

CHAPTER 1: GROWING UP WITH TECHNOLOGY

The children in our studies were three or four years old. Like Andy and Evie they used technologies in different ways. They went to nursery, enjoyed active lives, and engaged in a diverse range of pursuits with friends and family. Whilst all the children had exposure to technologies at home their experiences varied: some children lived in homes with high levels of technology but preferred to read books, draw pictures or play with toys. Other children lived in homes where parents lacked confidence or interest in how to use technology and yet the children were able to find creative ways of integrating technology into their play. Andy was a keen Game Boy player, enjoyed surfing the web with his Dad but also liked dressing up, football and swimming. Evie's favourite toy was the LeapPad but, apart from that, she did not show much interest in technology, preferring to look after her guinea pigs, play hopscotch or draw pictures.

Where families were enthusiastic users of technology parents encouraged their children's engagement with computer games or websites such as Nick Jr or CBeebies. In these families, children's developing competences with technology were noted with pride and seen as necessary for a successful future. Andy's mother believed this, too. Unlike her husband, she was no enthusiast but reluctantly acknowledged that she would need to familiarize herself with computers for her own career. There was no need for technology in the MacGregors' working lives and, in any case, they did not have much in the way of spare income to buy products and they were worried about the effect they might have on Evie's play. Other parents said that they were not against digital technologies but they would leave introducing them until their child indicated interest, preferring to encourage imaginative games with dolls or outdoor play. Most of the parents had some ambivalence about the ways in which technology could be beneficial or detrimental to their children's wellbeing and described uncertainty about the role it should play in their family, sometimes expressing contradictory views within the same interview.

Although the vignettes of Andy and Evie may reinforce some stereotypes (Andy is a boy, likes technology and is from a financially advantaged home; Evie is a girl, not very interested in technology and from a financially disadvantaged home), overall these different patterns of experience and attitude were not divided by the socioeconomic status of the families. We found a more complex picture in which there was often a stronger link between parents' own experiences of technology in the workplace or in educational settings and the ways in which these influenced the opportunities they offered their children. Although some children had more access to technology at nursery than they did at home we found widely different patterns of provision and support there, too. In circumstances such as these, in which children are exposed to a wide range of experiences before they start school, do we need to be concerned that some children are disadvantaged compared to others in terms of their opportunities to use technologies and, if so, what does this mean for their future education? These questions are of more than academic interest when governments

increasingly see education as an opportunity to familiarize young children with the technologies associated with global knowledge economies.

PREPARING CHILDREN FOR THE KNOWLEDGE ECONOMY

UK governments see computers as having the potential to improve the standards of pupils' school education and they have invested accordingly. Since the 1980s, when the BBC microcomputer was introduced, through to the National Grid for Learning in the 1990s, and the Home Access scheme which launched in England in 2009, children have been seen as a generation that needs to be prepared for working in the knowledge economy, a metaphor which implicitly associates brain work with technology and its economic benefits. There has been heavy investment in the Home Access scheme to promote the educational benefits of home computer and internet access (Becta 2008) as part of the strategy to ease the transition to a knowledge-based economy. As it will be fifteen years until most three- and four-year olds enter the labour market, policy interest has not focused on technology for this age group until comparatively recently, surfacing at around the turn of the millennium and driven by a desire to prepare children of all ages for what is seen as an increasingly complex and technological world. For instance, the *Digital Britain* report, produced by two government departments, states that 'in education and training for digital life skills, we need a step change in approach, starting with the youngest' (BERR/DCMS 2009: 64) and it is now widely accepted by policymakers that the pattern for success in later life is established in the preschool years: the *Early Years Framework* (Scottish Government 2008a: 7) refers to the first years of a child's life as laying the foundations of skills for learning, life and work and having a major bearing on wider outcomes including employment. Similar aspirations are found in the *No Child Left Behind* legislation introduced by the government of the United States in 2002. The primary goal of part D, 'Enhancing Education Through Technology' is to improve student attainment through technology, with the additional goal:

to assist every student in crossing the digital divide by ensuring that every student is technologically literate by the time the student finishes the eighth grade, regardless of the student's race, ethnicity, gender, family income, geographic location, or disability.

