Guided interaction in pre-school settings

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Abstract
The aim of this study was to explore how guided interaction could create opportunities for learning with information and communication technologies (ICT) for children aged three and four. The study was grounded in the naturalistic environment of the playroom, in a context of free play and child-initiated activity, and focused on interventions selected and implemented by practitioners.

Guided interaction describes the ways in which children's interactions with computers and other forms of ICT can be actively supported in pre-school settings. The paper presents a framework which illustrates proximal and distal guided interaction and the modes by which they are enacted. The concept of guided interaction i) provides a tool for thinking about the different modes by which learning can be supported in pre-school settings and ii) helps practitioners to articulate, reflect on and legitimise changes in pedagogy, enabling them to find new approaches to working with ICT. The paper provides an account of the analysis underpinning the development of the concept followed by a description of its characteristics and the different types of learning that can be supported. An adapted version of this analytical framework has potential both as a research tool and to support changes in practice for professionals in other sectors of education.

Introduction

Play is the dominant medium for learning in pre-school education in many countries and there is a consensus that pedagogy and practice should be child-centred, an approach manifested by children choosing what to do during extended free-play periods. Although this approach is supplemented by adult-led small group activities in most areas of the pre-school curriculum, this has not generally been the case for supporting learning with information and communication technologies (ICT).

Guided interaction describes the ways in which children's interactions with computers and other forms of ICT can be actively supported in pre-school settings. The aim of the study reported here was to identify ways in which practitioners can support children's encounters with ICT and the concept of guided interaction was mobilised to focus thinking about how these encounters can be enhanced and actively supported. Although the study was conducted with the active participation of practitioners, this paper focuses not so much on the their perspective as on the concept itself. The paper outlines the provenance of the term guided interaction, describes the analytical processes that led to its development and presents a framework which has the potential for application in other educational settings.

The claims we make in this paper relate to the value of guided interaction as an explanatory concept that makes different demands on practitioners depending on the learning context and enables researchers to identify and interpret pedagogical actions. These claims have repercussions for practice, particularly in terms of concepts of pedagogy, how support is co-constructed in interaction with children and the areas of learning that can be supported by ICT. The key features of guided interaction presented here include how it operates in both distal and proximal dimensions and the ways in which it is enacted multimodally.

The context of the study: ICT in pre-school settings
A study which was commissioned to inform policy on ICT in the early years showed that i) activities are often focussed on computers, ii) other technologies in the playroom are not recognised as ICT and iii) choosing the computer as a free-play activity can lead to unproductive

interactions (Plowman & Stephen 2005). When children experienced problems, a typical period of interaction was often for one or two minutes before they gave up. The study led us to conclude that desktop computers are not generally suitable for lone play activities by children aged three and four and that extending the definition of ICT to include digital still and video cameras, mobile phones, electronic keyboards and toys that simulate technologies such as laptops and barcode readers has a number of advantages. These technologies can provide better support for mobility and collaborative use, are easier to integrate into play activities, are more fun to use and can support a range of activities. Because some of these technologies are more familiar to practitioners they promote confidence, they can be more affordable and they can give children the opportunity to build on competences and knowledge that they may develop in the home.

We found that in all settings practitioners had responsibility for a number of activities or a particular area of the room. This meant that supervision of children playing at the computer was limited, opportunistic and competed with other duties. Children rarely asked for help so adults became involved with computer play only if they noticed a need for intervention. Computers were often located in corners away from sand and water or high levels of traffic so were not within peripheral vision. Where they were visible, a casual glance was not adequate for assessing the state of play at a computer in the same way as it would be for other playroom activities. Within this busy environment, practitioners were familiar with providing highly contingent responses to children but this did not extend to children’s play with ICT: most supervision consisted of overseeing turn-taking and ensuring that children did not cause damage. Children rarely sought help and lack of intervention by practitioners was due to a combination of the following factors:

- limited confidence with ICT
- a desire for children to find out for themselves
- a resistance to approaches that could be perceived as too instructional
- priority being given to assistance required elsewhere in the playroom.

These findings prompted the study reported here and its aim of identifying ways in which pedagogical actions by practitioners can support children’s learning with ICT.

