on these devices. All the children also had technological toys, including play laptops or robotic dogs.

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[5]Growing Up in Scotland: http://growingupinscotland.org.uk/; the Millennium Cohort Studies: http://www.cls.ioe.ac.uk/; Growing Up in Australia: http://www.growingupinaustralia.gov.au/. All accessed June 14, 2014.

[6]For instance, uSwitch (2014) claim, based on a survey in 2013, that more than a quarter of children in the UK have a tablet by the time they are 8 years old.

[7] 'Parents' and 'caregivers' are used interchangeably.

Each visit had a common core of data collection, such as establishing any changes in family circumstances, but also had a particular focus, such as parents' autobiographical accounts of their own childhoods (see Section 4.1), audits of toys and technologies, or shared discussions with parents and children about the transition to school. A diversity of methods enabled us to pay some attention to the visibility of children, gain some insights into children's and parents' perspectives, and construct multifaceted pictures of the interactions between family practices, technology and children's everyday lives. The theoretical framework for the study is described in the next section, followed by a more detailed account of some of the methods, how they were developed from a theoretically informed position, the methodological challenges they addressed, particularly in terms of paying heed to the children's experiences and perspectives, and some of the findings that followed.

There are several sources of further information about the study (e.g. Plowman *et al.*, 2012; Plowman and Stevenson, 2013). For this special issue, we are primarily interested in the relationship between the methods used and how they contributed to a better understanding of the role of technology in these children's lives.

3. AN ECOCULTURAL APPROACH TO CHILDREN'S USES OF TECHNOLOGY IN THE HOME

Ecocultural theory (Tudge, 2008; Weisner, 2002) emphasizes the influence of typically occurring activities on children's development. As 'ecocultural' is derived from the Greek 'oikos', meaning a house or household, it is appropriate for our interests as it acknowledges the important role of the immediate environment in young children's learning. It has been associated with cross-cultural research such as Tudge's (2008) fascinating study of 3-year-olds in the USA, Russia, Estonia, Finland, Korea, Kenya and Brazil but it also supports insights into more homogeneous cultures, such as the Scottish White families with preschool-aged children in our study who lived within a 10-mile radius of each other.

Although the theory does not relate specifically to technology, the study's premise of understanding the home as a learning environment made up of both social and technological dimensions in which cultural values are modelled and transmitted through family relationships is in line with an ecocultural approach. Culture is defined as 'any group that can be differentiated on the basis of its values, beliefs and practices, its social institutions, and its access to resources… [T]he members of the group should identify themselves as being part of that group, and should attempt to pass on the values, beliefs, and practices to the next generation' (Tudge and Hogan, 2005, p. 112).

The role of the home and its intersections with the developmental, social, material and economic aspects of children's lives is central to issues pertaining to children's visibility in research. As a place where children typically spend most of their time, it is a site within which the child and their family construct culture during their everyday interactions. In a later elaboration, Tudge *et al.* (2012, p. 1394) describe the ways in which the personal characteristics of individuals (such as values, beliefs, past experiences, temperament, motivations) and the characteristics of the context (such as culture, social class, immediate setting) shape these everyday activities and interactions and involve a 'dynamic interplay' between aspects of the culture and the role of children within that culture. *Toys and Technology* explored the ways in which children can influence the cultural contexts in which they live, along with looking at the ways in which these contexts influence the opportunities and limitations that children encounter. Interwoven with this was a focus on parents' values and attitudes and how they form their children's experiences with technology in the home. The methods we used were therefore selected to allow for research that was broadly naturalistic and defined by its location in the home and would reveal some of the ways in which context intersected with everyday family activities and interactions.

The following discussion starts by considering parents' ethnotheories of children's play and learning and how these influence their values and attitudes relating to technology in the home. Although we advocate making children more visible in research, we start with parents because understanding something of the values and attitudes that underpin family practices should enable us to understand more about children's everyday lives.

4. PARENTS AND ETHNOTHEORIES

An ecocultural approach emphasizes the distinctiveness of each family, but some aspects of parenting, such as ensuring a child's wellbeing, are generally considered to be universal. The definitions of wellbeing and the means by which it is achieved are, however, culturally specific and strongly influenced by parents' belief systems or folk theories about childrearing. Known as ethnotheories (Brooker, 2003; Harkness and Super, 2006), these beliefs about bringing up children are culturally shaped by many factors, including the caregiver's age, education, employment history and geographical location. Ethnotheories are compatible with an ecocultural approach, although there are many ways of analysing parents' childrearing practices (Edwards and Bloch, 2010), because they are seen as the consequence of a combination of the parents' personal views, parent–child interactions and the cultural context. As described above, each of these influences the others in a constant, dynamic process.

