

**At home with the future: influences on young children's early
experiences with digital technologies
Joanna McPake and Lydia Plowman**

Early years curricula encourage practitioners to build on children's home experiences. Research into the kinds of activities that young children engage in at home and considerations of how to link these to their experiences in pre-school settings can therefore make an important contribution to practice. This chapter, which draws on studies investigating young children's home experiences with digital technologies, seeks to identify some of the key factors that influence the nature and extent of these experiences. Although *digital divides* – reflecting classic social divisions of economic status, gender and ethnicity – have been extensively explored in order to understand the causes of inequalities in access to digital technologies, our research concluded that parental attitudes towards these technologies are more influential than economic disadvantage in determining young children's experiences.

To explore this issue in greater detail, we have drawn on the concept of *prolepsis*, a key influence on parents' interactions with their children deriving from the projection of their memories of their own idealised past into the children's futures (Cole, 1996). Parents' assumptions, values and expectations are influenced by their past experiences, enacted in the present, and are then carried by their children into the future as they move from home to formal education. We argue that prolepsis has powerful explanatory force for understanding the kinds of decisions parents make about activities such as the extent to which children engage in technological play.

It is now widely recognised that children's learning begins in the home and early years practitioners around the world are encouraged to recognise this and to build on children's home experiences. So, for example, Scotland's *Curriculum for Excellence* states that:

Parents are the first and most influential educators of their children. It is important that staff across all early years settings recognise the interests and experiences children bring from home and use these as a starting point to extend learning.

(Scottish Executive 2007: 22)

In order to do this, practitioners need to understand more about the kinds of activities likely to be available to young children at home. Much of the research in this field has focussed on early language and literacy experiences, but there is growing interest now in children's early experiences with digital technologies. Such technologies, which include not only computers, mobile phones and games consoles, but also many toys, musical instruments and domestic appliances, are now widely available in the home and increasingly accessible to young children. Many have the potential to support early learning, both to support traditional aspects of education in the early years, particularly for literacy and numeracy, as well as to increase young children's familiarity with contemporary social practices. Digital technologies have had a significant impact on the ways in which we communicate with others, on shopping, on leisure activities and on ways of working – and young children learn about these from observing their parents, siblings, friends and neighbours, and by joining in themselves. Thus, given the pace of technological change, children's early experiences at home and in the community are likely to be radically different from those of a few years ago and will continue to evolve quite rapidly.

The research

This chapter draws on two research studies conducted by the authors in the first decade of the 21st century, exploring the home experiences of young children – aged between 3 and 5 years of age– with digital technologies. The broad aim of both studies was to answer the following questions:

- What do young children do with digital technologies at home?
- How varied are their experiences?
- Do these experiences support or enhance early learning?

The first study, *Already at a disadvantage? ICT in the home and children's preparation for primary school* (McPake et al., 2005), investigated the impact of socio-economic disadvantage on pre-school children's developing competences with digital technologies, focussing on children's technological experiences in the home in the year before they began formal education, and investigating concepts of advantage and disadvantage in this context. The study also addressed teachers' perceptions of children's ICT competences on entry to school. The research took place over six months and involved:

- a *survey* of the *views* of parents of children aged three to five, who were attending eight nurseries in central Scotland;
- *case studies* of 16 children, aged three to five, from families selected following the survey; eight of these families were defined as 'disadvantaged' and eight as 'more advantaged';
- *interviews* with staff from four of the primary schools which the case study children were likely to attend in due course.

The second study, *Entering e-Society: Young children's development of e-literacy* (McPake et al., 2007), focussed more specifically on early digital literacy (i.e. the competences needed to make effective and creative use of digital technologies), by:

- defining and describing early digital literacy;
- exploring the relationship between young children's development of print and digital literacy;
- identifying key factors responsible for digital divides between children who have the opportunity to develop high levels of digital literacy, compared with those who do not;
- considering the implications for children as they start primary school.

The research occurred in three stages:

Stage 1: established a broad picture, via a survey of 346 parents of young children in central and western Scotland;

Stage 2: investigated issues in greater depth through 24 case studies, based on five rounds of visits to families over an 18-month

period;

Stage 3: explored pre-school and early primary education professional perspectives through an expert forum.