The origin of guided interaction

Guided interaction was used more than fifty years ago to describe an ideal teacher-student relationship within the context of adult education (Knowles 1950). In the context of technology-mediated learning, as it is deployed here, the term was used by Plowman (1992) to describe the ways in which the interface can offer guidance for interactive media used in schools. This was followed by a large-scale evaluation study (Laurillard *et al.,* 1994) of the *Interactive Video and Associated Technologies in the School Curriculum* programme in over 200 primary and secondary schools in England and Wales. In writing about the design issues that emerged from that study, Plowman (1996) conceptualised guided interaction primarily as a design issue relating to communication between the computer and the student; it did not explicitly encompass human support as teachers were often absent from the locations in which computers were used. Suggestions for ways in which interface design could guide interaction included features that are now commonplace such as making 'help' easily available and targeted, including an introductory guided tour to demonstrate the available content, making apparent the connections between sequences and guiding progression from one sequence to another.

These design principles were later developed in the context of a study that investigated the ways in which both learner- and designer-generated narrative could be used to guide interactions so that they support the construction of learning (Laurillard *et al.,* 2000; Plowman *et al.,* 1999). The emphasis of that study was also on design of the interface and presentation of content. Three different versions (described as linear, resource-based and guided discovery) of an educational CD-ROM were produced to establish ways in which learning can be supported. Of these, the guided discovery (see Brown & Campione, 1994) version was closest to the support provided by a teacher as it offered guidance by breaking down the task and providing paths through the content, questions to stimulate enquiry and direction to specific resources.

More than ten years later, many of the problems identified in the school studies were still prevalent in pre-school settings. We found that children were reluctant to seek human or machine help, used random clicking and could not interpret dialogue boxes or icons even though adult help was, in principle, always available in the playroom. In response to these continuing difficulties, we expanded the concept of guided interaction from its earlier emphasis on design of the interface to focus on the role of human help in guiding interaction and to explore the ways in which a practitioner actively assists children to interact with the computer and other forms of ICT. We had planned to investigate guided interaction initiated by both adults and peers but as we found very little evidence of peer support for learning of this kind we focus here on the role of adults.

Design of the study and sources of data

Eight pre-school settings were selected to represent a range of types of provision and were formed into two clusters based on proximity. The nurseries served a total of about 400 children aged three and four from a broad socioeconomic range of families. The research was undertaken in collaboration with two practitioners from each setting, at least one of whom had little or no previous experience with technologies in the playroom. Researchers visited each individual setting on seven occasions and produced baseline information, a technology audit, field notes, focussed observations and video recordings.

Over the course of the 2003-2004 school year, each cluster group met with researchers four times to share observations based on video recordings and to identify ways in which practitioners could provide guided interaction and support to children using ICT within the playroom setting. Following an introductory meeting of each cluster, the research team observed and video recorded playroom activity over a period of a few months and this was discussed in the second meeting. Each site also planned a small-scale project for implementation and evaluation that would either address recognised problems with technology-based activities or enable the exploration of new activities or pedagogical actions. These projects were put into action over the subsequent few weeks, during which time the research team made further recordings in addition to the practitioners collecting their own data. The practitioners' projects were discussed in the third cluster group meeting and another project identified, repeating this cycle. A final review was held in the fourth meeting, in summer 2004. (This process of guided enquiry is described in Stephen & Plowman, 2005.) As our observations in the earlier study had led us to conclude that some of the problems were caused by the focus on computers one of the practitioner projects at each site was designed to include computers and one involved an alternative form of ICT such as digital cameras, electronic toys, or listening centres. There was at least one desktop computer available in each of the playrooms but access to other ICT resources varied across settings.

Practitioners' discussions in the cluster meetings were recorded and they were also interviewed individually about how they conceptualised their practice in the playroom both before and after data collection. A questionnaire on competence and attitudes was distributed to all forty practitioners in these settings. This data has been supplemented by a survey of the views of over 200 parents of pre-school children and case studies of sixteen children which explored their exposure to, and developing competences with, technologies in the home, although this paper does not refer to the survey or case study data (reported in McPake *et al.* forthcoming). The following section provides an account of the analysis underpinning the elaboration of the concept of guided interaction in this context before going on to describe its characteristics.