They are also influenced by caregivers' own childhoods. An ecocultural approach can reveal these ethnotheories by linking

adults' recollections of their time as a child and their experiences of being parented to the ways in which they bring up their own children, thus linking past and future. There are many manifestations of these ethnotheories relating to different facets of childrearing, such as parental interpretations of a child's social smiling (Kärtner *et al.*, 2013), the extent to which children are encouraged to develop long-term relationships with people outside the family circle (Aukrust *et al.*, 2003) or perceptions of the role of play in developing learning (Parmar *et al.*, 2004), but the concept was of particular interest to us in the context of parental attitudes to the role of technologies in their child's life.

4.1. Starting from the parents

Ethnotheories are embedded in family practices and revealed by the mundane activities of everyday life. We needed to develop a variety of ways of accessing this information because, as the cultural psychologist Rogoff and her colleagues point out, 'tacit, routine expectations of everyday life are likely to be among the most powerful cultural experiences-especially because they are expected and unexamined by most participants' (Rogoff *et al.* 2007, p. 491). We therefore started by inviting parents to recollect their childhood play on our first visit. They enjoyed this opportunity to reminisce about their own patterns of play and their most treasured playthings. Considering how these differed from their child's experiences revealed ethnotheories about the value of play and its various manifestations in the context of technological change.

On a later visit, we asked parents to comment on statements presented on laminated cards. These statements were designed to echo opinions we had picked up from the media or other interviews that represented particular points of view. Statements included 'my child learns more at nursery than they do at home', 'children have far too many toys nowadays', 'playing with technological toys gives my child a head start with their learning', 'using technological toys limits a child's imagination' and 'I always look for the educational value in the toys I buy'. While several reactions consisted of a simple 'agree' or 'disagree', some statements prompted more expansive responses in which parents would think aloud, musing on the different standpoints as they figured out their views. In some cases, the exercise also generated discussion with the children as the parent sought their comments. The conversation was recorded so that, combined with other sources such as the childhood recollections, we were able to build up a picture of parental ethnotheories and how they influenced values and attitudes to technology. As Harkness and Super (2006) note, it is easier for parents to talk about their own child's routines and qualities than to answer questions about abstract principles of childrearing, especially since ethnotheories may consist of unexamined assumptions about what is natural and right for their child.

4.2. Parents' values and attitudes

The families in our case studies had many characteristics in common but there was considerable variety in attitudes to the role of technology in their child's life. Some parents, across income levels, were keen consumers and users of leisure and work technologies and encouraged children's developing competences with technology as necessary for a successful future. In other homes, more traditional activities were valued and parents encouraged board games and active play.

Using sources of data such as the childhood recollections and the responses to statements outlined above, as well as more conventional semi-structured interviews, we categorized the parents' attitudes to their child's engagement with technology as either 'guarded' or 'well disposed'. There were seven families in each broad category (although there was occasional dissension between the caregivers, this was usually an area where there was a reasonable level of accord) but no clear pattern in terms of socioeconomic status, with three high SES families in one category and four in the other. Neither was there a clear link between the level of technology in the home and caregivers' attitudes to its use by their children: five of the seven families assessed by us as having a high level of technology at home were also categorized as 'guarded', suggesting that adults' enthusiasms for technology did not necessarily transfer to its use by their children.

Values and attitudes are not explicitly observable to outsiders and may be unexamined by those who hold them so it can be difficult to see how they translate into family practices. An appreciation of how they shape children's experiences and opportunities may rest on explicit prompting of parents, perhaps in a conventional interview, but it also requires methods that foreground the children.

5. CHILDREN, FAMILIES AND HOMES: REFLECTIONS ON METHODS

This section reflects on some of the methods that gave us a more direct route to children's experiences and perceptions. These choices were theoretically motivated, as by synthesizing the views of both parents and their children we were able to generate the holistic account that is associated with an ecocultural approach. Our choices about methods were also pragmatically motivated, so we start with a description of the ways in which we dealt with the practicalities of conducting fieldwork in the home.