(U.S. Department of Education 2002: Section 2042)

Developing the early years curriculum with reference to information and communication technology (ICT) has therefore been a fairly recent phenomenon and the countries of the UK and elsewhere are at different stages of implementation. Research in this area is still limited compared to the enormous amount of literature on ICT in schools. Whilst it is widely accepted that the opportunities and challenges brought by technologies should be addressed for the years of compulsory schooling, especially for older children who will enter employment more imminently, there has, so far, been less attention to the period before children start school. Introducing ICT into preschools is not simply a matter of adapting policies that have been developed for schools or of translating findings from schools-based research because there are fundamental differences between these phases of education, as outlined in chapters 3 and 4. Compared to the years of compulsory education in schools, preschool settings have a distinct culture in terms of different norms of professional practice with reference to adult-directed teaching, an emphasis on learning through play, and a less

prescriptive curriculum and concept of assessment. The notion of computers having a role in driving up standards, as stated in *No Child Left Behind*, is beginning to emerge but does not have the high profile it has in schools.

Over the years that we have been engaged in research about preschool children and technology we have seen many changes: computers have become more commonplace in the playroom, practitioners' confidence has increased, and there has been more political interest in the value of home learning. However, the pace of change has not kept up with the technological changes in society and their influence on how we communicate or spend our leisure time: many nurseries continue to think of ICT as being primarily concerned with desktop computers, it is unusual to find activities involving the internet in the playroom, and practitioners still find it a challenge to adapt their pedagogy to include technology. This slow pace of change is highlighted by a recent report published for Becta, an English government agency which promotes the use of technology in learning. The report refers to ICT in schools rather than preschools, and states:

[T]he development of new pedagogies can be a substantial professional challenge: teachers must learn new skills and rethink and refashion the teacher–learner relationship. Developing pedagogical approaches of active learner engagement, facilitating and scaffolding learning rather than transmitting knowledge, using new, more open, questioning techniques, and undertaking assessment for learning all provide significant challenges to a teacher's role and identity. A lack of time, willingness or the resources to develop new pedagogical approaches is a major barrier to fully exploiting the educational potential of digital technology.

(Chowcat, Phillips, Popham and Jones 2008: 20)

This analysis refers to the need for teachers to rethink pedagogy and learn new skills as key challenges for using technology to drive educational change, topics that we will examine in a preschool context in chapters 4 and 5. But educational change can be slow. The report's description of the need for change is being reported more than 20 years after computers were first introduced in schools and in the wake of repeated major capital investments: in his speech to the BETT conference in January 2009 Jim Knight, the Minister for Schools and Learners, announced that more than £5 billion has been spent on ICT for schools in England and Wales over the last decade. Preschool education does not share this history. The urgency to equip playrooms with technology has been mainly absent until the last few years. As an example, the title of our first research report on preschools and ICT is *Come back in two years!* Based on fieldwork carried out in 2002, in the first paragraph we say:

'Come back in two years!' is a quote from a preschool practitioner as she waved goodbye at the end of a research visit to her playgroup. The implied continuation of the sentence was '... and then we'll have something to show you'. Like most of our other interviewees, she was enthusiastic about ICTs and had a strong belief in their value, but she was aware that the situation in her playgroup fell short of some undefined notion of 'best practice'. She felt confident that we would see a great transformation if we were to return in two years' time and we often heard comments from other practitioners such as 'it's just a matter of time'.

(Stephen and Plowman 2003a: 2)

Given that attention turned to young children in nurseries long after those aged five to sixteen in schools, it is not surprising that changes in preschool pedagogy for integrating ICT are still emerging. In the endnote to the same report we provide the following summary of the analysis we have presented:

Some aspects of this report may, on first reading, seem to present a fairly gloomy scenario of the use of ICT in preschool settings. We report a lack of training, a lack of explicit pedagogy, wide variation in levels of resources and a fairly low level of practitioner skills. However, the underlying tone of this report is optimistic. Practitioners are looking into the future, as our use of the phrase 'Come back in two years!' as the title for this report emphasises.

Although one of the participants in the study said that positive change was 'just a matter of time', transforming this optimism into practice that will have a positive impact on children has many resource implications. It will require greatly enhanced training opportunities... It will also require more guidance in the form of a national strategy for the use of ICT in preschool settings. This will give practitioners the impetus to address the changes in practice that will bring about enhanced learning opportunities for children.