Analysis

A total of sixteen hours of video data was recorded in the eight nurseries but, as pre-school settings do not structure time into lessons and a number of different activities can be going on simultaneously, this data was recorded opportunistically. Video recordings made during the first phase of the research were analysed in terms of interaction episodes and coded using broad categories (type of technology or other artefact, absence or presence of adult, the activity, the nature of the child's response). These interaction episodes could vary from about ten seconds to thirty minutes, with five to ten minutes being typical, as they were a way of managing the data by interpreting the start and finish of specific periods of activity with a particular artefact. This process led to the identification of episodes in which practitioners provided support as well as examples where an absence of support led to less productive experiences for children, such as being bored or giving up an activity easily. These sequences were edited and presented to the two cluster groups as a series of vignettes designed to stimulate reflection on their spontaneous practice. We had identified 'guided interaction' as a potentially useful term in the earlier study of pre-schools (Plowman & Stephen, *op. cit*.) outlined at the beginning of this paper and introduced it to practitioners in this study as a way of conceptualising different forms of support, although the research team had not yet exemplified its characteristics in detail.

During the practitioners' first project to explore guided interaction, we collected more video data and practitioners produced records of observations, typically on sticky notes or written in progress files, but occasionally using photographs or video. This new data was discussed in further cluster group sessions and the cycle was repeated. The definition of guided interaction thus developed iteratively as a result of our own analysis combined with the practitioners' experiences and observations. This meant that findings were rooted in the culture of the playroom and guarded against promoting a deficit model of educational change by imposing a 'solution'.

During a later phase of the study, following the cluster group meetings, the analysis shifted to examination of adult-child interactions at a finer level of granularity and combined this with analysis of the cluster group discussions and interviews with practitioners. The focus of analysis was interaction between the adult, child and technological artefact within a broader perspective because 'thinking and doing are linked in social practice' (Gutiérrez, 2002, p.313). This sociocultural approach motivates a focus on the learner's participation in joint activities and cultural practices rather than on individuals' internalised learning associated with cognitivist approaches.

Using interaction as the unit of analysis also meant that we were using the same evidence as practitioners to interpret children's learning and behaviour. The key difference is that, as researchers, we were able to reflect on the process of interaction after the event, whereas practitioners have to make interpretive decisions in the moment. The use of video clips in the process of guided enquiry empowered practitioners to engage in this process of analysis and reflection and share their insights. Our analysis, in turn, enabled practitioners to see their role in mediating children's interactions with ICT in a new light and to think about ways in which practice could be developed to enhance children's learning.

We supplemented video analysis with practitioners' observation records and accounts to analyse changes in learning in terms of *knowledge of the world, learning dispositions* and *operations*. These categories are deliberately broad: we did not want to fragment learning into numerous subsets as this would not be compatible with pre-school practice and so would be less open to interpretation by practitioners. We also analysed practitioner-generated written observations of implementing the intervention and responses to two specific questions in a post-intervention interview for evidence of guided interaction. These questions asked about the adult's contribution when a child was playing with ICT and elicited the practitioners' perspectives on the kind of support or interactions children need when using ICT in the playroom.

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 outcome with which the support is associated (tables 1 and 2). All examples in the tables are taken from data collected during this study. Some are drawn from children's use of computers; others are drawn from children's use of alternative types of ICT.

What is guided interaction?

Guided interaction describes the ways in which children's interactions with ICT can be actively supported in pre-school settings. Our analysis indicated two main dimensions of the framework for understanding guided interaction: distal and proximal. *Distal* refers to guided interaction that takes place at a distance from the specific learning interaction and so has an indirect influence on learning. *Proximal* refers to the face-to-face interactions between adults and children that have a direct influence on learning. The process of guided enquiry enabled practitioners to see how their current practice can constitute guided interaction and raised awareness of existing, if isolated, actions as well as identifying the appropriate circumstances in which support could be offered in order to maximise opportunities for learning. Practitioners also became aware of times when a child's self-directed exploration is more appropriate and, in these circumstances, the intentional absence of direct action may be a source of guidance. Guided interaction was therefore enacted adaptively as a result of practitioners' own interpretation of events. The concept was not introduced prescriptively and the taxonomy provided in tables 1 and 2 was not shared with practitioners in this format as it emerged from a later stage in which both sets of practitioner-generated projects were analysed.

