DIGITAL TECHNOLOGIES AND LEARNING
IN THE EARLY YEARS

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PART 1
THE EARLY YEARS TECHNOLOGICAL LANDSCAPE

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FRAMING TECHNOLOGICAL EXPERIENCES IN THE EARLY YEARS

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CHAPTER OVERVIEW

Within the increasingly technologised landscape of early childhood experiences, this chapter sets the scene for the remainder of the book by considering how learning experiences are being shaped by the digital era. The chapter will articulate this discussion by following a young child through a snapshot in their learning journey with new technologies.

This chapter aims to:

- Set up the frame for understanding how play and learning experiences are moulded by the digital era.
- Set the scene for the remainder of the book by unpicking what in research and practice we could mean when discussing 'technologies'.
- Present a case study of a young child playing and learning with technologies.
- Consider the place for, and role of, 'technological experiences' in early childhood education.

Learning in the digital age

From childhood through to adulthood, life in Western society has become technologised (Plowman et al., 2010). The 'powerful informational, communicative and interactive learning possibilities' of technologies (Richards, 2006: 239) and the associated rapid changes in these technologies create a new landscape of knowledge, learning and growing up for young children. From the perspective of the child, the speed of technological developments and the pervasiveness of

these resources in society and children's lives have led to a widespread polarised debate in both academic literature and the mass media. Some parents and academics continue to be concerned about the perceived dangers of too much technology for developing children (Palmer, 2015), while others have advocated the benefits of integrating technology into children's lives at young ages (Marsh et al., 2005; Saracho and Spodek, 2008). In adulthood, digital citizens and the digital workforce are embracing technologies in a bid for efficiency and higher productivity. As a result of the digital revolution and the increased expectation to be 'connected', the lines between personal and professional life are blurring. This is impacting on children as it is becoming increasingly common to hear arguments around children's digital literacy as a precursor for success in contemporary society. Certainly, academic literature suggests that in such a 'knowledge economy' and digital society children need to be well equipped to use technologies because they are likely to consume a large part of their working and personal life (Siraj-Blatchford and Siraj-Blatchford, 2006).

Thus, the presence of technologies in all aspects of our lives might be linked to changes in terms of how we construct and share knowledge, what counts as learning, as well as what counts as play. Questions have been raised about who owns knowledge in an open access, internet society, for example. Relatedly, in Chapter 2, Karagiannidou discusses how traditional learning theories are re-envisaged in light of the technological age, while, in Chapter 3, Yelland and Gilbert reflect on how play is being reimagined. The shift in perceptions across these chapters, and the remainder of the book, builds on long-standing research, theorising and discussions, which consider whether people learn differently in an age of bite-sized information and multitasking. For example, over a decade ago, it was suggested that 'Digital Natives' learn differently to those born prior to the 1980s (Prensky, 2001). This was developed and it is thought that increased use of technology from a young age legitimises learning through 'trial and error', 'tinkering' or 'bricolage' (Kolikant, 2010). The debate portrays contemporary children as multitasking, experiential learners, in contrast to previous generations who learned from slow, linear and step-by-step approaches (Prensky, 2001). This is not without challenge as some argue that it is not evidence-based (Bennett et al., 2008), but, nonetheless, the premise has laid roots as it calls for fundamental reform in teaching approaches. In light of this altered perception of children's learning experiences we are now seeing many of those from upper levels of schooling taking cues from long-standing early years principles. Thus, whether for better or for worse, technologies are shaping the trajectory of society and our educational experiences. It is fundamental for us to understand the role and place of these resources in everyday life and early years education.

Yet understanding the role and place of technologies in early years practice and in children's play experiences is fraught with challenge. First, definitions of technologies vary greatly among academics and practitioners, widening the theory–practice divide. While academics are beginning to adopt broad definitions of technologies encompassing more resources, such as early years programming resources (Bers and Horn, 2010), practitioners are still mainly focused on the use

of tablet computers, cameras and interactive whiteboards. We need to understand better how we define technologies in both theory and practice before any mutual construction of principles and practices around technology for play in early childhood can be achieved.

