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Guided Interaction: Exploring how Adults can Support Children's Learning with Technology in Preschool Settings

Lydia PLOWMAN

Moray House School of Education

University of Edinburgh

Christine STEPHEN

School of Education

University of Stirling

Abstract

We report research that was initially a response to our observations of the difficulties that three- and four-year-old children in Scottish preschool settings may experience during free play at the computer. In conjunction with preschool educators, we observed and made video recordings of children's encounters with more varied forms of technology. We identified ways in which educators could support children's learning, calling this support guided interaction. Analysis revealed indirect (distal) and direct (proximal) forms of guided interaction. We conclude by commenting on our research into children's learning with technology in their family homes and provide some implications of these findings for consideration by educators.

Introduction

Our interest in children's learning with technology originated when the most common form in preschools was a desktop computer which the children could choose to use during free play periods. Despite their enthusiasm for playing with the computer, the children's encounters with it were brief and often unproductive. They frequently experienced operational difficulties as a result of random clicking and imprecise selection of icons, or they found it difficult to understand navigation because the screen design was not tailored to the needs of young children. Additionally, they could be hampered by their inability to read or respond to on-screen instructions, or when they found the tasks within games too conceptually demanding. The busy preschool educators had to share their attention between children using the computer and those doing other activities and this meant that their supervision tended to be opportunistic and reactive rather than proactive. Although educators willingly responded when a child asked for help or when the children's behaviour demanded their attention, we noticed that the children were more likely to walk away and turn to other activities than seek help when they encountered difficulties.

Scenarios such as these were the starting point for the research reported here, a summary of findings from a series of research projects funded by the UK's Economic and Social Research Council. As a result of noticing these problems, we aimed to explore how educators could enhance three- and four-year-old children's encounters with technologies. We did this by starting with a period of observation and then inviting preschool educators to become actively involved in the process of thinking about guiding learning in

contexts where the focus is on child-initiated learning through play.

Most children in preschool education in Scotland are three or four years old, with 96% of four-year-old children in part-time preschool education funded by the government and provided by the public, private, or voluntary sectors. Consistent with national expectations about good practice, children typically spend most of the time in their preschool setting choosing freely from a range of activities provided by the educators to support their social, emotional, physical, aesthetic and cognitive development. Play, alone or with others, is considered to be an important medium for learning but in many settings there is also a brief daily period when children are gathered together for adult-led activities. Practitioners take account of children's current interests and the next steps for learning that they have identified through their observations in the playroom when they plan the activities and resources for each session.

Although some of the research we report predates the introduction of the Curriculum for Excellence, which currently guides practice in Scotland, the broad principles remain the same. Children in the Early Level (from three to six years old) are expected to discover what technologies can do, find out how it can help them to present their ideas, and explore how technologies can be used to communicate through play and structured activities. We refer here to practitioners or educators because not all of the staff in Scottish preschool settings have a teaching qualification.

We have been conducting research in the area of young children, learning and technology for more than a decade (Plowman and Stephen, 2005). In the first part of this article we describe some aspects of learning with technology in preschool settings and summarize the main features of guided interaction. In the second part we consider why it can be helpful for early years educators to understand more about children's encounters with the broader range of technologies found in their family homes.

Technology in Preschool Settings

Although we have encouraged educators to include the growing range of technologies which can be better suited to the needs of young children, such as digital cameras, dance mats, cell phones and toys that simulate real-life resources such as barcode readers or toy laptops, we focus in the first part of the article on screen-based devices. The introduction of laptops and handheld devices such as tablets have brought some advantages to children's learning with technology in terms of their affordances for sharing and mobility, but we have found that many of the same challenges persist: the precise form of the technology may have changed over the last decade but our evaluation of online educational games in a preschool setting, undertaken in 2012, showed that many of the problems that children encountered were the same as those we had identified in 2003.