(Stephen and Plowman 2003a: 33)

In drawing attention to pedagogy, resources and training our commentary echoes the diagnosis on the use of ICT in schools provided by the Becta report mentioned above. Whether in schools or in playrooms, the challenges seem to be enduring. Simply investing in technology or offering training in the mechanics of using equipment will not lead to the sought-after changes; these are more likely to be brought about by supporting practitioners across sectors to feel confident about developing their pedagogy. In the descriptions of our research in the following chapters we show that there is a role for technology in early years education but using it to create learning opportunities depends not only on changes in practice but also on engaging educators in discussions about the value and desirability of very young children using computers.

The shift in interest to informal education settings is partly the result of a greater appreciation of the kinds of learning and knowledge that can be developed in the home. Typically, this is different from the curricular knowledge found in formal education settings as it is more contingent, more fluid, and more grounded in everyday life. As such, it has not been the primary focus of researchers' or education professionals' attention. The recent attempts to make the curriculum less prescriptive and more flexible and responsive build on greater cognizance of the opportunities for learning in the home, particularly in the early years. Having a better understanding of the skills, knowledge and concepts associated with children's experiences at home is central to the ways in which children's learning can be extended in preschool settings; this has been usual practice in the case of literacy and numeracy for a number of years, but children's learning about and with technologies at home has not been valued or even noticed. This means that children's learning on entry to primary school can be focused on operational aspects such as how to control a mouse or open a file and does not extend beyond technology for work and study, such as the PC or

interactive whiteboard. This book is an attempt to shift the balance in favour of greater understanding of children's everyday activities with a range of technologies at home and to relate this to their experiences at preschool, not to assist formal education in its colonization of the home but to enable parents and practitioners to gain a deeper understanding of what children do and can do. We are neither evangelists for technology, nor amongst its detractors. Rather, we describe what we have learned from our studies and come to some conclusions about the ways in which technology can enhance learning in the right circumstances.

RESEARCHING CHILDREN AND TECHNOLOGY

From an educational researcher's point of view, the preschool years are a particularly interesting time for investigating children's learning with technology: nurseries and homes offer opportunities to observe the relationship between formal and informal learning, the balance between child-centred and adult-directed activities, and the relationship of these technologies to a media environment which encompasses television, DVDs, books and magazines. The book's foundation in empirical research means that its illustrations of practice (through vignettes, extracts from interviews, field notes and photographs) necessarily focus on the technologies that we saw in use. Accordingly, *Growing Up with Technology* is not intended to be a manual for how to introduce technology into preschool settings and it does not present tried and tested activities for practitioners to implement within a particular curriculum. Nor does it provide a source of advice for parents on what constitutes the right approach to living with technology at home. Rather, we bring insights from a range of perspectives – education, cultural psychology, and social studies – to describe and discuss general principles that are likely to be relevant even as the technologies change. Too much focus on the technology would suggest that it determines practice as well as risk the content becoming outdated. Our focus is as much on interactions between children, their peers and adults, as it is on interactions between children and technology so our observations will outlive particular toys or devices.

The research took place over a number of years, originally located in preschool settings and with a focus on enhancing practice and informing policy. An acknowledgement that the role of ICT in early childhood education was not being fully explored or exploited led to a commission to inform the development of the Scottish government's policy. Our review of the literature (Stephen and Plowman 2002) pointed to the paucity of good evidence-based writing on the subject. Indeed, despite claims about the powerful contribution that ICT could make to young children's learning and development we were drawn to the conclusion that there were more questions than answers about that contribution and so we embarked on the observational study of existing practice mentioned earlier, *Come back in two years!*

This was followed by looking at the strategies that could be adopted by practitioners to enhance learning with ICT and we later moved to examining experiences in the home. This transition from developing policy, to examining practice, to taking a broader view of the place of technology in the lives of young children mirrors the evolving areas of focus for policy makers, particularly how children's experiences with technology at home can contribute to their education. During the period spanned by our research early years practitioners have been increasingly encouraged to value home learning but they have not necessarily been aware of how children's experiences with technology at home can contribute to activities in the playroom and

the early years of primary school. The research reported here describes the competences, knowledge and understanding that children develop at home by playing with technology and by being part of a family in which using technologies for domestic tasks, leisure, and work or study are just everyday activities.