Technology: Unpicking the term

In the Chapter Overview above, I write that this section discusses what we *could* mean when referring to technologies. I use this particular phrasing because a definition of technologies in relation to education and, in particular, early years education, is difficult to achieve. Elsewhere I have briefly explored the difficulties with defining technologies:

> In contemporary discussions of digital childhoods a range of nuanced terms are used to describe the resources children use as part of everyday life and learning including, but not limited to, 'technologies', 'digital technologies', 'Information and Communication Technologies (ICT)', 'smart toys', 'screen-based media' and 'digital media'. With such fast-paced evolution in technological resources, definitions quickly become erroneous. … Research in relation to technologies has evolved through explorations of the desktop computer (Haugland, 1992), to 'electronically enhanced objects', 'clever' robotics (Bergen, 2008) and smart toys (Plowman, 2004) to screen-based media (Neumann and Neumann, 2014) and on to 'internet-enabled' resources (Palaiologou, 2016). … These definitions are evolving and already calls for explorations of future technologies are in place, as Livingstone et al. (2015), suggests the need to explore 3D printing and Smart Homes. (Arnott, 2016b: 330)

Despite the brevity of the discussion in that particular chapter, in reality it warrants lengthier consideration due to its complexity. The interchangeable way that terminology is used to represent different resources, and the distinct difference in perspectives between researchers, academics and practitioners, make arriving at a universally accepted definition particularly difficult. This is especially troublesome when the aim of this book is to create a conduit between theory and practice, where it would be hoped that those generating theory and those applying said theory have come to a consensus.

One of the problems with defining technologies is the sheer volume and range of resources being covered. 'Digital media' and 'technology' are considered inclusive terms reflecting the range of resources likely to be available in early years education (Plowman, 2016). Such resources could include: music players and games consoles for entertainment purposes (McPake et al., 2013); everyday household technologies available to children, such as digital toys and games (Arnott, 2013; McPake et al., 2013); desktop and portable computers, including tablet computers and mobile devices (e.g. Edwards, 2013; Neumann and Neumann, 2014); 3D printers (Livingstone et al., 2015); non-screen-based resources such as microscopes and

metal detectors (Savage, 2011); and now even non-working technologies, as Bird discusses in Chapter 8. Combining these examples, and the many more resources which are not listed above, into an encompassing list is almost impossible. For example, Plowman et al. (2010: 15) once suggested that technologies are 'electronic objects that are found in homes and educational settings'. Similarly, I have previously suggested that a usefully broad definition of technologies may be 'everyday electronic objects and toys that generate a response when stimulated by the child' (Arnott, 2013: 99). This definition served me well in relation to the technologies I was discussing for that particular project, but it does not offer a definition which could be universally applied to all technologies used in children's early playful experiences. Indeed, it is at odds with many of the technological devices discussed by the authors in this book, for example non-working technologies are not electronically powered and would not generate a response. According to the above definition, these recourses would be excluded but as we see from Bird's discussion, they offer valuable insight into how technologies are shaping children's play in contemporary early learning and childhood.

For that reason, much curricular or policy guidance has been known to offer an exemplar list of possible technologies to articulate their meaning (Scottish Executive, 2003) rather than present a comprehensive definition. This could be because the term 'technology' relates to innovation and with innovation not only come new resources but often a shift in focus. It is therefore not always achievable to have a static definition which fails to recognise these innovations. Instead an evolving list of sub-categories that could be used to describe the resources of interest to early years research and practice is often utilised. For example, there was once a strong focus on Information, Communication Technologies (ICT). As technologies involving new innovative resources have emerged, the use of ICT is slowly being replaced with the distinction between digital and non-digital. As computer scientists are taking a greater interest in education, we are seeing increased discussion of 'smart' resources and programmable artefacts which could be a category of technologies in their own right or could appear broadly under the 'digital' banner.

KEY DEFINITION

Digital devices

The term 'digital devices' is used here as a collective term for all equipment that contains a computer or microcontroller and to which adults and children might have access, a list which now includes toys, games consoles, digital cameras, media players and smartphones as well as handheld, laptop or desktop computers (Palaiologou, 2016b: 305).

Similarly, classification of resources as digital or technological *toys* in comparison to technological artefacts, devices, resources or tools (i.e. not a toy) is emerging.

Yet still the lines continue to blur as technologies evolve. In previous work, I have talked about non-toy technologies as *adult world resources* (e.g. digital cameras, metal detectors) (Savage, 2011), yet with the lucrative child technology market perpetually expanding, product developers are now producing children's versions of these adult world resources, such as toddler-friendly cameras or Digi Blue microscopes, designed specifically for children. These raise further questions over classification of resources once more. How do these varied categories of technologies shape children's play experiences and learning? In this book we would argue that narrow definitions of technology may limit the scope for technological play and misrepresent children's experiences.