5.1. Co-constructing accounts of home visits

The decision to use two researchers for all home visits was originally adopted for reasons of personal safety as the researchers were visiting unknown families in unfamiliar locations. Although this is resource intensive, the benefits outweighed the costs. As different combinations of two

researchers from the team of five were allocated to each household and conducted all visits to that family, the researchers became trusted figures. The presence of two researchers also meant that we were able to conduct research tasks in parallel: one researcher conducted the interview with a caregiver while the other would engage the child in an activity, making the most of the opportunity to elicit data that was not entirely mediated by parents on the child's play and preferences. This solved a problem often encountered when including children of this age in research visits: they are unlikely to amuse themselves for the duration of an interview and caregivers are unable to give sustained attention if they are frequently interrupted. It also seemed to make the fieldwork visits more enjoyable for the families, not least because the child would be happily occupied for an hour or so. Nevertheless, we need to remember that the visits were paid work for the researchers, but usually took place in a family's leisure time (including evenings and weekends for parents in full-time employment), and that although we might enter their home with a plan for what we wanted to cover in that session, there was still an overriding need to be sensitive to the exigencies of daily life.

This strategy also created the opportunity to gather the richly detailed data required by an ecocultural approach. Following the visit, one researcher took the lead in writing up an account. The second researcher then annotated these notes from their own perspective and an initial analytical account, including sections for personal, methodological and theoretical reflections, was compiled jointly within a few days of each visit to inform subsequent stages of data collection and analysis. The paired fieldwork simplified the logistics of involving both parents and children and the resulting co-constructed accounts captured the immediacy of fieldworkers' impressions of home visits. This goes some way to dealing with the problem, identified by Becker (1996, p. 56), of researchers imposing a uniformity or connectedness on events through their observations: 'Being there produces a strong belief that the varied events you have seen are all connected, which is not unreasonable since what the fieldworker sees is not variables or factors that need to be "related" but people doing things together in ways that are manifestly connected'. Jointly constructed accounts enabled us to mitigate the tendency of observation to impose this singular vision as well as address the issue of striking a balance between documenting and interpreting everyday domestic life raised by Coughlan *et al.* (2013, p. 177) in their discussion of methods for studying technology in the home.

5.2. Involving children

The presence of two fieldworkers was particularly valuable for enabling the children to get to know us over time as the two younger members of the research team became, in effect, play partners who were also collecting data. This is ethically complex but the technique was planned rather than spontaneous so we had opportunities to consider the implications, to be clear about

our intentions and to gain full consents in advance from parents, although it was not as easy to explain to the children. Research methods that gave prominence to children were tailored to their needs and designed to express different aspects of their lives, including the toy tours and mobile phone diaries described below and drawing (see Duncan, 2013).

The focus here is on three specific challenges that we encountered as part of our attempts to give greater visibility to children, along with a description of the methods we developed or adapted to deal with these situations. These are concerned with (i) engaging young children in conversation about research topics, (ii) learning more about their experiences out of hours and beyond the home and (iii) gaining insights into their roles in the dynamics of family interaction.

5.2.1. Engaging children in conversation: the 'toy tour'
A standard interview format is unlikely to be a successful strategy for establishing young children's preferences and experiences as they may find it difficult to sustain attention for more than a few minutes in conversation with a researcher. Three- and 4-year-old children can struggle with answering 'how' or 'why' questions and conversational etiquette may not be high on their list of priorities, so they will readily walk away in favour of an activity that seems more promising. Parents sometimes worry about this and use mild coercion to encourage their child to participate, a situation that can create discomfort in the researcher.

One example of a technique developed for these circumstances was the child-led tour of the home. These toy tours took place during our second visit and involved walking around the family home chatting about and documenting the toys while the children took photos of their favourite objects or directed the researchers to take photos on their behalf. This provided an opportunity to build rapport and generate the potential for conversation, a process that can be difficult with young children who are not susceptible to the direct questioning associated with interviews. More than this, the photos of their own toys became the focus of relaxed conversation on a subsequent visit and the toy tours provided glimpses of the ways in which families deal with storage for toys (Stevenson and Prout, 2013), which toys appeared to be in regular use or were semi-discarded, and insights into the ways that both parents and children exercise power and negotiate social relationships within the home (Stevenson and Adey, 2010).

