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Touchscreens and Personalized Education

Touchscreens have become new ‘playgrounds’ for teachers, researchers, designers and children. In this chapter, I use the ‘playground metaphor’ to stress the multifaceted and rich potential of these devices to support personalized education and outline how the effects of personalized education depend on individual children’s needs, the context of their learning and the content of the activities. I focus on positive examples which, of course, are not the norm, and were, in the studies described here, influenced by the use of the Our Story app and teachers’ sensitive and responsive pedagogy. This approach is intended to showcase a positive side of personalized education against the backdrop of the techno-centric approaches presented in Chapter 3, and to inject some empirical data into a predominantly theoretical discussion of personalization in the ending part of this book.

Digital technologies and young children: Search for integrated practices

If I wrote this book some five years ago, I would probably need to make the case for why it is important to discuss digital media and young children in the first place. Indeed, if we consider this quote by Parette, Queensberry and Blum (2010), we can see that not so long ago technology was not welcome in early childhood classrooms: ‘Quite frequently, a visitor in many early childhood settings might think that young children were asked “to leave their technology at the door” before entering the classroom. Cell phones and other communication applications, computers and other tools may not be allowed by education professionals who use traditional teaching approaches and materials’ (Parette et al., 2010, p. 336). Historically, digital technologies have been considered either good or bad for children, and although a yes/no philosophy is not so prevalent among educators now, there are still many early years settings where digital technologies are banned (e.g. in the majority of settings that follow the Montessori model) and there are still many families where children are not allowed to use technologies (or only under strict restrictions). These approaches are often based on the assumption that young children learn better and can have richer experiences when they interact with natural materials and spend time outdoors. It is assumed

that technology-based and natural environments are not compatible and that one replaces the other. A contrasting understanding of technologies in early childhood is that the two cannot be separated and that they mutually enrich each other. As Siraj-Blatchford (2015) explains: 'ICT [information and communication technology or interactive media] is now ubiquitous and mobile, many preschools have found scope for the integration of ICT in young children's outdoor play environments and ICT also provides a means of bringing the outdoors learning environment into the classroom' (p. 18).

Rising use levels

In this chapter, I outline studies where children aged 2 to 8 years used technology as part of their early learning, with the support of their peers or teachers or parents. When discussing and conducting this research, I followed the rationale that the question of whether technology (and, by extension, digital personalization) is good or bad for young children is of little practical value. For the majority of children growing up in the Minority World, technology is part and parcel of their lives, including those of the youngest children. This is unlikely to change in the future – national and international surveys document clear growing trends of technology use among increasingly young children (e.g. Bergström & Höglund, 2014 in Sweden; National Literacy Trust Annual Survey, 2016 in the United Kingdom and Madden, Lenhart, Cortesi, & Gasser, 2013, in the United States). For example, in the United States in 2011, only 10 per cent of children under 2 had ever used a mobile device (Common Sense Media & Rideout, 2011). This increased to 38 per cent of zero- to 2-year-olds in 2013 (Common Sense Media & Rideout, 2013). For the youngest children, a nationwide survey showed that zero- to 2-year-olds are using an average of one hour and fifteen minutes of screen media per day, primarily watching TV or videos (Wartella et al., 2013). The rising use is happening among all sections of the population; for example, a study conducted in a low-income urban community showed that almost all (97 per cent) zero- to 4-year-olds who are registered with the paediatric clinic in this community had used a mobile device (Kabali et al., 2015).

My approach to digital personalization is informed by these data and the outstanding research of my colleagues and international scholars who are looking for effective ways to integrate and not separate the digital and non-digital forms of early childhood education (see, for example, the work of professors Cathy Burnett, Karen Wohlwend, Jennifer Rowsell, Jackie Marsh and many others). The more we can involve young children as authors, makers and producers and empower them to experience authentic learning opportunities, the better it is for the future generation. Clearly, the use of technology and digital personalization are broad blanket categories and we need to be asking who uses which device for what purpose, for how long, in which context and for which activities. Age is probably the most discussed factor in these considerations.