In order to ensure breadth in children's technological play experience, we must ensure we adopt a broad-ranging perspective on technological resources. I have previously made the case that a clear definition is not as important as understanding the properties of the resources in question and recognising that children's experiences are always likely to be different.

> Irrespective of the definition employed, the central point to note is that technologies are heterogeneous (Bergen, 2008); they are not all the same. Indeed different resources offer different technological affordances (Carr, 2000) and as such may influence children's early experiences differently. In order to understand the role of technologies in early years, we must therefore consider the range of resources available and explore their affordances and unique properties. (Arnott, 2016b: 330)

I stand by this position but I also recognise that some guidance may be helpful to bridge the theory–practice divide. For that reason, I suggest that Johnston and Highfield's definition of technologies presented in Chapter 5 is particularly powerful.

KEY DEFINITION

Definition of technology

> … anything that can create, store or process data – this could include digital toys or other devices such as computers or tablets (Palaiologou, 2016b); less tangible forms of technology such as the internet (Knight and Hunter, 2013); and imaginary technologies – such as those that appear in dramatic play (Edwards, 2014; Howard et al., 2012). (Johnston and Highfield, Chapter 5, p. 58)

Playing and learning with technologies

This book is concerned with how children's play experiences are evolving in light of the digital or technological era. In order to put the book in context it is useful to

draw on an extended case study of a child's technological play experience in their early years. The story told here is my own, and my daughter's. I draw on my own experience living with two roles; as a mother concerned for my daughter's development, her future and her safety, and as an academic trying to maintain a balanced position on technologies in children's lives. I do not pretend that this case study is a result of rigorous research evidence (that comes from the remaining chapters in this book), but rather it is my reflection on a young girl's technological world. It represents some of the choices that we as parents need to make when raising our children in a constantly 'connected' world. It is also a world unregulated by learning outcomes – my focus for my daughter is for a happy and healthy childhood – so her experiences with technologies, presented in the case study below, are that of play and fun and self-motivation. As such the case study gives a useful introduction to the remaining chapters of this book because within this short snippet of informal childhood experience with technologies, we see every element of play experience, learning journey and, indeed, pedagogical considerations, which are so skilfully addressed by each chapter author.

CASE STUDY   A CHILD'S JOURNEY WITH TECHNOLOGIES FROM 0–3 YEARS

Heather will turn 3 years old in 3 months' time but already she is competent with digital touch screen internet-enabled technologies, and has been reasonably proficient for almost a year. When handed an unlocked mobile phone or iPad (or similar tablet), she can independently find Skype to call her grandmother or her father when he is away on business. She recognises the logo for Skype and when selected she can locate the appropriate contact from their contact image. She recognises the distinction between using Skype to video call and WhatsApp to send 'texts'. When she wants to 'text' she can locate the WhatsApp icon, locate the appropriate contact, typically her Grandmother, and she holds down the voice record function independently to send a 'text' (a voice message which is delivered instantly in the same way an SMS would be). She can make a standard voice call when the contacts have pictures (Figure 1). She can also locate the Spotify app on her own and select music. She can autonomously use YouTube. She can locate the app and select videos from the videos already available in the suggestion features (in the first instance she requires an adult to type in the search field for an appropriate video but when she returns to the app without the phone being completely shut down, the previous selection is still available). She can then seamlessly move to the next video from the list of suggestions offered by YouTube. Sometimes she watches videos intently and other times she 'browses', i.e. watches a video for a few minutes before moving on to the next. She can recognise the various icons for different apps and can remember where different TV programmes can be found. For example, on the iPad she can locate Ben and Holly in the videos icon because it was purchased from iTunes. When she wants to watch *Despicable Me*, she recognises that this is found in the Amazon Video icon and navigates to it (Figure 2).