Distal
Although our original focus had been on closely coupled interactions we became aware through dialogue with the practitioners that the activities that are more remote in terms of time and space were also guiding interaction, albeit indirectly. This orchestration of learning includes making provision for learning in terms of access to and monitoring time spent on ICT equipment, creating an environment to facilitate learning, planning the curriculum, and identifying next steps. These pedagogical actions are therefore guiding interaction at one remove from the face-to-face interactions described as proximal. As such, they are not as easily observable as proximal interactions, or as susceptible to categorisation, and it is partly for this reason that these less visible aspects of support for learning do not receive as much research attention. This distal dimension of guided interaction is similar in some respects to 'pedagogical framing', described as 'behind the scenes work including provision of materials, arrangement of space and the establishment of daily routines to support cooperation and equitable use of resources' (Siraj-Blatchford *et al*., 2002, p.23), although our understanding of guided interaction suggests that the distal and proximal aspects of support are more integrated than this description may imply.

Practitioners tend to prioritise the planning and providing role of the adult (Stephen, Brown & Cope, 2001) over direct interactions between practitioner and child. This is a principled, if implicit, practice which is the outcome of a Piagetian approach to understanding learning (Stephen, 2006). At its most simplistic, this constructs learning as a natural process of growth for children (hence the metaphor of the kindergarten) so the usual pedagogical approach derives from a concern with children's progress through developmental stages or sees child-initiated free play as the medium for learning. In such circumstances, a focus on direct adult-child interactions can be interpreted as 'teacherly' intervention and this is considered inappropriate in pre-school settings.

Proximal
The proximal dimension of guided interaction can be resource intensive because establishing joint attention on a one-to-one or small group basis is a prerequisite. Table 2 shows a prevalence of physical interactions and so they have been sub-divided into categories such as touch and movement. The physical modality is mainly related to operational outcomes as practitioners typically show a child how to do something rather than use a verbal explanation. However, it is also related to dispositions for learning through physical manifestations of pleasure in learning or the simple act of physical presence providing reassurance to a child trying a procedure for the first time. We observed very few examples of children's overt help-seeking behaviour and noted that support for operational outcomes cannot easily be provided at a distance: it requires close supervision to identify and meet needs that are not explicit.

Mode
In the *proximal* dimension the 'mode' column in the tables describes the means by which guided interaction is enacted. In the context of pre-school education this is a channel of communication between the practitioner and learner that mediates their interaction, the mode is embodied and it depends on proximity between adult and child. The interactions associated with guided interaction are multimodal in nature, encompassing language, gesture, touch, gaze, and physical action, frequently with two or more communication channels in use simultaneously. These

interactions are shaped by cultural and social processes and are highly contingent on the activity, the site of learning, the learner's level of competence and the individuality of the practitioner. (See Flewitt, 2005, and Klerfelt, in press, for other examples of the multimodality of communication with pre-school children).

Video analysis and observation demonstrated that language was not dominant as a mode of communication as there were few examples of extended adult-child thinking and talking. This was also noted in a large-scale, longitudinal study of the cognitive and social impact of pre-school provision as Siraj-Blatchford and Sylva (2004, p.718) refer to 'shared sustained thinking' as working together to 'solve a problem, clarify a concept, evaluate activities, or extend a narrative' and in a report based on inspections of over 1600 sites of pre-school provision (HMIE, 2006, p.8). That report states, 'Children generally learn to work and play well with other children in pre-school centres, and they do so in settings which are characterised by fun and enjoyment. Some improvement is needed, however, in the quality of talk and interaction between adults and children to ensure that all children's learning needs are met fully'.

Talk is a key medium for interaction in school classrooms but in pre-school settings responsiveness to children's emotional states is central to the practitioners' role, so touch, gesture and eye contact are also important forms of communication. The absence of talk was particularly striking when children used computers. When on their own, they rarely initiated talk with other children or adults, either to convey pleasure or to seek help. When using a computer in pairs or groups, as was fairly common, they tended to communicate with each other non-verbally (eg taking control of the mouse, moving in closer when they wanted to join in, or upending the sand timer used to time sessions when they wanted to prolong their turn) so although there was an appearance of collaborative use of the computer, it was very limited in practice. This lack of dialogue also characterised children's use of the computer with an adult. The focus on the screen inhibited communication as it made the synchronisation of eye contact difficult and the usual rules of verbal turn-taking did not seem to apply.