Parents and practitioners frequently express the belief that children have a greater proficiency with technology than they do, but our analysis of data from eight preschool settings demonstrated that young children need guidance from adults. The sociocultural perspective that informs our research describes how factors such as material resources, the cultural practices of the setting and interactions with adults can shape a child's learning experiences. Within this theoretical framework, the ways in which learning is supported have been conceptualised in a variety of ways, including scaffolding (Wood, Bruner and Ross, 1976), assisted performance (Tharp and Gallimore, 1988) and guided participation (Rogoff et al, 1993). However, none of these concepts refers specifically to learning with and through technology. The mediation of learning by technology makes a difference because it introduces an *operational* dimension to learning. In other words, young children may find it difficult to interact with the content on a screen-based device because they cannot achieve what is required in order to get started or to maintain an activity. This is often a problem of interface design but it can be exacerbated if children do not receive the help from others that they need before they can become independent.

Guided Interaction

We describe this support for learning mediated by technologies as *guided interaction*. Because we wanted our findings to be useful for educators and to make a difference to children's experiences we developed methods that allowed us to explore typical everyday experiences in preschool playrooms. The practitioners decided on the pedagogical strategies involving technology that they wished to explore and, with the research team, they collected evidence as they went about their work. At our regular meetings we shared video recordings and observations made by the researchers in the playroom and discussed emerging findings. More information on this process, described by us as guided enquiry, is available in Stephen and Plowman (2008).

As we listened to the practitioners and analysed 16 hours of video along with practitioner observations and our own field notes it was clear that ensuring that children have the kind of positive encounters with digital media in the preschool playroom that can support learning requires more than face-to-face interactions with adults. In the context of learning about and with technologies in preschool settings guided interaction requires *distal* (indirect) and *proximal* (direct) actions. The analysis enabled us to devise a taxonomy of guided interaction showing examples of different types of support, the different modes in which that support is enacted and the learning with which the support is associated. (The account here is highly condensed; see Plowman & Stephen 2007 for more detail.)

Distal Guided Interaction

Distal guided interaction refers to the technology-related actions and decision-making that support learning but take place at a distance from the children. It includes planning for the whole group and for individuals, selecting and providing appropriate resources, arranging the physical environment of the playroom and deploying staff resources in a way that allows support for productive use of technology. Local practices can shape the form that guided interaction takes in each setting by influencing the accessibility and range of digital media available in the course of each preschool day and the extent to which technologies are integrated with other playroom activities. But preschool policy at a national or regional level can also influence the likelihood and form of guided interaction and could include staff deployment decisions, prioritising of objectives, and practices such as planning and recording progress. Examples of distal guided interaction can therefore range from something as simple as providing a sand timer to structure turn-taking through to identifying the learning needs of individual children, rather than relying on a limited number of tried and tested technological activities. These manifestations of distal guided interaction can vary considerably according to national policy on technology in the early years and the associated models of funding and resourcing provision and practice.

Proximal Guided Interaction

Proximal guided interaction refers to direct, face-to-face interactions between adults and children when they are jointly engaged in activities with technology. It is important to note that the proximal guided interaction that enhanced children's engagement with screen-based technologies in the playroom was not just mediated through language. Indeed, the absence of talk was particularly striking when children used computers. When on their own, children rarely initiated talk with their peers or adults, either to convey enjoyment or to seek help. When sitting alongside an adult, the focus on the screen inhibited communication as it made eye contact difficult. Supportive interactions tended to be multimodal. As well as talk (or often instead of talk), proximal guided interaction involved gesture, touch, gaze and, sometimes, the emotional support that comes from the proximity of a familiar adult. Examples of how 'to do' guided interaction could range from explicit demonstration of how to use an on-screen paintbrush or eraser, showing a child how to frame a picture in a camera's viewfinder, reading out choices from the screen and helping the child to click on the one they selected or encouraging a child to try something new. Some of these involved spoken language, particularly if they were instructional interactions; others included placing a

hand over the child's while they moved the mouse, or just sitting next to the child while they tried something new.

The following extract from field notes presents a scenario that illustrates some of the features of guided interaction. Over a period of time, we were able to analyze a whole series of events such as this in different locations, with different children and practitioners, and with different technologies so that we could build up a detailed description of guided interaction.

> ***Supporting play at the computer***
> Margaret [the educator] sat beside Steven at the computer. He was interested in the *Pingu* game but selected 'quit' by mistake. She helped him to get back to Snowball Alley and spoke encouragingly to him as he used the mouse to drag objects into position. Margaret asked Steven to count the number of snowmen and to repeat the numbers. He appeared to be totally absorbed most of the time but occasionally pointed to the screen or turned towards Margaret, looking very pleased. Margaret decided that John, who was hovering nearby, should join Steven. She changed the game to one suitable for two players and showed them how to click and drag. She sat on a small chair alongside the boys in a position where she could see the screen and the children. Once she could see that they had settled into the game she moved away, first telling them where she was going, and then scribbled down a log of the incident and which game they were playing on a sticky note.