In broad terms these two studies found that most young children had many opportunities to experience a wide range of digital technologies, including telephones, computers, electronic musical instruments, MP3, CD and cassette players, televisions, video and DVD players, still and video cameras, games consoles, and domestic appliances. As a result, by the time they were ready to start school most had established early digital literacy (basic operational, social and cultural competences), and used this to support the development of early print literacy, numeracy, information-gathering and problem-solving skills. (See also Plowman et al. in press, a and b, for further discussion of the project findings.)

Economic disadvantage and digital technologies in homes

In both of these studies, a key focus was on the variation of children's experiences from one family to another, and on the question of whether children whose technological experiences were more limited might be at a disadvantage once they started primary school. We selected young children from 'more advantaged' and 'less advantaged' families and explored how their experiences with digital technologies might differ. We defined the two groups principally on the basis of parental income, although we recognised that other factors (such as disability, location (rural or urban) or social isolation) might also contribute.

In both studies, there were differences between the more advantaged and the less advantaged families in terms of the kinds of technologies available in the home. Advantaged families were more likely to have expensive and up-to-date technological items but this did not always mean that children in these families had greater access to digital technologies. Children in less advantaged families typically also lived in 'high tech' homes, though the

technologies might be older and have been purchased second hand or indeed be of uncertain provenance. These parents were often more relaxed about children using and exploring technology at home precisely because it was less valuable and less sophisticated than was the case in some of the more advantaged families. In those homes, expensive equipment, purchased for adult use or for work purposes, was frequently not made available to children.

One example from our case studies shows how limited resources need not prevent children from learning to use a range of technological items, particularly when parents are convinced that the early acquisition of technological skills will have long-term benefits.

Kirsty: making the most of limited resources

Kirsty Bennet was a four-year-old girl living with her mother and her nine-month-old brother, Hamish. Ms Bennet was a lone mother who stayed at home to look after the children and therefore had very little income. The family owned a TV, a video camera and a mobile phone with a digital camera and an Internet connection (used daily to check their bank balance), and technological toys which included a dance mat, hand-held electronic games and a *LeapPad* (a console for interactive books which are read aloud using a 'magic' pen).

The family often went to the library, both to read books and for Kirsty to play with some of the electronic toys there to help children learn to read. They did not have a computer, but visited Ms Bennet's mother on a regular basis to use hers. Ms Bennet and her mother were both very competent computer users, having undertaken a number of courses in the past. Ms Bennet continued to update her skills with the intention of finding office work when Hamish started school.

Kirsty was a competent user of all the technologies available to her, operating the TV controls independently and accessing games via the interactive features. She was an enthusiastic user of the *LeapPad* and could access children's websites on her grandmother's computer. She particularly liked finding online drawing and painting games.

Ms Bennet encouraged Kirsty to learn to use the computer, and the other technologies they had at home, because she felt strongly that these things would be important for Kirsty in

the future and that she would be at a disadvantage if she did not learn how to use them.¹

Entering e-Society extended *Already at a disadvantage?* by investigating parents' attitudes towards their children's technological experiences, and compared the views of more and less affluent parents. Towards the end of the study we asked the 19 parents still involved in the research (eight less advantaged and 11 more advantaged) to comment on a set of statements, based on the range of views expressed in interviews in earlier stages of the research.

We found very few differences between the two groups. Most parents were enthusiastic about technologies in the home, and comfortable with their use. For example, almost all (18 of the 19 parents) felt that their children's use of technological items was right for their age, and that playing computer games was harmless fun. Most (16 parents) made use of the technologies they had in the house without planning deliberately to teach their children how to use them. When asked whether children might be missing out on more important things if they played with technological toys and games, the majority (16 parents) saw this as a question of balance:

It depends. As long as they're doing other things and that's not all they're doing. Alex loves football and goes to training twice a week and loves to play outside. If he has a chance to go out and play he will forget about the computer – it definitely takes precedence.²

On these points, there was general agreement. Other issues produced more varied responses: just over half (11 parents) agreed that they were not very confident about their own abilities to help their children learn to use technologies:

¹ All of the vignettes presented in this chapter are based on case study field notes made during the course of *Entering e-Society*. All names are pseudonyms.