Figure 1.1   Phoning Nanna to say thank you for the new pram

Figure 1.2   Long train journey with the iPad

Figure 1.3   Photographs taken by Heather at 2 years old

Figure 1.4   Printing out a photograph with Polaroid Instant Print Camera

Figure 1.5   Hoovering the car with Dad

Figure 1.6   Shopping with her younger sister

(Continued)

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Heather's use of these resources is balanced with other play activities. Throughout the day she also uses puzzles and paints or uses art materials to create pictures. She also uses digital 'paint' applications. She takes photographs and shows these to family and friends with pride, just as she does with her drawings and paintings (Figures 3 and 4). She plants vegetables in the garden with her father. She attends swimming lessons. She has a doll which she cares for in the same way I care for her little sister. She watches toy reviews, often of dolls and how they can be played with, fed and bathed like real babies, and has developed American terminology, such as diaper instead of nappy for American toys. She has a North American doll which is the same as one she watches on YouTube and she asks for a diaper for her but a nappy for her sister or all other dolls in the house. She attends nursery. She reads books at bedtime. She enjoys water play in the garden and she enjoys carrying out simple household jobs like washing the car or hoovering; she has a toy Dyson hoover, that actually vacuums – the same as her parents' (Figure 5). She bakes in her kitchen with her battery powered free-standing mixer, just as she bakes with me. She watches cooking programmes, such as how to bake Peppa Pig cakes, and she looks at paper recipe books. She plays with multi-coloured building blocks or shape sorters and watches videos of foods or toys separated into colours. She rides a balance bike. She visits the zoo or local farms and she takes pictures when she's out on excursions. She attends local museums. She pretends to buy and sell items using her shopping till and she has her mother's old cancelled credit card to 'purchase' goods (Figure 6). She likes to scan the barcode of items on self-service machines when out shopping with her family. She goes to the park and spends hours climbing, swinging and sliding. She has a family dinner time where she talks about her day. She has an old landline telephone handset that no longer works and she role-plays conversations with it. She walks to see the horses in the fields. She attends BookBugs sessions at her local library.

The examples presented above give only a snapshot of Heather's experiences but even so, it is clear that technologies are plentiful in Heather's world, yet not overpowering. Heather's motivation to engage with technologies is self-initiated. Despite my research focus in my academic role – which some might assume would lead me to encourage more technology use – I have to ensure balance in Heather's activities to avoid overuse of sedentary technology engagement, just as any other parent. It is for that reason, and from my previous research knowledge (Arnott, 2013; Arnott, 2016a; Arnott, 2016b; Arnott et al., 2016), that I called this chapter framing technological experiences in early years. High quality experiences with technologies do not happen by chance. Technologies do not do the pedagogic planning for us, despite their interactive properties. Yet we see from the short case study above how, through open ended play and fun, carefully framed, scaffolded and supported experiences, children can have enriched technological journeys.

The role of technological experience in early childhood education

What is clear from this case study, and potentially of most relevance to this book, is that children incorporate technologies into their play experiences naturally, based on what they see in the lives around them – the way children have always done with traditional resources. Just as Heather breastfeeds her doll after seeing her sister being fed, Heather uses technologies in the way her parents do, i.e. she walks around the house talking on her pretend phone while simultaneously cooking, or pushing the pram. She copies her parents' actions when she takes a photo of her sister by clicking her fingers above her head to get her attention. She scans her library books with the LED light of a desktop mouse just the way librarian does when taking books out of the library. For Heather, technologies are all around her. She integrates them into her play in the same way she would with traditional resources.

What does all this mean for technological experiences in early years education, learning and play? Elsewhere I have described how technologies could be integrated skilfully into early childhood practice and life.

> Gripton argues that part of supporting child-initiated play and learning is planning for endless possibilities. She argues that 'preparing and enabling endless possibilities is as much about belief and faith as it is about the practicalities' (2013: 18). The same is true for technologies, which should be viewed as another resource in your setting through which you can plan for 'opportunities' (Savage, 2011), 'possibility thinking' (Craft, 2012) and 'endless possibilities' (Gripton, 2013). Balance the risks, but embrace the potential afforded by technologies and utilise them in a manner that suits your practice and children's learning – just as you already do with traditional resources! (Arnott, 2016b: 338)

With digital technologies permeating early years playrooms and homes, there is a perception that these resources alter early years practice in some way. That parents and practitioners need to be vigilant with technological toys. The focus on technologically-specific practice is fuelled by the interpretation that technologies are unique resources, which bring with them their own specialist set of requirements in children's learning. Technologies are consistently segregated in policy and curriculum documents as distinct, stimulating the discussion about how these resources should be integrated into children's lives. Yet how different are these artefacts? And what different impact do they really have on children's early experiences in comparison to traditional early years toys and resources?