The modes by which support was enacted in the *distal* dimension were broadly categorised as policy and pedagogy. Policy refers to actions taken in order to comply with policy directives and curriculum guidelines and includes planning and recording children's learning. It should be noted that the fieldwork for this study took place during a period shortly after the introduction of a new policy document on ICT in the early years (Learning and Teaching Scotland, 2003), although levels of familiarity with the document varied widely across nurseries. Within the distal dimension, pedagogy is an umbrella term which refers to the ways in which practice and concepts of role shape actions in the playroom. Practice includes actions that are recognisable to participants and others as constituting a norm in the particular context of the playroom and it is informed by practitioners' implicit and explicit theories of learning (Stephen & Brown, 2004).

There is considerable overlap between these categories. Examples of guided interaction in the distal dimension were drawn from transcripts from the cluster meetings and interviews with practitioners. Practitioners' interpretations of policy were filtered through their experience, their individual concepts of role and current practice so allocating actions to categories was more problematic in the distal dimension than it was when analysing proximal actions on video. Broadly, establishing an environment for learning by providing resources, ensuring access to them and setting up activities were demonstrations of practice; activities driven by policy considerations included planning and recording learning. These modes are not as fully elaborated as they are in the proximal dimension because the means by which guided interaction is achieved (e.g. a change in planning or assessment practice) were not as obviously visible. The categories should therefore be seen as indicative at this stage, serving as a reminder to include the less visible as well as the visible actions when analysing forms of interaction.

Learning

Practitioners in Scotland do not routinely refer to learning outcomes (Stephen *et al*., 2001) but we identified three areas of competence that can be developed by play with ICT: knowledge of the world, operations, and dispositions to learn. These three categories are not intended to be exhaustive (physical development is missing, for instance) but to function as a framework to enable us to identify more clearly the broad areas of learning that can be supported by ICT. Both distal and proximal interactions have associated learning outcomes, even if these are not explicitly articulated.

The degree of competence children acquire across these categories depends on a number of factors including developmental stage, their own interests and preferences, access to ICT, the quality of guided interaction, and the particular interests and aptitudes of practitioners and family members. Guided interaction can support all three areas of learning described here although some areas are currently more readily supported than others.

Knowledge of the world includes what is referred to as 'subject' knowledge in schools. It encompasses learning in areas such as mathematics, language, and knowledge about living things and places. Children live in a media-rich environment and come into contact with a wide range of technologies through their family and in the wider world so the category also includes children's understanding of the role of ICT in leisure, work and play, and their ability to harness it for a range of social and cultural purposes, such as communication, self-expression or entertainment.

There are few examples in the proximal dimension of intended outcomes that could be classified as knowledge of the world. Interventions were rarely explicitly cognitive in orientation, such as developing learning in terms of the subject content, and most interactions were operational. Knowledge of the world is often mediated through talk and, as has already been noted, we did not observe many learning conversations.

Operations refers to understanding the functions of items such as the mouse and on/off switches as well as the ability to operate them, which often relies on motor skills. Operational competence also develops children's concepts of technological interactivity and can demonstrate that taking an action can produce a response. Children usually need adults to help them acquire specific operational skills, after which they may move on alone to become independent users. Once a certain level of proficiency has been gained it is likely that children will be able to make more progress in the areas of knowledge of the world and dispositions to learn. Table 1 shows few learning outcomes categorised as operational in the distal dimension because operational support generally requires face-to-face interaction, as exemplified in Table 2.

Knowledge of the world and operations are fairly standard dimensions of learning with and about ICT; indeed, the limitation of some discussions of this topic is that they focus on these domains of learning to the exclusion of others. *Dispositions to learn* encompasses a range of affective, social and cognitive features of learning to learn which are particularly important because supporting children's development as confident and self-directed learners is given high priority in pre-school settings. These dispositions emerge from children's participation in shared activities and relationships and their expression of learning needs and achievements (Carr, 2001). ICT has a role to play in developing children's dispositions to learn by increasing self-esteem and the confidence gained from accomplishment as well as supporting independence and persistence in the face of initial difficulties. It also has potential for supporting curiosity and promoting pleasure in learning by enhancing engagement and motivation. Interaction with ICT can also have the benefit of making explicit to a child the consequences of exercising particular learning strategies in ways that are more apparent than in non-technological domains. Dispositions to learn are learning outcomes for both proximal and distal guided interaction, illustrating the primacy of these aspects of learning for pre-school education. Enhancing learning requires support for operational skills but also for these less easily measurable positive dispositions towards learning so a checklist approach to the development of skills is inappropriate.