5.2.2. Out of hours and beyond the home: mobile phone diaries
The mobile phone diaries (described in detail and with illustrative examples in Plowman and Stevenson, 2012) were developed as a novel approach to experience sampling. Rather than ask families to engage in the onerous task of keeping a diary and the associated problems relating to recall, parents used their own mobile phones to send us combined picture and text messages of their child's activities in response to prompts from us six times on each of three separate days. They were

asked to include in the text message who the child was with, where they were and what they were doing. Introduced after several visits, so that families felt comfortable with the request, the method had a 96% response rate and a very high level of compliance, producing experience snapshots that gave us access to places and times that would otherwise be unavailable. The technique illustrated the variation in children's experiences across three separate days, especially the importance of play, and demonstrated that technology does not dominate their lives to the extent that media coverage suggests. A storyboard of the images and texts for each day was created to represent 'a day in the life': this was given to the families as a memento and was also the object of a later stimulated recall exercise in which we asked parents and children together to comment on the typicality of the episodes represented and to elaborate on the significance of particular activities.

5.2.3. *Dynamics of family interactions: parent-recorded video*
Another approach used videos of day-to-day life recorded by a sub-set of four families in order to explore the ways in which family context influenced children's encounters with specific technologies (described at more length in Stephen *et al*., 2013). Unlike other aspects of the study, which was broadly naturalistic, this technique was premised on an intervention: we developed case studies focused on three child-oriented technologies selected to represent different interfaces and modalities and marketed primarily for entertainment or for educational purposes.[8] Families were provided with a Flip video camera that could store 1 h of video and parents were asked to record their child's interactions with the three products over the course of a week on an opportunistic basis.

The recorded episodes were analysed in terms of how the products mediated interactions between the focal children and their parents and siblings and revealed the level of emotional support required, whether this was to manage frustration when children encountered difficulties, their 'over-excitement' when successful, or disagreements with play partners. This was in addition to the more overtly didactic interactions that focused on the operational dimensions of play such as explaining scores, reading out instructions or offering guidance on how to improve performance. The parent-recorded video afforded opportunities to observe the kind of everyday, personal interactions that are not normally available given that the presence of researchers can change the dynamics of family interactions. As parents were in control of the recording, they could delete any footage they did not want scrutinized by the research team and could select the episodes they were willing to share, thereby simplifying some of the ethical considerations relating to the use of video as a means of data collection.

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[8]These consisted of a Wii games console already owned by each of the four families, a LeapFrog Tag reading system supplied by us, and a technological 'pet' or child's game console chosen by the child and parent from a range of six products that we offered. More details about the products and the choices made by the children are given in Table 1 in Stephen *et al.* (2013).

5.3. What we learned about children, families and technology

This section provides a brief overview of some of the insights we gained by using these various approaches. The research was framed by questions about the nature of play and learning with technology in the home, and our analysis was grounded in an ecocultural approach that recognizes that a young child's learning cannot be separated from the environment in which it takes place and that many factors interact with the 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—parents, siblings and other relatives such as grandparents and cousins—who may act as sources of support by monitoring activities, helping when things are difficult, providing encouragement and praise for achievements, and assisting children to manage their emotions if they get frustrated. However, family members could also hinder access. Older siblings could dominate use of devices, preventing their younger brothers and sisters from participating in games or watching videos, and parents who worked from home blocked their child's use of a computer if its primary function was related to their employment.

The technologies we observed on our visits did not exist when the adult caregivers in our study were children so they did not draw on memories of their own parents' ways of dealing with issues such as screen time. This meant they could not look to the past to determine the extent to which their child's access to technology and their digital play should be regulated. Household rules about pocket money, bedtime or eating habits are usually influenced by the parents' recollections of childhood, whether it is a reaction against what they experienced when they were growing up or whether it is an aspect of their upbringing that they want to recreate for their own children. But the generation of parents involved in our study (all in their thirties) was not able to develop ethnotheories around family practices relating to technologies in the same way as these other aspects of family life. This lack of a key reference to inform their ethnotheories offered an explanation for some of the uncertainties expressed about the role of technologies in their children's lives.

Our initial focus was on the parents rather than directly on the children. As caregivers, they were enormously influential at this stage, so descriptions of their motivations and actions helped us to understand more about day-to-day life for their children. We were able to gain insights into the ways in which family practices were mediated by parents' beliefs about young children and technology and how these ethnotheories were based on parents' earlier experiences of technology at school or work, their own levels of expertise, and views on the importance of digital skills