Children under the age of 2 and digital technologies

Without a doubt, the use of technology plays out differently for different children, depending on the children's age and other demographic factors. Very young children (those aged less than 24 months) may not have the maturity level necessary for purposeful use of technologies. The use of technology more generally and digital personalization more specifically for this youngest age group needs to consider some additional factors, which are fully described in the helpful guidelines produced by Lerner and Barr (2014) and the American Academy of Pediatrics (revised statement published in 2016). In sum, they need to be evaluated in relation to the development of children's specific skills (fine motor, gross motor, language); in relation to the specific context in which these young children grow up (e.g. supporting family backgrounds vs. deprived families or remote parents); and the emerging research evidence on the impact of specific features of technologies (e.g. interactivity) on the development of key competencies in this sensitive period. The period after birth and before the children turn 2 is an especially crucial developmental period, but it does not mean that 2-year-olds are a homogenous group and that they all respond to technologies in the same way. I have detailed the impact of technologies on this crucial development age period with two leading US paediatricians – Dr Jenny Radesky (University of Michigan Medical School) and Professor Barry Zuckerman (Boston Medical Schools) – in specialist articles and refer the interested reader to Kucirkova and Zuckerman (2017) and Kucirkova and Radesky (2017). I deliberately and consciously do not include children under 2 in my discussions of digital personalization and in my empirical work because of the additional considerations necessary for this age group.

I began the discussion of children and technologies more broadly and now move from the funnel approach to the specifics of digital personalization with touchscreens. 'Touchscreens' is an umbrella term for a suite of touch-manipulatable devices: iPads, tablets and smartphones, also known as personal mobile technologies, or interactive media. Touchscreens have some features that make them different from other technologies and I summarize these features next.

Touchscreens: Key features

Anyone who has seen a touchscreen would notice that touchscreens are different from desktop computers because they have a touchscreen interface and are designed to be lightweight and portable. Thin and light devices are easier for transportation between formal and informal learning environments (e.g. the same device can be used at home as well as in school), between inside and outside (e.g. tablets can be taken outside or for school trips) and for travelling (e.g. taking tablets on board of flights and for car trips). Undoubtedly, this characteristic facilitates children's learning across the traditional boundaries of school and home (Sharpley & Roschelle, 2010) and across formal and informal learning environments. From the perspective of the 5As of personalized education, the key novel affordances of touchscreens are their touch

manipulation and multimedia and I will therefore focus on these two features. As explained in Chapter 8, I conceptualize these features as ‘affordances’, that is, not only as the physical properties of the devices but also as the learned behaviours, activities and relationships associated with these features.

Multimedia refers to the combination of several media into one device, which can produce the so-called multimedia effect. As discussed in the previous chapter, the multimedia effect can bring about potential learning benefits (see Mayer’s studies). In addition, multimedia in touchscreens can offer multiple engagement options for children, as well as teachers and researchers. This is how I arrived at the playground metaphor.

The playground metaphor

The combination of several media into one device means that touchscreens can be used by researchers for a number of research activities: to collect video or audio data, to take photographs or notes, to look up and use information, to collaborate with colleagues and to curate and share files. The availability of these multiple functions within one device can foster collaboration among various stakeholders and can lead to productive design-based research (Kucirkova, 2016a). Similarly, teachers can use touchscreens for a number of activities: they can create, edit and store photographic evidence of children’s activities, access and curate information about selected topics of interest, contact children’s parents and install specific apps on the devices. The simplicity of the content management and distribution functionality means that teachers can easily create, compile and edit resources. This can support the accumulation and curation of a rich repository of resources over time. It can also invite contribution from parents and pupils and can lead to collaborative digital projects. I have highlighted the benefits of these multiple functions and functionalities in several professional articles (see Kucirkova, 2014c, 2015b, 2016c). What I discussed only in passing is the fact that touchscreens are a great new playground for the children too: touchscreens offer apps (programmes) for storytelling, sharing pictures and reminiscing, for writing and practising reading, building puzzles and imaginary worlds, colouring and drawing, playing matching games, recording their own voices and thousands of other options. Just like on a traditional physical playground, there is a range of different activities supporting different skills (with the main difference being the fact that with touchscreens children cannot develop the full range of fine motor and gross motor skills as they could on a physical playground).