Discussion

There is a two-way relationship between distal and proximal interaction. The proximal interactions between the child, adult and technology influence the resources made available and other aspects of the orchestration of learning. However, these distal features also influence proximal guided interaction: if a practitioner adopts a pedagogy that sanctions a non-interventionist approach the interactions are more likely to consist of troubleshooting than joint problem-solving. Similarly, if a management decision is made to finance the purchase of computers rather than other forms of ICT, this will determine the forms of adult-child interactions. The distal dimension of guided interaction does not therefore provide a backdrop for learning but offers a reciprocal relationship with the proximal dimension of guided interaction so that, together, they constitute the context of learning. Guided interaction is situated, but this needs to be understood as located in, and unifying, both proximal and distal dimensions. Practice and pedagogy are embodied and transformed in the proximal arena but researchers also need to take account of the less visible, distal dimension of guided interaction in framing the learning context.

Researchers' interest in interaction can lead to a focus on the proximal and the omission of other important aspects of study: Wertsch (1991, p.86) comments that social interaction is often investigated as if it occurs outside social structure and Cole (1996, p.220) refers to a 'reliance on face-to-face, two-person interactions' in empirical work. Erickson (1999, p.129) points out that it is myopic to focus only on the proximal as there is a need to account for actions and events 'far removed in time and space from the local and contemporary scene of teaching and learning work'. He interprets the distal to encompass a historical dimension that we do not present here as we have focussed on distal elements within the control of practitioners. These elements occur within a much larger context of political, social and economic forces which are the subject of considerable debate (e.g. Archer, 2003; Erickson, 2004), although an understanding of the ways in which these macro and micro processes are mutually influencing is beyond the scope of this study.

Monitoring and modelling activities appear in both proximal and distal dimensions. Monitoring can include the direct action of moving a child to a different level of difficulty on a computer game or the close physical presence required to monitor that equipment is being used safely or correctly; it can also include the less direct action of recording a child's progress and planning their return to an appropriate activity. Monitoring demands the practitioner's sensitivity to a child's needs and is essential to ensure that children are making progress and that difficulties in any of the areas of learning are identified and addressed. These continuous observations are undertaken almost intuitively and are translated into records which document children's experiences and build up into a profile.

Modelling is also central to guiding interaction. In the proximal dimension it entails using ICT in a way that is consistent with 'real life' activities so that children learn how to use them and their cultural and social value. Although we did not see many examples, this can also occur in the distal dimension. For instance, if practitioners use a computer in the playroom for authentic tasks such as making labels or writing the newsletter children can benefit from observing this behaviour and developing cultural awareness even though the learning does not occur in a closely coupled situation. Alternatively, practitioners may be able to effect a transition from the distal to the proximal dimensions. A practitioner printing digital photographs in a quiet part of the playroom, for example, transformed this solo activity into an example of proximal guided interaction by creating an opportunity for learning when a child came over to watch. More often, practitioners used the computer located in the nursery office for these types of activities and so opportunities for modelling uses of ICT were lost.

Where there were direct face-to-face interactions they tended to be concerned with operations; we saw few examples of learning conversations to direct the child's attention and prompt reflection. Operational guided interaction was often achieved by physical action alone (e.g. moving a mouse or selecting an icon) but this form of guided interaction may not be needed as much for forms of ICT where the affordances contribute to making the modes of interaction more visible (e.g. musical keyboards or toy barcode readers), as the need for operational support is reduced. This is one reason why we encouraged practitioners to explore the use of technologies other than computers. For discussion of some of the benefits of tangible technologies see

O'Malley & Fraser (2005) and Price *et al*. (2004). Recent work has also reported on the ways in which other technologies encourage affective responses (Luckin *et al*., 2003; Ryokai, Vaucelle & Cassell, 2003) and the role of technologies beyond the desktop (Facer *et al*., 2004; Rogers & Price, 2004) although it has tended to focus on slightly older children or in the different environment of the school.