² Comments reported here were spontaneously generated as a result of the statement task.

I would like to know more about the computer. [...] I could help Liam with the basics but he will far surpass me. I can teach my children sums and things I learned at school, but as far as technology goes I'm very limited.

These views were often linked to the belief that children 'pick up' technological skills 'naturally' and do not require any formal teaching. Liam's mother believed that he would soon 'surpass' her, and indeed that his six-year-old sister had already done so. (See Plowman et al, 2008.)

Parents were also divided on the importance of their children learning to use technologies at this stage. Just over half (11 parents) thought that they would be at a disadvantage if they did not:

I don't know how young they have to be to learn [to use digital technologies] but I do think they need to learn young these days. Certainly in schools because it's so competitive now and everyone uses technologies, and they'll need to be smarter than me!

However, about a third (seven parents) were unconcerned:

I think they are too young now, and they will pick it up later anyway.

Similarly, just under half (nine parents) thought that investing in technological items would pay off when their children went to school:

Especially computers – both to help with school projects and general computer knowledge. If they go into school with some background, it will help them. They need the help from home as well as school.

This was one topic where less advantaged parents felt more strongly than those who were more advantaged. Three quarters of the less advantaged parents (six of the eight in this category) were in favour of investing in

technologies, while around two thirds of the more advantaged (seven out of 11) were ambivalent:

Will early investment in technology pay off when children start school? Possibly, but not necessarily. I know some friends whose kids don't use computers at all and by the time they get to a certain age they'll all be at the same stage anyway.

Another area of difference between the two groups related to the belief that using certain kinds of technology could damage their children's health and development. Overall, around half (ten parents) thought this was the case. Around two thirds of the more advantaged parents (seven out of 11) expressed concern:

I know there's a lot of talk about mobile phones, and I don't know if that's right or wrong, but I would never encourage them to use mobile phones. They've asked but I've said no because I don't think it's necessary for them to use them.

But a similar proportion of the less advantaged parents (five out of eight) said that they were not worried about this.

You hear this kind of thing [about mobile phones] but I don't believe it.

Our analysis of parents' attitudes towards their children's experiences of digital technologies thus indicates that most parents – regardless of economic background – were in favour of children exploring and learning to use the different technological items available to them. Some parents, particularly the more advantaged, were ambivalent about the long-term benefits of these experiences and had some concerns about possible effects on children's health. Thus, our case studies showed that explaining the digital divide on the basis of economic advantage or disadvantage is a complex matter. Children from less advantaged families may not live in homes with the latest

technologies, but they may have greater access to more basic equipment. Their parents may be more convinced of the benefits of early opportunities to learn to use these technologies, and less concerned about potential risks, than children from more advantaged families.

Parental perspectives on children's experiences with digital technologies at home

Although we concluded that economic disadvantage was not the most important factor influencing young children's experiences with digital technologies, our case studies clearly demonstrated that some children had greater opportunities than others to use a range of technological toys and other tools. By the time they were about to start school, some were more technically competent and more aware of the range of potential uses of different technologies than others. If economic advantage or disadvantage was not the most obvious explanatory factor, what else might account for these differences?

More detailed analysis of our case study data showed that parents' views on the potential benefits (or dangers) of early exposure to technologies were a powerful predictor of the extent of the opportunities young children might have to explore or play with different technological items. These perspectives were influenced by a number of factors, particularly parents' technological expertise, itself a product of their own experiences of using different kinds of technology, and views on the importance of digital technologies in the future, whether for educational, work or leisure purposes.

The importance of these various factors is illustrated by the experiences of two of our case study children, Grace and Catriona. They both came from more advantaged families, remarkably similar in terms of demographic characteristics but very different in terms of parental attitudes towards digital technologies. As a result, the children's early experiences of learning to use technologies differed.

Grace and Catriona: the impact of parental attitudes

Grace and Catriona were both four years old at the start of the study. They both had six-year-old brothers, and their parents had similar professional backgrounds. Their fathers had skilled jobs requiring specialist technical competences: Catriona's father, Mr Stewart, was a marine pilot while Grace's father, Mr Baxter, was responsible for the production of a local newspaper. Mrs Baxter was a childminder and Mrs Stewart was involved in home care for the elderly. Both the Baxters and the Stewarts had early experiences of learning to use computers.