All of the participants in our research projects lived in Scotland's central belt, an area which includes Edinburgh and Glasgow and which comprises small towns with an industrial past, former mining villages, and communities in rural and semi-rural settings. While some parts of the central belt have successfully made the transition from mining or manufacturing to service industries, others are in decline, with high levels of unemployment and limited opportunities for work. Preschool education is provided for children aged between three and five, with almost all four-year-old children (96 per cent) in part-time preschool education funded by the government and provided by the public, private or voluntary sectors (Scottish Government 2008b). The children in our studies attended nursery, typically for a morning or afternoon session, although some children attended on a wraparound basis which extended to cover a typical working day.

Over the course of the research projects that provide the basis for this book we visited households and nurseries and we describe these various settings as well as interactions between children, family members and nursery staff. We refer to parents throughout this book but this sometimes means adult caregivers who took a parental role in the household and were not necessarily biologically related to the children in their care; we also refer to other family members, such as siblings and grandparents, who had important roles in supporting and shaping children's learning. The appendices provide accounts of these research projects. They provide information on the nurseries and the case study families, explaining how they were identified and the nature of their involvement in the research. We also summarize our methods of data collection, with a particular emphasis on our approaches for eliciting children's perspectives. This section will be of interest to researchers and to readers who require more detail about the design and conduct of the research.

Our approach to discussing young children growing up with technology is firmly rooted in our research. Observations from multiple visits to preschools and family households enable us to build detailed portraits of their lives, as illustrated by the vignettes in the prologue and elsewhere. The interviews with adults enable us to add to this knowledge by gaining insights into their values and attitudes; conversations with children give us some insights into their preferences and choices. The research settings of home and preschool are conceptualized both as technological landscapes and as settings in which cultural values are modelled and transmitted through social relationships. By combining these ways of looking at children's daily lives with their families and in preschool settings we can develop our understanding of their experiences with technology and how the attitudes and aspirations of their parents and practitioners can shape the nature and focus of their interactions. This enables us to move beyond those studies that focus on interactions between children and technologies without taking account of the broader context. These studies (some of which are described in Plowman and Stephen 2003) tend to look at individual children using computers in nursery or kindergarten settings, often with an emphasis on the development of operational skills such as mouse control, or specific areas of the curriculum, such as children using electronic books to develop literacy. It also

enables us to move beyond the fixed positions of those strongly against or in favour of the role of technology in early years education to provide a more nuanced account of the different kinds of learning that technology can support: we counter some of the assumptions about its deleterious effects whilst acknowledging the ways in which children can benefit from guided interaction and the ways in which they express their own preferences.

GROWING UP

Although we focus on just a year or so in the lives of the children and families in our studies, change is an important feature of their lives. Alexander (2006: 11) reminds us that development 'is a social process as well as a biological one'. Certainly, during the children's participation in the research we observed rapid developmental change in terms of physical growth, motor skills, cognition and emotions but we also saw dramatic changes in what they were allowed to do, the places they went, and with whom they spent time. Because we visited families every couple of months over a year we were able to document these changes. As nursery sessions are usually available for half days, many children of this age spend most of the time in the family household; this means that the values and attitudes of their parents are very influential in the experiences children have and the resources they encounter. As frequently pointed out, parents are the first and most enduring educators of their children and, whether they are aware of it or not, the home is the first learning environment, with or without technology.

Children in Scotland typically start school in the year in which they become five years old, so one of the key transitions for many of the children was beginning primary school towards the end of their period of participation in the research. As the transition to school approached some parents endeavoured to prepare their children not only for changes to daily routines and new relationships but also became more attuned to their children's learning, mainly in terms of literacy and numeracy and seeing computers or toy laptops as offering opportunities for school readiness.

This was a period, then, in which children experienced diverse changes and parents saw an acceleration of growing up. Thinking about the future and a child's education is fundamental to a parent's role, but whereas psychologists tend to focus on developmental changes, sociological discussions about childhood are saturated by concepts of children 'being' or 'becoming'. Lee (2002) analyzes the ways in which children are seen as the future, as human 'becomings' rather than human 'beings' who are agents in the construction of their own childhood. A child who is 'becoming' is in training to become an adult and is deficient in the skills that confer adulthood. As Uprichard (2008) points out, the future orientation of the 'becoming' discourse places more importance on what the child will become than what the child is and risks overlooking the everyday nature of life as a child. It also associates competency with adulthood. But the more recent emphasis on 'being', in which children are seen as social actors and having agency, is also limited. She questions this distinction, seeing children as both 'being' and 'becoming', and suggesting that looking forward is an important part of being a child. In discussing children growing up with technology we attempt to do both: a focus on technology makes a consideration of the future almost inevitable, and we share with their parents and the nursery staff an interest in these 'becoming' children's emerging skills, competences and dispositions, but we also recognize the wide range of competences that children have in the here and now.