Supporting learning

The research described here can be situated within other theories of supported learning with a Vygotskian orientation including scaffolding (Wood, Bruner & Ross, 1976), assisted performance (Tharp & Gallimore, 1989), dialogic inquiry (Wells, 1999) and guided participation (Rogoff *et al*., 1993). All of these approaches can be applied to the support of technology-mediated learning but they have not been developed specifically for this purpose. Although there has been a body of research exploring scaffolding in relation to technology-supported learning (e.g. Lajoie, 2005; Puntambekar & Hübscher, 2005; Schetz & Stremmel, 1994; Wood & Wood, 1996; Yelland & Masters, in press), the emphasis of that work has been directed at the desktop computer, whether concerned with intelligent tutoring systems (Merrill *et al.*, 1992), promoting peer collaboration (Scardamalia & Bereiter, 1994) or exploring how learners seek help (Wood, 2001). In attending to mediation and the role of artefacts there are important areas of overlap with these theories of supported learning but there are also some key differences.

- The concept of *task performance* underlies these frameworks but the concepts of both 'task' and 'performance' are inappropriate in the free play context of pre-school settings. Guided interaction focuses on the process of learning rather than the successful achievement of a task.
- The main mode of scaffolding and other forms of assisted learning is generally *spoken language*. Guided interaction is enacted multimodally as learning was not mediated primarily through talk in this context.
- Although these approaches are conceptualized within a sociocultural framework, and so, by definition, one would expect attention to the broader societal sense of culture, many studies tend to have a close focus on the *site of engagement* and the immediate learning environment. Guided interaction refers to practice beyond the proximal adult/child encounters implicit in the approaches indicated above, encompassing planning, the provision of resources and concepts of role as critical elements in the distal dimension.

Nevertheless, interaction is central to understanding learning in a sociocultural framework whether child-to-child, child-to-adult or between people and artefacts. All of these approaches to supporting learning are similar inasmuch as they describe a dynamic, reciprocal process which is multi-causal and highly contingent. This study looks in more detail at how one realm of interaction can be better understood by researchers and practitioners. Our earlier work (Plowman & Stephen, 2005) found that children 'playing' with the computer frequently experienced operational difficulties, were hampered by their inability to read instructions or respond to dialogue boxes and failed to complete tasks when the games or activities with which they were interacting were too conceptually demanding. Guided interaction is a response to the specific needs of learning with ICT in pre-school settings and focuses on ways of supporting learning with diverse forms of ICT, including dance mats, listening centres, toy mobile phones and laptops, digital cameras and electronic keyboards, rather than being restricted to computers. The study reported here led to the identification of a broader range of opportunities for learning and observed ways of supporting learning with and around ICT as exemplified in Tables 1 and 2.

Pedagogy

Although we recognise the dominant role of play in young children's learning, our observations challenge the widespread belief that free play is a sufficient condition for learning in the context of ICT. Play is young children's characteristic mode of activity but it also offers opportunities for support for learning (Bennett, Wood & Rogers, 1997). A principle of the research was to acknowledge this and avoid disturbing the distinctive qualities of pre-school provision, such as the emphasis on learning through play and child-led activities.

Supporting learning in the ways that we have outlined here may seem commonsensical once they have been explained and illustrated. If this is the case, the question is why guided interaction is not a part of usual playroom practice. A probable explanation is that it is an outcome of the tension between the child-centred, holistic construction of pre-school education that dominates western culture and the apparently more interventionist and teacherly guidance suggested by guided interaction (discussed at more length in Stephen & Plowman, 2005). Reservations about the interventionist nature of guided interaction in the proximal dimension are understandable if the interactions are conceptualised as unidirectional teaching but interaction is, by definition, a two-way process. Guided interaction places the onus for guidance on the practitioner (or peers) but the focus is on a common activity, the pursuit of shared goals, and the maintenance of mutual understanding. Wood & Wood (1999, p.152) point out that, if practitioners are fully responsive, ‘it follows that it is the learners who ‘drive’ them to act as they do’ and elsewhere refer to the ‘learner’s role in regulating tutorial interactions’ (Wood, 2001, p.280). In other words, it could be claimed that it is the children who guide the interaction. Rogoff (1991, p.351) also emphasises the learner’s agency in this two-way interaction by stating that ‘[b]oth participation and guidance are mutual efforts of children and their caregivers or companions: neither can be attributed to an individual alone’.