This example is taken from *Growing Up With Technology* (Plowman, Stephen and McPake, 2010, chapter 5). Other scenarios in the book include guided interaction at the listening centre and guided interaction when role-playing with a mobile phone.

The Value of Guided Interaction

Learning about the need for guided interaction was a positive learning experience for the preschool practitioners who participated in the research. Prompted by looking at the support needs of the children, practitioners found that they were learning, too. Spurred on by their increasing confidence in the value of technologies as a learning resource in the playroom they were driven to develop their operational skills and extend their pedagogical knowledge by learning from the experiences of their peers and reflecting on their own practice. As they became more confident users of technologies and expanded the range of devices on offer to include cameras, non-functioning cell phones and smart toys, the learning opportunities created for children also expanded. As children responded positively to these opportunities their encounters became more varied, sustained and productive. As a result, educators became more sure about what the young learners could achieve, creating a virtuous spiral.

It is important to note that the proximal and distal dimensions of guided interaction that we found were necessary to enhance children's encounters with technologies in the playroom were already present in the repertoire of preschool educators. They were familiar with ideas from the work of Vygotsky, such as the way in which working with a more capable other supports children's learning in the Zone of Proximal Development, and with the metaphor of scaffolding that draws attention to the ways in which children's competences can be extended by providing supporting structures. We observed practitioners making sensitive and contingent responses when children were engaged in playroom activities such as baking or completing jigsaw puzzles. However, if the interactions necessary to support children's learning with technology were already present in the practitioner's repertoire, we were puzzled about why these aspects of practice were not more frequently observed when children played with technology.

Barriers to Guided Interaction

As described at greater length in Stephen and Plowman (2008), there were several possible answers to this question of why educators were not transferring their usual practices in other areas of the curriculum to technology. In circumstances

where practitioners have oversight of many simultaneous activities within the playroom and other children need support for activities such as reading a story or riding a bicycle, *making time* for the one-to-one interactions often required by technology can be demanding. It is understandable that practitioners are more likely to focus their attention on the occasions when children using a device actively seek help rather than providing the guided interaction that might ensure that problems did not arise in the first place.

Another factor that restricts guided interaction around screen-based devices lies in the *problems of observing children using technology*. A screen on a desktop, laptop or handheld computer is not readily visible from across the playroom and so does not lend itself to the process of visually scanning a room that practitioners routinely use to monitor play and levels of engagement. Their awareness of actual or emerging problems was therefore limited. This is one of the reasons why expanding the range of resources available beyond those with a screen can be helpful.

When exploration is the favoured mode for learning in playrooms some practitioners' *understanding of their role* may lead them to interpret elements of guided interaction as too 'teacherly'. However, our evidence argues not for a shift to didacticism but for interactions that are sensitive to the context and to individual needs. This interpretation of effective pedagogy does not privilege formal instruction, but recognizes that it has to be child-led and responsive, constantly adjusting to the learner's needs.

Using Technologies at Home: Implications for Preschool Practices

Some of the findings from our subsequent research in family homes (Plowman, Stevenson, Stephen and McPake, 2012) also have implications for playroom practice. By the time they started school at age five, nearly all of the children in our case studies had encountered a range of digital media at home, such as cell phones, interactive television, games consoles, DVD and MP3 players, as well as desktop, notebook and tablet computers.

The devices that children engage with at home may be more sophisticated than those available in the playroom, posing a challenge for preschool providers who have to balance limited budgets with engaging children's interest and extending their learning. Even in low-income households in Scotland, the home provided a richer mix of technologies than many preschool settings as well as providing opportunities for children both to observe and to participate in authentic activities that were more personally meaningful than those on offer in the playroom. At home children can take part in internet shopping, talk to and see distant relatives and access some functions of the mobile phones or games consoles that their parents and older siblings use routinely. Ensuring a similar degree of authenticity and individual motivation in a playroom that has been designed solely for young children and where resources have to withstand heavy use requires not only imaginative practices but a specific commitment on the part of providers and policymakers.