The *Early Years Learning Framework for Australia* brings together the concepts of being and becoming with belonging. In its vision for children's learning it states:

Belonging is about knowing where and with whom we belong. A sense of belonging is integral to human existence. Children belong first to a family, within a cultural group, within a neighbourhood and to a wider community. Belonging acknowledges interdependence with others and the primacy of relationships in defining identities. In early childhood, relationships are critical to a sense of belonging. Belonging is central to being and becoming in that it shapes who children are and who they can become.

Being is about the present, and of knowing ourselves, building and maintaining relationships with others, engaging with life's joys and complexities, and meeting challenges in everyday life. Childhood is not solely a preparation for adulthood or for the future – it is a time to be, to seek and make meaning of the world. Being recognises the significance of the here and now in children's lives.

Becoming is about the changes that occur in identities, knowledge, understandings, capacities, skills and relationships. It reflects the process of rapid and significant change that occurs in the early years as young children learn and grow. Becoming emphasises learning to participate fully and actively in society.

(Commonwealth of Australia 2009: 4)

This document is designed to help practitioners plan, implement and evaluate the early years curriculum and it is wide-ranging in its aspirations and scope. The document makes very little reference to digital technologies but emphasizes the importance of families and educators working in partnership to support young children's learning and development. Our emphasis is on those aspects of children's everyday lives where encounters with technology provide opportunities to develop understandings of the world and the social and cultural roles of technology. We describe these aspects of everyday life in some detail in Chapter 6, along with the ways in which children can demonstrate agency by resisting suggestions or making their own preferences clear. Nevertheless, as the earlier discussion about government policy on technological skills for future education and employment indicates, children's experiences can be shaped by political and economic factors over which they have little control.

Towards the end of his book (which has the sub-title *Growing Up in an Age of Uncertainty*), Lee says:

.... we seem to have said very little about growing up. There are some very good reasons for avoiding this topic entirely. It is still hard to think of children changing over time without accepting the terms of the dominant framework. This is because it seems hard to chart and to describe change unless one has a fixed finishing point, such as journey's end or standard, complete adulthood, to refer to.

(Lee 2002: 137)

This suggests the need for some caution in using the title *Growing Up with Technology* for this book as we do not assume a 'fixed finishing point'. Rather, we use the title to suggest some of the changes that children, families and educators encounter in the year or two before starting compulsory schooling at five years old. The forward trajectory is implicit in our discussion of developing capacities and the imminence of school but the focus on the role of technology in the lives of children and their families blurs some of these issues about 'being' and 'becoming', the present and the future. Whilst 'becoming' children are seen as deficient in the competences they have yet to acquire as adults, such as reading and writing, we frequently heard adults say that children know more than they do when it comes to technology. So this is one area where children are not necessarily perceived by their parents or teachers to be incompetent. This is deemed worthy of comment because it seems surprising – after all, these children are three or four years old. It is only in this aspect of everyday life that parents perceive their child to know more than they do, even if these statements refer to basic operational procedures on a games console. The belief that children are more competent than adults in this arena can contribute to a feeling that technology is responsible for an inversion of the natural order, one where young children know more than their parents and in which assumptions about the meanings of both 'childhood' and 'adulthood' are troubled. But, as discussed later, at the same time that adults express inadequacy or a feeling of being threatened by this lack of knowledge, they also see technological proficiency as a natural state for children, such that children are believed to just 'pick up' their learning rather than it being transmitted in ways with which parents are more familiar (Plowman, McPake and Stephen 2008).

The view that children's accomplishment with technology is the norm is held in parallel with a belief that play is a natural activity for children. These phenomena of play and technology are sometimes oppositional, with parents expressing concerns about the ways in which technological pastimes detract from time available for play, which is seen as a healthier activity. At other times, these conflicting positions converge in the frequently used expression 'playing with the computer' which reduces the anxieties associated with the computer by seeing it as a plaything. As we shall see in chapter 4, activities described in this way were rarely playful, at least in the nursery. This convergence of play and technological proficiency continues as children get older and has led to a widespread belief, encapsulated in government plans to harness the power of computer games to accelerate learning, that what children learn through play will translate, over time, into skills needed for work and adult life. Hence we find expressions such as 'hard fun' or 'serious games' associated with learning with technology.