However, the Baxters had negative views of their early technological experiences, describing these as boring and irrelevant. Mrs Baxter was concerned that video games make children aggressive and that having Internet access at home would encourage her husband to take up online gambling or become otherwise 'addicted to the Internet'. She did not encourage her children to learn how to use currently available technologies because she believed that any skills that the children acquired now would quickly become obsolete. In contrast, the Stewarts were confident and enthusiastic users of home technologies, and used the Internet for shopping and banking. They had positive views of technology in the future, expecting that many more labour- and time-saving devices would become available, and believing that children should take every opportunity to develop the technological skills which would enable them to take advantage of these features.

Grace's and Catriona's own abilities to use digital technologies appeared to be related to their parents' attitudes and experiences. Grace had very limited skills: at the beginning of the project, in contrast to almost all the other children participating in the study, she could not use the TV controls, and she owned virtually no technological items, other than toy versions of a laptop and a CD player. Her favourite activities were playing with Barbies, dressing up, playing outdoors and swimming. Mrs Baxter did not encourage any technological activity and described Grace as uninterested in these things. At the same age, Catriona was fully competent with TV controls and the mobile phone and played computer games with her older brother. Her favourite activities included playing with dolls, painting, watching TV and playing computer games. By the end of our visits, she could also find favourite websites on the internet, enjoyed the dance mat, had decreed *LeapPads* and *VTech* toys to be too babyish for her, and could take pictures with the digital camera. Mrs Stewart was pleased that she was 'not frightened' of technology. Catriona's favourite activity continued to be painting and drawing, which she did both in the traditional manner and on the computer.

These and other examples from our case studies showed that parents'

technological experiences, both earlier in life and at the time of the research, and their aspirations for their children's futures, were more influential than family income on the access which children were given to technologies in the home and the opportunities they had to learn to use them. We turn now to consider the implications of this in greater detail.

Prolepsis: understanding the influence of parental experience and aspirations

Cole (1996) argues that one of the key influences on parents' interactions with their children is *prolepsis*, a term deriving from a Greek verb meaning 'to anticipate'. In this context, prolepsis refers to the ways in which children's social and cultural development is determined by cultural and historical constraints which predate their existence and Cole (op.cit.: 184-7) provides several examples from different parts of the world. Referring to a study conducted in the UK in the 1950s, he noted that gender stereotyping was commonplace from birth, so that parents commented that girl babies would not be able to play rugby, and that they would be a source of concern to their fathers as adolescents. Future gender differences feature prominently in other cultures' responses to new babies, too. For example, in the Zinacanteco culture of south-central Mexico, baby boys and baby girls were given symbolic objects representing the kinds of work they would be expected to do in later life.

A significant feature of this behaviour is that parents (and other adults in the community) project into the children's future lives their own view of what it is like to be an adult and, in these accounts, what differentiates men and women in their community, on the basis of present experience. Typically, they do not expect the future to be very different from the way things are now. Equally significant is the notion that in order that their children become the kinds of adults which their community expects to produce, parents turn to their own childhoods (now in the past) in order to identify the processes which made them the adults they are today and which, they assume, will be similarly

effective for their own children. Thus, as Cole remarks, ‘they “reach into” the cultural past, project it into the future and then “carry” that conceptual future “back” into the present to create the sociocultural environment of the newcomer’ (op.cit.: 186).

In our studies, prolepsis is at work in terms both of parents’ (and other adults’) long-term views of their children’s future, and of how their own experiences in the past have influenced the way in which they think about this future. We have seen from the cases of Grace and Catriona how their parents’ early experiences with technologies influenced the extent to which the children had access to technologies and were encouraged to use them; and also how these decisions are explained by their parents both in relation to their own past experiences and in relation to the kinds of technological futures their children will encounter.