Thus far, studies have critically evaluated the educational potential of touchscreens for young children’s learning and play (Flewitt, Messer, & Kucirkova, 2015; Hutchison, Beschoner, & Schmidt-Crawford, 2012; Sandvik, Smørðal, & Østerud, 2012). These studies, together with some theoretical (Falloon, 2013; Kucirkova, 2014b) and qualitative review analyses (Neumann & Neumann, 2015), described instances of children’s motivation and engagement during touchscreens’ use. In this chapter, I focus on the potential of touchscreens to support personalized education (as defined by the 5As introduced earlier in the book).

The possibilities of touchscreens for personalized education

In evaluating the potential of touchscreens for supporting the 5As of personalized learning, I use three key broad evaluation criteria of screen time, as suggested by Guernsey in 2012: the importance of context, content and individual child (3Cs; Guernsey, 2012). All 3Cs are closely related to the specific affordances of touchscreens that directly influence the learning possibilities. For instance, the extent to which a particular child (e.g. a child with reading difficulties) benefits from reading a personalized digital book about oak trees (the content of the book) when visiting her grandparents (i.e. the context) depends on the book's educational features and how the child responds to these affordances.

Impact on individual children

As mentioned, two distinguishing features of touchscreens are their multimedia and touch manipulation. There is one single 'Home button' for easy finger navigation, without the need for a mouse or another extra input device. This largely facilitates independent learning by young learners or children with motor impairment who often lack the dexterity skills necessary for manipulating PCs and other technologies.

With my colleagues Dr Val Critten (who, at the time of the study, worked at a special school for children with physical disabilities and communication difficulties in the south of the United Kingdom), Jane Harwood (who worked for the charity Open Storytellers in Somerset, the United Kingdom) and Professor David Messer from The Open University, I conducted two case studies exploring the potential of touchscreens for individual children attending special needs schools. We described two case studies in our co-authored article for *Communications Disorders Quarterly* (Kucirkova, Messer, Critten, & Harwood, 2014). For convenience, I summarize the main findings from these studies briefly here. In Case Study 1, Val used the iPad app Our Story in her classroom of six boys and three girls aged 7 to 9 years. Val used the touchscreens available in the classroom with the specific aim to support children's authorship and autonomy. The activity was the creation of a collaborative digital story, based on the children's trip to a spinney. The final story contained pictures taken with the iPad camera, short dialogues recorded by the children and short video excerpts of the children acting the story out in the sensory room. Selected elements of the story were personalized by the individual children depending on their abilities and interests and the final story was a collaborative amalgam. When Val reflected on the benefits of this approach for the individual children in her classroom, she concluded that each child benefitted differently. The description of these individual gains is important to be mentioned here as it fittingly illustrates the fact that the outcomes of a personalized intervention are very much unique – or personal – to each individual child.

For Rafiq and Lily, who had limited or no verbal output abilities, the app [Our Story iPad app] enabled them to make substantial contributions to a group story-making activity by taking pictures of each other in the costumes, which were later

used as part of the story. Both children took the two leading roles in the drama, and due to their inability to say lines, a collective class decision was made to narrate the play so that Rafiq and Lily could mime their roles. In contrast, for two of the more advanced communicators in the class (Calum and Habib), the app provided opportunities for negotiation and insertion of appropriate dialogue excerpts during the audio-recording of the story-creation process. Both boys have physical difficulties with turning pages in books, and the app facilitated their access to the individual story parts (the boys could swipe the pages of the digital book on the touch-sensitive screen). This allowed to meet the target of independent decisions during story-creation and story-sharing. (p. 47)

There is of course a caveat to these results. This study took place in a special school where practitioners are encouraged to take time and care to evaluate the benefits for each individual child. This is different from typical/standard schools where children's outcomes and the success of an intervention are evaluated in terms of average scores and percentages of students above the optimal achievement level. Val further wrote:

For John, who was the most able speaker in the class and the person who often monopolized speech-requiring activities, the app was used to support his social skills development (e.g., taking turns with other children who contributed to the storymaking). For the two children on the autistic spectrum (Martin and Robert), the app was used to capitalize on the iPads' attractive visual display of photographs and the resulting story. For Jane, who could not see the screen because of her visual problems, and Nina, who was unable to be left with an iPad on her own because of her erratic behaviour, supplementing the iPad story-making with an acted-out session meant that their target of sustained attention and ability to listen to others could be achieved. (p. 47)

In sum, in this classroom, the use of the Our Story app supported children's authorship of their own stories and thanks to the teacher's sensitive scaffolding, children's aesthetic choices, preferences and abilities were embraced and celebrated in the activity. This enabled each child to make an authentic (genuine) contribution to the activity and take ownership of their part of the story. Again, it is worth pointing out that such personalized learning would be difficult in a typical classroom setting where teachers follow a standardized curriculum and assess children on standardized measures of achievement.

In the second case study, Jane worked with Sally, a 12-year-old girl who attended a school for children with physical and intellectual impairment in the north of England. Sally didn't have a specific diagnosis. When formally assessed on the British Picture Vocabulary Scale test, her score reflected language skills of a six-year-old child (standardized score of 55). Jane used Our Story with Sally because she was keen to support the girl's autonomy in sharing personal experiences and opening up about her feelings. Sally took on the task with keen interest. With the iPad, the girl took pictures of several members of staff in the school, including of Jane, and added short captions expressing her feelings about these people. She also made short audio recordings and

demonstrated a clear interest in polishing and refining her story in the course of the individual sessions Jane had with her over six weeks. Jane noted that Sally became much more responsive to others during her story production: she asked the teachers whether they would like to be photographed and she also asked the head teacher for permission to take a picture of the school's main office. The possibility to take pictures and immediately view them on the big screen facilitated the brokering of photographs and led to some shared laughs as Sally was discussing the best shots with the teachers.

These early studies with Our Story and children with atypical development taught me a lot about the value of personalization in digital tools, about the importance of ergonomic design of touchscreens and the importance of flexibility when it comes to accommodating all children's needs. At the same time, they made me reflect on the value of digital personalized stories for typically developing children in a classroom. For these children, the focus of research has not been so much on individual gains, but more on the impact of specific resources (i.e. *content* of personalized education) and school environments (i.e. *context* of personalized education).

The impact of content

The content is with touchscreens created with the individual software programmes designed for the devices – the so-called 'apps' (short for applications). Unfortunately, as with many other resources developed for young children, the efficacy of the learning potential of an app is rarely reported by the app designers (see Kotler-Clarke, 2016, for a discussion on this issue). The reason is simple – it is unknown; the designers do typically not test how well an app can support children's learning. For their seal of approval, the app must provide children with fun play opportunities and motivate them to use it for repeated or prolonged time. This, many argue, is not necessarily educational.

Educational content of apps

When Vaala, Ly and Levine (2015) assessed the educational quality of 183 most popular apps (selected from the top fifty educational paid and free apps in the various app stores developed for young children), they found that 71 per cent of these apps did not provide information on an educational basis or pedagogy of use and almost half of the apps did not mention the expertise of the team who had developed them. In this book, I discuss personalized education facilitated by the Our Story app, which, as mentioned, has been developed as part of my doctoral studies, with input from teachers, parents and a team of people at The Open University. Given that this is not the trajectory of most educational apps, the results of Our Story studies are not generalizable to all learning situations with touchscreens. Our Story is a multimedia app and it works best on iPads which are touch-manageable. These two affordances work particularly well with open-ended content possibilities. Unlike most apps developed for young children, Our Story has almost no content – it is best thought of as a scaffolding for others to add their own content. As an open-ended space for

content creation, Our Story provides teachers and children with space where they can add their own materials and author their own multimedia stories. This is different from most story-making apps developed for young children because these contain story templates, story excerpts or story props and thus guide children in certain direction of content production.

The lack of content, or, phrased more positively, the availability of an open design space, is an important factor contributing to children's learning. This was documented in Kucirkova et al. (2014) with forty-one preschoolers in a Spanish preschool.