TECHNOLOGY

In its broadest sense, the word 'technology' can be used to mean the application of scientific knowledge and skills to extend human capabilities; as is frequently noted, this means that unremarkable items such as pencils can be described as technologies. However, we use the term in the way in which it is more commonly understood, certainly by the adult participants in our research, to refer to electronic artefacts that are found in homes and educational settings. To illustrate what we mean, by the time they started school, most of our case-study children had experience of using a broad range of technologies in their own homes and those of friends and relatives. They were likely to have access to toy mobile phones, laptops and cash registers as well as

encountering a range of leisure technologies used by the family, such as interactive television and DVD players, electronic musical instruments, iPods and CD players. Digital and mobile phone cameras had an important role in communicating with friends and relatives beyond the immediate family, and children enjoyed use of the increasing range of games on computers, websites, games consoles, handheld devices and mobile phones.

In his book *Beyond Technology*, Buckingham (2007: viii) writes that he regards some of the things we are interested in, such as computers and mobile phones, as media rather than technologies because he sees them as ways of representing the world, and of communicating. Whilst we share his interest in looking at these media in terms of social and cultural processes we do not discuss approaches that are associated with study of the media, such as representation, textual analysis or means of production, and we generally use the term technologies instead. This is not so much because we are specifically interested in machines or hardware (although we do make some observations about interface design and some of the operational difficulties that young children experience when interacting with computers) but because this is the term in common use and the materiality of these objects is particularly relevant for young children. Although we use 'ICT' to describe the information and communication technologies available in preschool, this is a term deriving from policy and it is strongly associated with educational applications. Parents do not use this term, so we usually refer to 'technologies' in the home environment. We use the terminology in this way, shifting between the two, as it highlights the different types of technology and associated practices available in the two settings.

Shore (2008) calls for more research on how young children learn with digital media, the impact of adult participation, and how children choose media experiences. Certainly, with some exceptions (Kirkorian, Wartella and Anderson 2008; Marsh et al 2005; Rideout 2007; Wang and Hoot 2006), there have been few research-informed accounts of young children's uses of technologies to date. This is surprising in light of the public interest in this area but is understandable in terms of some of the challenges of conducting research with preschoolers. Many of the anxieties about children's uses of technologies focus too narrowly on computers. Whilst we are not aware of evidence to suggest computers are actively harmful, our research suggests that desktop computers do not appear to promote learning for three- and four-year-old children in situations where they are left to play on their own because preschool staff are busy and need oversight of many children and different activities. We shall outline some of the observations that led us to this conclusion as well as describing some ways in which adults or more able peers can guide interaction and enhance learning.

A restricted view of technology, such as a focus on desktop computers, can lead to a restricted view of play. We suggest thinking about technology more broadly, to include digital still and video cameras, electronic keyboards, and toys that simulate laptops and mobile phones. These technologies can provide better support for mobility and collaborative use, are easier to integrate into play activities, are more fun to use and can support a range of pursuits. Whether at home or in the nursery, this expanded range of technologies can also promote more opportunities for learning, especially an understanding of the cultural and social roles of technologies and the development of digital literacies.

Technology and identity

In their study of highly skilled information technology workers, McMullin, Comeau and Jovic (2007) describe the ways in which their participants defined themselves in terms of the technology they grew up with: the Console generation was born between 1964 and 1973, the Windows generation from 1974 to 1978, and the Internet generation from 1979. It is too early to muse on the technologies that are likely to define the generation of children in our studies. Just in the few years since these children were born we have seen the introduction of touchscreen mobile phones with integrated internet communications and music players, software that enables us to make telephone calls over the internet, the growth in podcasting, services which enable us to watch television programmes as streamed video content on computers and mobile devices, cloud computing and netbooks, the small laptop computers designed primarily for email and accessing the web. In *Future Issues in Socio-Technical Change for UK Education*, Cliff, O'Malley and Taylor (2008) speculate about possible transformations to our lives, considering developments in brain-machine interfaces, psychopharmacology and artificial intelligence as possible trends and suggesting that the biotechnology of synthetic life could have as much impact over the next 30 years as the Personal Computer did in the previous 30 years. They remind us that technological advances will inevitably change society but, in tandem, social factors shape and influence the research, development, commercialization and uses of technology. Their analysis of technology trends suggests that it would be foolish to jump to conclusions about the technological futures that the young children who are three and four years old now are likely to inhabit.