Family context makes a difference to children's experiences with digital media. For instance, parents' views about whether technology is a beneficial or malign influence in the lives of their children influence the experiences with technology that individual children bring with them as they enter preschool (Stephen, Stevenson & Adey, 2013). In Scotland it could not be assumed that there is any relationship between the socio-economic status of their family and children's access to technologies. Families make different technologies available, model their use in different ways and encourage different activities.

Three- and four-year olds require and experience guided interaction as they use technologies at home as well as in preschool settings. Although, like practitioners, parents often talk of children just 'picking up' (Plowman, McPake and Stephen, 2008) how to use the technologies available at home we have observed a range of pedagogic styles within families. Some parents deliberately engage in didactic interactions, while others encourage their child to explore alone, believing that they will learn as they play. These

varied experiences at home mean that children in any one playroom will have different sets of competences and different expectations about how to engage in learning. Targeted guided interaction will be essential if they are to have productive encounters with digital media in preschool.

Supporting Children's Learning with Technology: some Conclusions

Curriculum guidance in the early years emphasizes the importance of supporting children in all aspects of their emotional, social, cognitive and physical development in ways that will enable them to become increasingly independent and eager to progress in their learning. These aspirations are compatible with the examples of playing and learning with technology that we observed at home, but we found that preschool staff tended to focus on what they saw as the overtly educational gains to be made – the acquisition of basic operational skills (such as learning to use a mouse), certain learning dispositions (such as taking turns), and the learning arising from the content (such as basic number games) – rather than children's awareness of the different cultural and work-related uses of technology.

In our research in preschool settings we found examples of technologies such as digital cameras, audio recording and listening devices and toys that simulate domestic appliances being used in playful activities designed to contribute to children's *social and emotional* development. They could be used as props in imaginative play with peers, for instance, or for listening to a story then acting it out with puppets. In circumstances such as these, the technological resources appear to enhance children's engagement and the authenticity of the play activity, making the pretend environment more like that experienced at home and in the community. When resources are carefully introduced they can support children's social and emotional development just as well as other resources.

However, the technologies enlisted to support *cognitive* development in preschool settings are still more likely to involve computer games. These digital resources are more likely to involve closed questions requiring correct answers or to offer opportunities to practise the application of concepts in ways that parallel more traditional preschool activities. Content may include phonics exercises that require a child to add letters to complete a word or matching, sorting and sequencing games. For some children these activities are more interesting and motivating when they are technologically mediated as feedback is instant and often accompanied by entertaining animations. However, these products do not generally extend cognitive activities such as finding out, problem solving and reflecting on thinking and learning. These typically require the adult mediation of guided interaction we describe here.

Our studies have identified a number of areas for consideration by early years educators that can shape their guided interaction. These can be summarised as the need to:

- recognise children's different preferences
- avoid focus on computers at the expense of a broad range of technologies
- acknowledge the range and diversity of children's early experiences at home and the ways in which parents, siblings and carers induct children into culturally significant technological practices, and
- extend their vision of the nature of children's technological competences beyond operational skills.

The National Association for the Education of Young Children claims in its position statement that 'Technology tools can help educators make and strengthen home–school connections' (NAEYC, 2012: p7). This means developing existing mechanisms to support links between home and school so that discussions with parents systematically include exchanging information about children's experiences with technology. Educators can build on this, shifting the current focus on skills towards a broader range of competences and dispositions and recognizing that children will start school with diverse experiences of using digital media, involving not only

computers but also a range of leisure technologies and interactive toys.

Our research suggests that technologies can expand the range of opportunities for children to learn about the world around them, to develop their communicative abilities, and to learn to learn. We believe that children's early experiences of playing with the various technologies available to them at home or in preschool settings can contribute to this learning, particularly when they are helped by supportive adults and more able others who monitor activities, help when things are difficult, provide encouragement and praise for achievements, and assist children to manage their emotions if they get frustrated. In other words, when children benefit from guided interaction.

Educators are expert at providing responses that are intuitive and finely attuned to children's specific circumstances and abilities but they can find this more taxing when technology is involved. The technological landscape changes quickly and as new applications and technologies are developed, new opportunities and challenges will emerge and the need for guided interaction will be renewed.

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