Open-ended content

In 2014, I received a personal grant from the Santander Bank to conduct a study with touchscreens in Spain. This led to a six-month-long study in two preschools in the Madrid suburban area. Together with professors Messer, Sheehy and Fernandez-Panadero, we studied children's peer talk in relation to different apps used by the children attending the preschools. The findings showed that children's use of exploratory talk (which is the most desirable type of classroom talk; see Mercer & Wegerif, 1999) was highest when children used open-ended apps (vs. predefined, closed apps). Open-ended apps are more conducive to personalization than closed apps because, naturally, they provide more possibilities for a child to express themselves. Interestingly, the open-ended nature of Our Story did not induce children into independent but into collaborative story-making in the classroom. During the story-making, children needed to talk to each other to negotiate which pictures to select from the shared classroom photo gallery, which name to type in the box describing the pictures or whose voice to record to accompany a picture. Children who were less skilled with technologies asked their more IT-savvy friends for help when they couldn't get the picture they wanted on the storyboard or when they accidentally deleted the audio-recording. Children with more advanced literacy skills supported their friends when typing their names in the story box and those who were keen to make new audio-recordings or take new photographs spoke with their friends as they needed to negotiate their access to the device. The fact that the app did not provide them with any guidance or templates meant that they needed to talk to each other to use the app. In contrast, when the children used puzzle-making apps, they barely talked to each other and in silence completed their individual pieces. This is perhaps not surprising if we consider the fact that with puzzles the goal of the activity is to complete a predesigned pattern that is clear from the beginning and there is only one way to achieve that goal (to put the disparate pieces in order). However, authoring multimedia stories with Our Story meant that the children asked more 'W questions' (who, when, why) and used more sophisticated sentence structures – akin to a problem-solving scenario.

The importance of open-ended content for children's learning was also discussed by Falloon and Khoo (2014), who observed 5-year-old children interacting with a range of iPad apps in New Zealand classrooms. In addition to peers, the researchers assert that for higher-quality classroom talk with open-ended apps, the teachers' support in establishing 'ground rules' is indispensable. All told, for preschool-aged

children (between 4 and 5 years), the use of open-ended touchscreen apps with peers' and teachers' support can facilitate effective personalized education. Notwithstanding, this conclusion should be viewed as applicable to a specific learning context, namely that of a preschool where the children and teachers provide support to each other. The affordance of an open-ended content of Our Story is taken up differently in different learning contexts.

Impact of context

In 2014, I had the opportunity to examine the value of personalized education (as facilitated by the Our Story app and teacher-selected apps on iPads) in three different contexts. This was a study conducted at the beginning of the 'iPads era', between 2011 and 2012, when the devices began to emerge on the market. In those years, iPads were predominantly bought and designed for home use or high and secondary schools, but not early childhood classrooms. Intrigued by the prospect of using iPads in British preschools, Dr Flewitt, who worked at that time at The Open University, Professor David Messer, my former Phd supervisor, and I received some pump priming funds from The Open University to conduct a study to evaluate the benefits and limitations of using iPads in preschool settings. We approached three different settings: Children's Centre nursery (3- to 4-year-olds), a primary school reception class (4- to 5-year-olds) and a Special School (7- to 13-year-olds) and we observed the use of touchscreens in these three schools for two months. The teachers in these schools had not used iPads before and we therefore spent some time on professional development prior to the use of the devices. We were primarily interested in how the teachers would integrate (or not) the devices into their existing practice, whether iPads would disrupt or enable innovative pedagogy and whether the Our Story app would support personalized learning. On a practical level, we hoped that the possibility to try out the devices for a longer period of time would enable the settings to make an informed decision about the value of the devices for their settings before they make an investment and commit to a large-scale purchase of the devices. In addition to Our Story, we uploaded some simple literacy and maths apps to the devices and showed the teachers where they can find more apps and how to download them.

Given the open agenda of the evaluation and the different set-up of each setting, it was of no surprise to us that we found differences among the three settings, with the iPads playing a different role in each context. Our goal was not to compare the three schools against each other but to find common threads and similarities of use. Let me first outline some commonalities in relation to the limitations of using touchscreens overall, for any type of education.