In *Growing Up Digital*, another book with 'growing up' in the title, Tapscott (1998) refers to the Net Generation (also N-generation and N-geners), so called because it is the first generation to grow up surrounded by digital media and their connections to the internet. He defines this generation as those who were between the ages of two and 22 in 1999, whether or not they were active users of the internet, although he cites figures that show that less than 30 per cent of households were expected to have online access at the time of the book's publication in 1998. Compare that to the most recent figures for Scotland (Office of National Statistics 2008), where the research for this book was carried out. They show that 61 per cent of households had internet access (slightly less than the figure for the UK as a whole, which was 65 per cent) and that, of these, more than 80 per cent had a broadband connection, not generally available at the time that Tapscott was writing. Although Tapscott includes children from the age of two in his definition of the Net Generation the views and experiences of the young people in his study were participants in online forums which required a fairly high level of functional literacy; in common with most commentators on digital generations, he does not take account of children as young as those we describe and they are noticeable by their absence in most accounts of children's uses of technology.

Tapscott claims that motor skills, language and social skills, cognition, intelligence, reasoning, personality and, during adolescence, autonomy, a sense of the self and values are enhanced by interaction with technology. He declares that 'What we know for certain is that children without access to the new media will be developmentally disadvantaged' (op. cit.: 7). We do not share this certainty. Although the research we carried out was primarily focused on children's learning we did not compare children using technology with those that did not and we did not assess learning gains or try to measure development. What we are interested in here is describing some of the forms

of learning that we have identified, making a distinction between learning *about* technology and learning *with* technology and examining the different forms this can take in the social and technological landscapes in which children spend time.

The concept of 'growing up' is also central to 'digital natives', the term coined by Prensky (2001) to describe school and college students who have grown up with digital technology and speak its language. This is counterposed against 'digital immigrants', people such as their teachers who have adopted technology later in life and learned to adapt to their environment but do not assimilate fully. The terms have captured the popular imagination, perhaps because they simplify these generational differences and chime with the oft-stated belief, mentioned earlier, that children know more about technology than adults. We see greater complexity than this distinction implies. Visits to families where the parents were avid users of technology but the children were not force us to question how practices and preferences emerge. The use of 'natives' and 'immigrants' suggest identities that are determined by the technology, whereas, as this example suggests, both children and adults demonstrate their own preferences. Avoiding a technocentric approach by examining families' and practitioners' everyday experiences within a social and cultural framework shows that the metaphor is difficult to sustain. Nor does the metaphor follow through if we think of immigrants as energetic, ambitious and adventurous people who bring new cultures, new ways of doing things and new blood to an established country. The use of the term 'digital natives' suggests that digital culture is a place that belongs to the young but has been colonized by the old but our research evidence suggests that this is too simplistic.

We do not see the children in our studies as defined by the prevailing technologies so we do not give them tags such as 'digital natives', 'technotots', 'toddler netizens' or 'digikids'. Our research shows that technology is not a defining feature of their lives but just one of a range of activities they engage in on their own or with their families. This being the case, it prompts a question about why we would want to write a book on the topic. The political commitment to the introduction of ICT described earlier means that practitioners are now expected to offer technological resources to support children's learning but we know that there are uncertainties and misapprehensions, some of which are shared by parents. Our aim is to contribute to debates about the value and desirability of young children using computers and to enable others to engage in conversations and come to some conclusions about the following questions. Is it important for children of this age to learn to use technology? Are some children in a better position than others to take advantage of it? What is best suited to their needs? Children come to preschool with different experiences from home. How can practitioners recognize and extend these experiences? Many of the perceived benefits of technology concern children's learning but hitherto there has been little analysis of the kinds of learning that technology supports or impedes for children in this age range. We have developed different categories of learning with and through technology that are based on our observations and practitioners' accounts which allow us to explore these issues and we return to these questions in Chapter 9 and reflect on the evidence that we have presented from our research.