Sometimes parents may seek to avoid aspects of their own past lives which they saw as leading to problems later on. Grace’s parents had negative experiences with technology in the past and were unconvinced of the need to prepare for a more technologised future because their experiences suggested that the technologies of the future would bear no resemblance to those currently in use. Moreover, they saw technologies as a threat to the kind of childhood they wished their children to have. Technological play could lead to aggression and addiction, and would interfere with, or limit, the amount of time available for the kinds of activities they saw as more appropriate: in Grace’s case, playing with dolls and physical exercise. In these choices, we can intuit two aspects of Grace’s future which her parents were keen to ensure: one based on traditional gender expectations of girls as care-givers, and one perhaps influenced by modern concerns about the effects of children’s lack of physical fitness. Technological play can be seen by parents as inimical to developments of this kind. Digital technologies, particularly video games, are seen to be aimed more at boys than at girls and to cater for boys’ predilection for action and aggression rather than girls’ traditional interest in nurturing and

social roles. Technological play is also seen as taking up time that children might otherwise have spent playing outdoors.

In contrast, Catriona's parents, with positive experiences of technology in their own past, projected a future for their children in which technology would play an increasingly important role and where it would be important for Catriona *not to be frightened* of using technology, both for work and in other aspects of everyday life. Unlike the Baxters, they did not see technology as getting in the way of traditional activities such as playing with dolls, creative play or exercise, but rather as offering alternative ways of pursuing these interests. More significantly, perhaps, they encouraged Catriona to learn with technology, encouraging her to play with technological toys such as the *LeapPad* or the *VTech* console. In this way, they both reflected their own past experiences where digital technologies had played a positive role in their studies, and projected a future for Catriona where this would be increasingly significant.

Among the case study families, the Baxters and the Stewarts were unusual in that both sets of parents had had quite extensive experience of digital technologies, as students and then in work contexts. This is likely to become the norm for parents of young children in a few years' time but, at the time of the research, this was not so for most of the parents. They had grown up in the 1970s and 1980s, before digital technologies became widely available in the home, and many had only recently begun to use computers, mobile phones and other such items. Consequently, many were tentative about their own competence and were surprised by the apparent ease with which their own children mastered the technologies available to them. Plowman et al. (2008) explore why parents believe that their children 'just pick up' technological skills, failing to recognise that they in fact model and support their children's learning in various ways.

Disturbing prolepsis

Where parents encounter childhood practices which they themselves had no opportunity to experience, the operation of prolepsis is disturbed. Although many of the parents intuited that digital technologies would play an increasingly important role in their children's future lives, they could not refer back to their own childhood experiences as a way of understanding how best to prepare their children for such futures. As technology had no place in their own childhoods, parents felt ambivalent about its role in their children's lives and saw it as potentially threatening.

Alex: prolepsis interrupted

Alex was a four-year-old boy living with his parents, Mr and Mrs Simmonds and his older sisters, Laura (age 12) and Shelley (age 10). Mr Simmonds worked from home as a music teacher and Mrs Simmonds had recently returned to full-time work for the Council in the area where they lived, in the west of Scotland. Their earnings placed them in the 'average' bracket, neither 'disadvantaged' nor 'more advantaged'.

Their home was defined by us as 'high tech'. There were two TVs and two computers in the home. One computer, in Mr Simmonds' studio, had broadband, while the other in Laura's bedroom, did not have Internet access. Both parents and Alex's older sisters had mobile phones and digital still and video cameras. Mr Simmonds had an electronic drum system which he used for teaching and playing. The family had a PlayStation and a GameBoy. Alex had remote controlled cars and received electronic educational games for Christmas, including a *LeapFrog* Phonics Writing Desk.

Alex was competent with most of the technologies available to him at home. He could use all three remote controls to change channels on both TVs, play games on the interactive TV setting and use the DVD player. He enjoyed playing free demo games on Sky Interactive, and after coming home from nursery would typically go straight to this or to the computer to play games on children's websites. He knew how to open Internet Explorer, then his own collection of favourite sites, and then select *CBeebies* or *Yahooligans* (two websites targeting pre-school children). He would play these games happily for long periods of time and was keen to show his mother how to play. He was competent with the PlayStation when it was in operation and could not understand why his mother was not able to use it. He could use the electronic drum set, putting on the headphones and using the controls to change tempo, etc. He 'knows what he's doing', according to his mother, although he was not supposed to play by himself. He could take photos with the digital still camera and review these on the camera.