for their children's futures. Their perceptions of the potential benefits or dangers of early exposure to technologies shaped the availability of opportunities that children had to explore or play with different technologies in the home, although most families went to some lengths to ensure a mix of both traditional and digital activities and felt that they had the balance about right for their own circumstances. Rather than the level of family ownership determining patterns and duration of use of technology by young children, a mix of parental attitudes, educational aspirations for their child and how much guidance was considered necessary by the parents or requested by the child appeared to be more influential. A high level of presence in the home did not necessarily mean technologies were made available to the children (as they were sometimes reserved for work use or only allowed to be used when supervised) and, where they were, it did not necessarily mean that children had any interest in them, even when encouraged by their families. Children's interactions were therefore strongly mediated by their parents, but it was clear that, even at this age, children were able to exercise their own preferences to some extent. Tailoring methods of data collection to put children at their ease through techniques such as the toy tours empowered them, rather than their parents or the researchers, to be the experts on their play preferences. These tours, for instance, also revealed a considerable number of bestselling digital learning toys (such as play laptops or games consoles featuring educational games) chosen by well-meaning parents and other relatives that had been consigned to the back of cupboards or hidden away under beds once the batteries were dead. Children did not pester their parents for replacements as they did for products that were considered to be more fun, indicating that parents' perceptions of favourite toys and activities did not always match the children's. While observation is often used as a way of circumventing children's reluctance to engage in extended conversation, the interpretation of the observed activities may be questionable. Engaging directly with participating children and finding ways for them to articulate or demonstrate their choices enabled us to gain insights that were not available by other means and to have more confidence in piecing together an ecocultural understanding of their lives.

6. DISCUSSION

Perhaps it is not surprising that the study of technology in the context of young children, families and the home has been neglected given the methodological challenges. Working as strangers in an intimate domestic setting is testing enough without the added complications brought about by the presence of young children. Some of the reasons for the widespread omission of children from studies that explicitly aim to provide in-depth accounts of family life are discussed in the following section, along with some suggestions about how to address these challenges.

6.1.   Accounting for children's lack of visibility

Methodological concerns encompass ethical issues relating to conduct of research in the family home and how to establish consent from a child who does not understand the concept of research. Standard data collection techniques, such as interviews and questionnaires, are the mainstay of many research projects but it is doubtful that they will yield usable data with 3- and 4-year-olds, so there are also pragmatic concerns about how to involve children who may be able to write their name or draw a smiley face to indicate assent but are unlikely to be able to read simple instructions, write responses or engage in extended conversations. Researchers often turn to video recording as an alternative but this increases ethical complexities and leads to questions about how to integrate visual representations in a text-based report of research (Plowman and Stephen, 2008). Being much easier to collect than to analyse, it is important to have an explicit rationale for video-recorded data or it risks being over-used by default. *Toys and Technology* made considerable use of visual methods but video recording was limited to that undertaken by parents in the four families who participated in the case studies of specific technological toys (see Section 5.2.3).

The creativity of researchers is tested by constraints on the ways by which information, instructions and feedback can be presented to, or elicited from, young children. While researchers such as Crabtree *et al.* (2012, p. 44) assert that '[t]alk is the most obvious and pervasive way in which members conduct their work and make whatever it is that they are doing into an intersubjectively recognizable and naturally accountable activity' this does not apply to young children in the same way that it does for employees in the workplace. The research community might also reflect on whether studies of young children using technology in the home are lower in status than studies of technologies in other domains, such as cockpits, underground stations and air traffic control centres. Much in the same way that childcare is highly gendered so, too, is taking young children seriously when the research context is domestic.

6.2.   Visibility and agency

All three of the approaches for involving children outlined in Section 5.2 used visual methods (children taking photos with a digital camera, parents taking photos with their mobile phones and parent-recorded video) so children were literally made visible. However, making children visible involves more than featuring in photographs and videos or paying attention to the routines and practices of family life revealed by these methods; it is also about the ways in which we, as researchers, see both children and adults as social actors who actively influence their interactions with the people and objects around them. As experts in being children and in their own domain, children are 'competent informants about and interpreters of their own lives and of the lives of others' (James, 2001, p. 250).

While parents resourced and supported play and learning and sought to ensure a balanced range of activities, children also influenced their own learning and development by choosing preferred activities and pastimes and seeking out particular toys and games. They actively influenced their interactions with the people and objects around them although, as 3- and 4-year-olds, their agency was circumscribed given the powerful role of parents in establishing the local culture of the home.