THE STRUCTURE OF THE BOOK

Following on from the point we make here, that educators should be aware of, and engage in, discussions about technologies and young children, Chapter 2 looks at

some of the different positions that are taken on this emotive topic. Evangelists promote the benefits of video games and romanticize a technological future but other commentators romanticize a non-technological past and are cautious, seeing the technologization of childhood as detracting from social and imaginative play and contributing to obesity. The currency of the metaphor of a 'toxic childhood' and recent reports which provide a gloomy prognosis for contemporary childhood indicate the scale of anxieties.

We trace two of the main theories that have influenced how we now understand young children's learning in Chapter 3, looking at the ideas initially developed by Piaget and Vygotsky. We explain key concepts such as interaction and pedagogy, and how we see learning as taking place within a sociocultural framework, considering the extent to which play is a medium for learning for young children and describing what we know about the role of technology in play and learning at home and preschool. Technology is both a part of the context which influences children's learning outcomes and is one of the cultural tools which children make their own as they learn.

Chapters 4 and 5 provide more detailed discussions of learning in preschool, looking at how the use of technology relates to policy, curriculum and pedagogy. These chapters look at the practitioners' perspectives and why they are often ambivalent about the role of technology in early years settings: they acknowledge the demands of the curriculum and the need to prepare children for school and later life but are also uncertain about what this means for their own professional practice. Picture sequences based on video evidence of the problems children encounter when using computers lead to a discussion of why this matters for children's learning and why many of these problems might be reduced if children are given opportunities to engage with more diverse forms of ICT.

The chapters examine the ways in which pedagogy can evolve as ICT becomes an established feature of playrooms. We describe how we enrolled practitioners in a process of guided enquiry which led to us jointly identifying ways of supporting children's interactions with technology that were consistent with the ethos of the playroom and the development of our understanding of guided interaction. This approach to thinking about pedagogy was informed by the understanding of learning outlined in Chapter 3 and builds on existing practices in the playroom rather than allowing technology to drive educational change. The concept of *guided interaction* is introduced and positioned in relation to sociocultural theories of how learning can be supported by other, more able helpers, such as scaffolding and guided participation. Help can be provided by adults (such as practitioners or family members) or other children (such as siblings or peers) but the prevalence of this help and the forms it takes vary from one context to another. The practitioners' interventions enabled us to analyze learning with technology in more detail than hitherto, leading to a categorization of learning with and through technology as (i) extending knowledge of the world, (ii) acquiring operational skills, and (iii) developing dispositions to learn. We present tables which provide examples of these different types of learning in relation to a detailed description of guided interaction broken down into the different types of support, the different modes in which that support is enacted, and the type of learning with which the support is associated and describe the ways in which it can be integrated into practice on a day-to-day basis.

Chapter 6 moves away from preschool settings to look at what is known about learning in the home and then goes on to consider the home as an environment for learning about and with technology. It looks at the home in terms of its physical features, family practices, family values and family interactions, using survey and case-study data to build pictures of parents' expectations and aspirations for their children's futures as users of technology. Chapter 7 examines the three forms of learning with technology that we had identified in preschool settings but in the context of the home and adds (iv) learning about technologies as cultural practices. The domestic and leisure technologies that children play with or observe in use at home are conceptualised as 'environmental' technologies that can encourage extended forms of learning, including the development of digital literacies. Chapter 8 contrasts this with what is available in preschool settings and discusses some of the ways in which young children's encounters with technologies are supported in these different environments. It outlines the various ways in which guided interaction can be provided and the types of learning that are found in these different technological and sociocultural landscapes.

Chapter 9 returns to the questions posed earlier in this chapter: Is it important for children of this age to learn to use technology? Are some children in a better position than others to take advantage of it? What is best suited to their needs? How can preschool practitioners recognize and extend these experiences? It considers the transition from preschool to school by looking to the future of these children, considering whether the recent policy emphasis on home learning means that some families are disadvantaged in terms of children's opportunities to use technologies. It considers what forms these digital divides take and whether their impact persists as children start their formal education in school. Understanding children's experiences across different contexts enables us to identify ways in which their prior learning can be supported and their rich experiences of different technologies can be acknowledged so that they are prepared for the technological futures that face them. Finally, in the Epilogue, we return to Evie and Andy, the children introduced in the Prologue, to get a glimpse of their experiences after they started school.