Mrs Simmonds did not learn to use technologies while at school and had not had any opportunities to acquire even basic operational skills in her first job. As a result, she felt disadvantaged when she was looking for a new job and competing with younger people who were more technologically competent. In her next job, in a bank, she finally had the chance to learn to use *Word* and email. Now working at the Council office she was learning new skills as the need arose. Mr Simmonds had recently bought a computer and had taken an introductory course to get over his fear of using it because he needed certain music applications for his work. At the time of the study, he had taught himself to use email, the Internet and *Media Player*, wrote music on the computer, and downloaded music for students.

Alex's parents did not know how he had learned to use the various technologies available in the home. Mrs Simmonds was quite surprised and proud when Alex opened an application on the computer for the first time and found what he was looking for himself. She thought that he learned to use these technologies on his own, by trial and error. But both parents also had a general feeling of being overwhelmed, unsure what he would be like when he was older. They wondered whether he would go on to a career in computers, but at the same time were worried that he spent too much time on these kinds of activities. They had concerns about him coming across inappropriate content on TV or on the computer, and also that technology-based play could be detrimental to social development. They often told him to stop watching TV or playing computer games, encouraging him instead to play outside.

Although the work of Cole and other cultural-historical researchers implies that prolepsis is a universal feature of human life (as demonstrated by examples from a wide range of 'traditional' and 'modern' societies around the world) and one of the key mechanisms by which culture is embedded in human development. He makes clear that prolepsis requires at least the impression of cultural continuity from one generation to the next but there have been few studies exploring what happens when prolepsis is disturbed or interrupted as a result of major societal changes.

Parents recognise that the advent and near ubiquity of digital technologies has significantly changed the nature of childhood, and that it is difficult to be confident about appropriate ways to ensure the best possible futures for their children. In most cases, they cannot rely on their own past experiences as a guide. Some of our case study parents had come to uneasy compromises, such as that reached by Alex's parents, allowing their children access to

technologies, concerned that not doing so might blight their future prospects. At the same time they worried that this could limit features they valued from their own childhoods (particularly playing outdoors and playing with other children), features that they felt also had an important role to play in enabling their children to grow up to be the adults they hoped they would become.

Research on the early experiences of children growing up in culturally diverse societies such as the UK and the USA (e.g. Gregory et al., 2004; Long et al., 2007; Kenner et al., 2007) addresses some of these issues. In culturally diverse societies, prolepsis becomes more challenging because parents' (and other adults') past experiences of growing up, in many cases in another country with very different social and cultural traditions, may not provide a clear guide for their children's futures. Their studies of children of Puerto Rican origin in the USA and children of Bangladeshi origin in the UK (among others) show that certain cultural traditions associated with the country of origin (for example religious practices or storytelling) retain a key role in enabling children to develop identities as 'Puerto Ricans' or 'Bangladeshis' despite living in another country where other identities (as 'Americans' or 'Britons') are likely to become increasingly salient.

They found that both grandparents and siblings had important roles to play in proleptic activities, such as story-telling or role play games. In these, younger children learned both about the traditions of the culture of origin which families hoped the children would continue to practise, but also about their possible future roles in British or American society. A key finding was that young children were not passive recipients of these various futures but rather played an active role in their reconstruction or enactment. Kenner et al. use the term *synergy* to define this relationship, summing up in this way their observations of grandparents and grandchildren learning together in the context of both traditional and technological activities:

Grandparents treated children as competent co-constructors of the event, giving them plenty of time to act and only offering guidance when this was evidently needed. At the same time, the warmth and closeness of the relationship reassured children that

guidance was continually available. Meanwhile, children also provided support for adult learning, particularly when using the computer together. They expressed mutual care and sensitivity for their grandparents as learners.

(op.cit.: 239)

We see this development in the thinking about the operation of prolepsis as an important way of countering any notion that young children are entirely at the mercy of external forces in terms of the kinds of experiences they have with digital technologies. Although economic disadvantage may make a material difference, and although parents' own experiences and expectations have a powerful role to play in determining the nature and extent of children's activities in the early years, the children themselves are not passive recipients. Rather, they play an active part in transforming these opportunities into experiences which are meaningful to them. Their choices can influence their parents' lives in the same way as their parents' choices guide theirs. Where parents saw opportunities for their own learning in their children's interest and growing expertise, the value of these shared activities was valuable and transformative.