Barriers to effective use of touchscreens in schools

In all three settings, the teachers needed to overcome some logistic and pedagogical limitations before they could use touchscreens effectively in their classrooms. The

barriers that impede any effective educational practice include: (1) cost (the cost of the hardware and accompanying systems needed to support their effective use in classrooms such as high-speed Internet, secure online storage area, protective covers); (2) lack of time necessary for professional training supporting effective classroom deployment (especially for educators who are not frequent IT users and in settings with no dedicated IT support) and (3) lack of pedagogical knowledge related to touchscreens' use in the class. As for the financial barrier to the use of touchscreens in schools, it should be remembered that the cost of hardware is not the only investment schools need to make with touchscreens. Decisions around the purchase of individual apps need to be negotiated with individual teachers. Also, in another study, we found that the limitations of the school's broadband capability were a bigger financial and logistical barrier than the actual purchase of iPads for the school (Kucirkova & Littleton, 2016). The process of incorporating iPads into the classroom took significantly longer than anticipated as permissions at local authority and information and communication technology (ICT) service provider level had to be brokered and secured. Thus, the school's basic digital infrastructure needs to be reviewed and updated before any touchscreens and personalized education discussions could take place. As for the professional training barrier, the difficulties of using iPads in the classroom, as noted in Flewitt et al. (2015), were similar to previous technology-supported interventions in schools. The key limitations of staff using or rather not using iPads related to technical problems and lack of dedicated technical support when problems occurred. Given the iPad's novelty at the time of study, many staff had limited expertise in handling the devices and often found it overwhelming to have to manage a classroom with a new device in their hands. The possibility to take the device home and explore its usability at their own pace mitigated against this limitation somewhat. However, not all members of staff were ready to dedicate their free time to learning how iPads worked and maintained that they could achieve similar goals and exciting activities without the technology (this was the view expressed especially in the early years setting). Our study strongly indicated that it is essential that teachers attend any training or induction session with a clear idea for the kind of activities they envisage to support with the touchscreens. Here, Colwell and Hutchison (2015) remind us of the need to give teachers and preservice teachers the time and confidence necessary for searching resources, which would be best aligned with their own pedagogical goals. In addition to online independent staff development, teachers can meet and collaborate with other teachers face-to-face and shadow classes where colleagues can exemplify and inspire each other with what can be achieved using specific apps. In many respects, these barriers are not unique to touchscreens – time, cost and lack of pedagogical training are the three key limitations we find time and time again in studies documenting the use of technology in school environments.

So, was there any added value of having the devices in the three classrooms we observed? One dominant theme across the three schools was that when the touchscreens were used in classrooms in a planned and careful way, they offered the children unique opportunities for enhancing their communication, collaborative interaction as well as independent learning. Conversely, haphazard use combined with little critical evaluation led to frustration (for the children as well as staff),

poor classroom management and low-concentration levels. These broad-brush findings gave way to a more detailed examination of the iPads' value for personalized education.

Benefits of using touchscreens in schools (from the 5As perspective)

A full report of the benefits we observed in the three settings is provided in Flewitt et al. (2015). We did not compare the positive effects against baseline data and we did not have information on the benefits or limitations of other technologies used in these classrooms before touchscreens. The research is therefore largely descriptive and not explicitly tied to personalized education. In this section, I pick out benefits that impact on, or are related to, the 5As.

For lessons where the teachers identified clear learning goals and purpose of the activity, the use of iPads offered children rich opportunities for independent (autonomous) as well as collaborative learning, which, in some instances, enabled them to achieve higher levels of accomplishment than with traditional resources. This has led the teachers to re-evaluate the children's competences. For instance, one teacher told us that after she had seen a 5-year-old Harry using the app Doodlefind, she realized that his spelling abilities were much more advanced than she had previously thought: 'He's been reading Level 7 reading books and all of a sudden he could read every single word that flashed up and get really high scores and I sat down with him with the reading books and we've moved him up 7 reading levels because I didn't realise' (p. 301). Touchscreens not only allowed children to demonstrate their skills but also unlock their potential in areas previously not considered or not available in the class.