Researchers are still grappling with understanding manifestations of agency in early childhood and the implications for research methods and ethics. More than simply getting a research proposal past an institutional ethics committee, a step-by-step analysis of the ethical implications of research procedures at a practical level needs to be coupled with an awareness of the contested nature of ethics and how it invokes concepts of children's voice, their rights, their legal status and power differentials. Navigating between these when there is pressure to get data within a particular timescale can be challenging. As James (2007, p. 262) remarks, 'Although new approaches in the study of childhood and children's everyday lives have opened up a theoretical and conceptual space in which children can speak as participant-observers about their experiences of the world, this is not in and of itself sufficient to ensure that children's voices and views are heard'. For a fuller discussion of the practical, ethical and logistical challenges that arise from working with preschool children and their families at home, including gaining access and negotiating consents, see Plowman and Stevenson (2013) and others (including Alderson and Morrow, 2011; Thomson, 2008; Tisdall *et al.*, 2009; Valentine, 1999) on how to take steps towards ensuring that young children are visible in research and that it is conducted ethically.

7. CONCLUSIONS AND CAVEATS

An ecocultural approach is necessarily going to draw on a constellation of methods for collecting data if we are to gain insights into diverse aspects of family life. Investigating children's competences with technology, for instance, drew on children's self-report as well as observations and parental accounts. Investigating parents' understandings, aspirations and expectations drew on parents' reminiscences of their own uses of technology since childhood as well as interviews. Although finding a balance between attending to the technology, the child or the family can be demanding, our focus was on children's experiences in the home and, given the age of the participants in our study, our interest inevitably extended to include their interactions with family members. This enabled us to analyse the opportunities for learning provided by those interactions, the material resources that were made available and how caregivers' values and attitudes influenced children's experiences. Our choice of methods gave some prominence to the children's point of view and enabled us to consider aspects of their experience that may have been overlooked, either by us or by their parents.

However, our visits over a period of more than a year could not fully capture a sense of day-to-day family life given its evanescent nature and especially given the rapid changes in the life of a 4-year-old child. To some extent, we can guard against this through the 'long conversation' (Silverstone *et al.*, 1991) that takes place between the researchers and the families, both as a formal part of the data collection process and in the social exchanges that take place as a guest in another's house. A long conversation within the research team during the analytical phases and the process of reflexivity in which methods 'talk to each other' (Silverstone *et al.*, 1991, p. 222) is also inevitable when multiple methods are used in a variety of settings over a period of time.

As Horton and Kraftl (2006) note, an interest in the everyday is, at first glance, an interest in *everything*. So how do we make decisions about the focus of our enquiry? How do we know which methods lead to which conclusions? The problem is that in trying to describe the interconnections between these different aspects of everyday life the researcher imposes a unity of meaning that risks giving a distorted sense of how all this is experienced from either the child's or the parents' point of view. In doing so, it smooths over the contingencies and messiness of family life in the interests of neatly encapsulated sets of findings.

The tension between the aim of making children visible and the prominence in this account of parents' practices, attitudes and aspirations is difficult to resolve. Although we can justify this in terms of the role of parents in the home lives of young children there is always a question of whether it is possible to do more. Having started by pointing to the absence of children in other studies of everyday uses of technology, the focus on methodology here, i.e. the choices made by the adult researchers, has led to the children who participated in the study lacking a strong presence. Although there are many references to young children and their learning, there are no photographs either of them or taken by them, or illustrative extracts from their conversations with us. Others have tried to address this problem by involving children in a participatory capacity (see Druin, 2002, for a useful overview of the various roles that children can play in the design process). There has also been a move towards children as action researchers in their own educational environments (Cheminais, 2012) but, as Kellett (2005) points out, there is a risk of tokenism and of adult 'filters': it is still typically the case that the researchers devise the questions, select the methods and control authorship and representation. While similar debates have long occupied ethnographers, the issues are writ large when the research participants are young children.

Despite these quandaries, *Toys and Technology* has contributed to our understanding of young children's everyday lives at home by emphasizing the variation in children's experiences, challenging prevailing notions of the homogeneity of young children's encounters with technology and highlighting differences between children with apparently similar backgrounds. Ecocultural theory supported our analysis as it highlights (i) the interactions between people, places and things, (ii) how they

interweave with the values and practices which permeate family life and everyday activities and (iii) how these both recreate and transform the culture of which they are part. While ecocultural theory does not address itself explicitly to the role of technology, it helped us to make principled choices about the areas on which to focus and its holistic approach to family life enabled us to make connections between the various sources of data and to grapple with some of the methodological problems of putting children centre stage.

The discussion here is not intended to be prescriptive about the choice of methods or to describe the implications for design but to raise some questions in the minds of researchers about how we position children when conducting studies of technology in the home. Although the study was framed by educational questions, the approaches to collecting data that are summarized above may also be suitable, with modification, for making children more visible when studying other aspects of technology in everyday family life.

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