One argument for the lack of exploration of technologies in context may be that, in fact, these children used technologies differently in preschool to other traditional playroom resources. Certainly, evidence suggests that technologies, computers in particular, were not well integrated into play-based curricula (Howard et al., 2012). While calls for more developmentally appropriate use of

technologies in early childhood playrooms are evident (Parette et al., 2010), until recently the lack of understanding around technology as part of play-based curricula makes this challenging. Howard et al. (2012) demonstrate the inherent issues of integrating technologies into the playroom by highlighting that research recommends that technology use should be guided by adults. In doing so, they argue, you are formalising the activity and reducing the play-based, child-initiated nature of the activity. In recent years, however, this perception is changing and was are seeing more play-based experiences with technologies.

This short story of Heather's experience gives us insight into how the experiences considered in this book may unfold in a child's life.

1. We begin to understand Heather's technological learning journey is one of participation and co-construction as she constructs digital conversations or takes photographs (Chapter 2).
2. We see multimodal play as Heather watches baking videos, plays with toy baking equipment and bakes real cakes with me (Chapter 3).
3. We see creativity and dramatic play as Heather engages in digital and traditional art activities or acts out role-play scenes (Chapter 4).
4. We see technologies used outdoors as she acts as a photographer in museums or when on excursions (Chapter 5).
5. Numeracy and literacy are highly developed through watching colour matching videos or toy reviews. Many vloggers record themselves separating out confectionary, such as bags of M&Ms into the groups of colours. They edit these videos to music and insert text which shows how the colour of that particular group of M&Ms looks when it's written. In other cases, children watch videos of people opening toy packaging or surprise eggs and these eggs are often colour coded to help children learn the colours as they watch. Literacy is also developed in this manner and it was interesting to see that Heather uses terminology appropriately in different contexts (Chapter 6).
6. Given Heathers proficiency with YouTube, she was often able to navigate to materials that were not appropriate. These were still child orientated videos but they may represent behaviours by other children on the videos which we as parents considered to be offensive. Alternatively, she might navigate to nursery rhymes that she was not allowed watch, such as Three Little Pigs, because the wolf had proven to give her nightmares. This gave us the opportunity to begin to instil an understanding of safe internet use. Heather discussed the inappropriate videos and her recognition of safety became apparent when she began saying at the beginning of an iPad session: 'I won't watch the nasty ones, promise'. Her viewing is still monitored but access to the device was not rescinded because of inappropriate content. The regulation of children's use of online social spaces by relevant legislation, parental control and product development limits their opportunities for 'testing boundaries, socializing and for taking risks in safe way' (Bers, 2012: 3). Guided internet use by us provides this opportunity. All of these experiences represent the world of a child under 3 years old and the associated decision making of the adults responsible for her care (Chapter 7).

7. She demonstrates interchangeable use of working and non-working technologies, understanding clearly when her non-working telephone handset requires pretend play rather than interactive two-way conversation over a working telephone. She uses an old discarded credit card for pretend play but doesn't ask to use it in shops. (Chapter 8).

8. The framing of these activities by me demonstrate a form of digital pedagogy when adopting a broad definition of pedagogue, a process which is fundamental to children's technological play and underpins every aspect of the learning experience (Chapter 9).

9. The self-motivated nature of Heather's play reflects how we can incorporate technological leaning experiences in a child-centred way by listening to their interests and needs. Permission was granted by Heather to Print her pictures and tell her story. (Chapter 10).

SUMMARY

To integrate technologies into play-based approaches skilfully it is important to consider the affordances of new technologies, alongside the possibilities and challenges they pose. Their interactive, immersive nature, use of powerful multimedia, user-generated and communication-enabling characteristics allow children to interact with new multifaceted learning environments and with other learners in a global community. This aids their cognitive, social and emotional development, and increases their self-efficacy and academic achievement (e.g. Sung and Hwang, 2013). Nowadays, possibly more than ever, children of all ages are not merely consumers of knowledge but rather contributors and co-constructors of collective experiences and meaning (Fischer and Konomi, 2007). Yet it seems that educators still do not believe this to be true:

> Teachers considered their use to be in opposition to what they actually try to do, believing that digital devices do not create opportunities for play in which children explore all their senses, but tend to limit both language interaction and opportunities for self-directed actions. (Palaiologou, 2016b: 316)

In reality the nature of play is changing in the digital era (Marsh et al., 2016). This book begins to give some insight to contemporary technological and digital play and fundamentally the digital pedagogy associated with these experiences.

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