In the special needs school, we observed how a 13-year-old Robert produced a colourful image by using one of the iPad colouring apps. This was the first colourful image Robert had ever produced in the classroom unassisted. The iPad colouring app offered Robert a range of templates and colours to choose from and enabled him to produce an image that he was proud to share with the class. For Robert and other children who typically struggle with independent use of resources, the touch manipulation of iPads, combined with embedded scaffolding in the app, opened new avenues for authorship. In this instance, the boy's authorship was enabled through a template-based app (not an open-ended app) as it was the case with *Our Story* in my other studies.

Another positive outcome noted in the studies was children's attachment to the devices, regardless of whether the devices were used for pure entertainment or for a formal learning activity. To a large extent, the iPads connected children's experiences at the school and at home. For children, who had no or minimal exposure to technology at home the use of iPads in the school afforded a new learning opportunity and enabled them to have an on-par experience with their peers. For children who already had touchscreens or iPads at home, the use of the device at school extended the home use with additional or alternative activities.

It could well be that the multimedia affordances of touchscreens, coupled with a range of apps available for young children's use and an unrestricted intervention,

influenced the range of outcomes and idiosyncratic responses of the teachers and children to the devices. This variety can be usefully explained with the playground metaphor.

The playground itself is not deterministic or judgemental – it offers certain possibilities for engagement (affordances) and these need to be orchestrated by its users. The users decide how the individual playground facilities are used, who participates in what, for how long, alone or with others and so on. While recognizing this range of options, it would be erroneous to assume that the playground itself is neutral. Some playgrounds have equipment for practising a range of skills, while others offer a limited range of facilities. Some playgrounds offer educationally designed, environmentally sensitive games areas, while others might be inappropriate or even harmful for children. A playground, very much like an iPad, is a space designed by humans, who have a certain agenda, ideas and views about children's play and childhood more generally. As mentioned in Chapter 1, these views can sometimes clash and lead to different research paths and results. I mention the obvious here because of the many large-scale government-funded initiatives that led to deployment of touchscreens in public schools and which reported mixed results – for example, in Turkey (The FATİH Project), in the United States (The LAUSD project in Los Angeles); in the United Kingdom (iPad Scotland), in Australia (department's iPads for learning trial), in Malta (Tablet Pilot Project) and in New Zealand (see for example the Tauranga's Te Akau ki Papamoa Primary School). As detailed in Chapter 3, innovative practices occur when new resources are used to enrich existing best practice, not to replace it.

I had the privilege to work with some enthusiastic professionals whose pedagogy strongly influenced the positive effects we observed in their classrooms. Yes, the touchscreens contributed to the positive effects, but when scrutinized with respect to the touchscreens' overall educational value, it is clear that the benefits came about because of the teachers' pedagogy. In 2014, I therefore advocated that we need to consider the extent to which touchscreens could 'act as an innovative pedagogical support to current classroom practices and instructional strategies' (Kucirkova, 2014a, p. 2). This chapter touched on but did not discuss in detail what the innovative pedagogical support could look like. I take on this task in the next chapter, where I present three possible pedagogies: embodied learning, design pedagogy and democratic pedagogy, which are particularly relevant for tablet-based personalized education.

Summary

From my studies concerned with children's use of touchscreens in the UK and Spanish classrooms I conclude that the educational value for individual children is very much determined by the content of the activities they engage with and the overall context supporting their engagement. Teachers need to mitigate against the practical barriers of touchscreens' use in public schools, and together with the researchers they

need to be mindful of how the interplay among the 3Cs (i.e. context, content and individual child) affects the overall educational potential of these devices for early learning. Touchscreens afford opportunities for authorship, authentic home-school connection and children's ownership of their own learning. These benefits, however, can only be achieved with effective pedagogy, which is often omitted from large-scale school technology reforms. This is why I dedicate the last two chapters in this book to pedagogies and the pedagogical techniques and frameworks facilitating digital personalization in schools.