Colin: learning together

Colin was three years old at the start of our study. He lived with his mother, Ms Knox, and his five-year-old sister Emma. Ms Knox worked part-time shifts looking after adults with learning difficulties. The family's income level placed them in the 'disadvantaged' bracket.

The family home was defined as 'high tech'. There were five TVs and one computer, with CD and DVD player/writer, printer, scanner, photocopier, Instant Messenger, and broadband Internet access. Ms Knox had bought it, and a digital camera, about a year before the study began. It was their first computer and they were all learning together. The children had a *Leapster* and a *LeapPad* that both Colin and Emma liked to use, and a dance mat. Both children had CD players, as well as an electronic violin and many battery-operated and remote-controlled toys and games.

By the age of three, Colin had developed basic operational skills such as switching the TV on and off himself. He could play games on the *Cbeebies* site by himself or with his sister, and they competed for turns to use the *Leapster* and the *LeapPad*. Colin loved taking

photographs with the digital camera and looking at his collection of photographs on the computer, although he would ask Emma for help to download them from the camera.

Ms Knox had not used computers at school or on the vocational courses she had taken since then, but the purchase of the computer had made a great difference to her own technological competence and to the children's. They embarked on learning to use it together, initially with help from a more experienced relative, and the computer and the camera now played an important part in family life. Ms Knox and the children communicated regularly with relatives in Australia via the webcam and email. Though Colin could not read or write, he would add emoticons to email messages and liked to send and receive photographs. During the study, the Knox family went on an extended family holiday to Australia to visit these relatives, and as a result the opportunities for electronic contact were even more highly valued after the trip.

The computer had pride of place in the living room and was in constant use, for games, for information seeking, for viewing photographs and for communication. Ms Knox expressed the view that her children were more technologically competent than she was: 'I'm not very good at these things – Colin is better than I am!' Yet when Colin asked for help with a game he was playing, she sat down and worked out with him how to resolve the problem. She explained that she had once been frightened of technology but was now a convert. When Colin was ready to set out on his career she wanted him to have greater opportunities than she had had: 'For lots of things, including job opportunities, new technologies will be important in Colin's life. There will be more opportunities for him to find out what he wants to do.'

For Ms Knox, digital technologies offered the promise of a better life, not only in terms of work opportunities, but also – in contrast to the views of some of the other parents – as a way of combating social isolation, through communications with distant friends and relatives. Moreover, the family was developing a shared bond through their mutual enthusiasm for the opportunities offered, and Ms Knox saw these as extending her own educational horizons as well as those of the children. She had few qualms about involving her children in technological activities at a young age because she saw these as enhancing rather than limiting their experiences.

Conclusions: children's technological futures

The lives that children born in the first decade of the 21st century will lead are likely to be very different from those of their parents. Digital technologies are transforming the way people work, shop, study and play so rapidly that it is difficult to anticipate what these activities will be like in twenty years time, when the children in our case studies will be completing their studies, beginning work and starting their own families. How can parents best prepare children for adult life in an unpredictable future?

Our research has shown that most parents believe that competence with digital technologies will be important and that an early start is likely to be advantageous. But the opportunities they make available to children are influenced by their attitudes to technology, fruit of their own past experiences and by the kinds of futures they envisage for their children. This means that when children enter early years education, their technological competence can vary quite substantially (Plowman et al, in press c). Practitioners seeking to develop this competence need to recognise the reasons for this variation and to reflect on how to respond: this variation is not just the result of families' economic status but also of their attitudes and aspirations for their children. Many parents are unsure of the value – or the dangers – of introducing their children to technological activities at a young age, and practitioners, as they seek to understand children's early experiences, may find that parents look to them for reassurance and encouragement. The task of the practitioner is therefore not simply to assess the child's competence and build on this but also to take into account parental perspectives and how these are likely to have influenced the child's own view of technologies, now and in their future.

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