Guided interaction is therefore consistent with child-centred pedagogy if practitioners are sensitive to the ways in which children initiate communication (which may be gaze, gesture or physical contact rather than verbal) and respond to their needs. An integral part of guided interaction in the proximal dimension requires being alert to the ways in which children actively direct the focus of learning and using pedagogical judgement to identify the optimal point for ‘timely intervention’ (Hemmings *et al*., 2000). This is a dynamic rather than formulaic process and also applies where there appears to be an absence of activity: in the many cases where children seem to respond to the computer in a desultory manner the responsive practitioner will be able to interpret this as a possible request for intervention.

Conclusion

Practitioners have a rich repertoire of pedagogical actions to support learning but need help to reflect on how they can apply this expertise to enhance children’s encounters with ICT. Transcripts of discussions in the cluster meetings and the final interviews suggest that guided interaction was a valuable heuristic for practitioners and the term was adopted readily as it encapsulated an approach that enabled them to reflect on their role in new ways. Practitioners and researchers were jointly able to identify a range of strategies for supporting learning with ICT that were rooted in the dynamics and constraints of authentic settings and maintained a balance between child-initiated and adult-led activities.

The study suggests that guided interaction provides support not only in terms of operational skills but also for less measurable positive dispositions towards learning such as persistence, engagement and pleasure. Interactions that enhance children’s engagement with ICT in the playroom are multimodal, including gesture, touch, language and, on some occasions, the emotional support of a known adult, but guided interaction also requires pedagogical activity beyond immediate interpersonal interactions. Thinking about guided interaction helped practitioners to question the purpose of ICT and to articulate, reflect on and legitimise changes in pedagogy. This prompted changes in the provision of resources, planning and assessment. Practitioners became more innovative, expanding their definition of ICT as well as using existing resources differently, and began to plan for, observe and record children’s engagement with ICT in new ways. This research investigated learning in pre-school settings but an adapted version of the framework has potential both as a research tool and to support changes in practice for professionals in other sectors of education.

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Table 1: Characteristics of guided interaction (distal)

Distal (Indirect interaction)			
Form of guided interaction	**Example**	**Mode**	**Learning**
arranging access to ICT	using sand timer to structure turn-taking	practice	learning dispositions
	recording patterns of use	policy	
ensuring access to help	making adult (or peer) help available	practice	learning dispositions
	checking on levels of engagement	practice	
modelling	using technology for a purpose, eg making video to show at parent's evening	practice	knowledge of the world
monitoring	planning child's return to activity	policy; practice	knowledge of the world, learning dispositions or operational
planning	ensuring balance across the curriculum	policy	knowledge of the world, learning dispositions
	ensuring range of activities for each child	policy	
	identifying learning needs	policy, practice	
providing resources	making broader range of ICT available	policy	knowledge of the world, learning dispositions, operational
	including disposable camera in story sacks for taking home	practice	knowledge of the world, learning dispositions
setting up activities	changing location and presentation of listening centre	practice	learning dispositions

Table 2: Characteristics of guided interaction (proximal)

Proximal (Direct interaction)			
Form of guided interaction	**Example**	**Mode**	**Learning**
demonstrating	how to use a tool such as the paintbrush or eraser	physical action; oral	
	placing a hand over child's hand as they move the cursor or click on icon	touch	
	how to frame a picture in viewfinder	touch; oral	
	how to plug in electronic keyboard	physical action; oral	operational
	turning over pages of story as children listen on audio tape	physical action	
	waving hand in front of EyeToy	physical action	
enjoying	sharing pleasure in features such as animation	oral; laughter	learning dispositions
	moving to the music on a CD player	physical action	knowledge of the world, learning dispositions
explaining	what is on slides for the computer microscope	oral	knowledge of the world
instructing	reading dialogue box on screen	oral	
	tell child how to use digital camera	oral, gesture	operational
	tell child to push button on tape player	oral	
managing	intervening in turn-taking	oral; facial expression	learning dispositions
modelling	putting on headphones to check sound level	physical action; oral	operational
	using a play phone to order a taxi	physical action; oral	knowledge of the world
monitoring	moving child to appropriate level of difficulty	gesture; oral	learning dispositions; operational
prompting	suggesting a child tries something new	oral	learning dispositions
	helping with typing in names (typically to start a new game)	oral; typing	operational
providing feedback	giving encouragement for efforts	oral	
	smiling as child types name on keyboard	facial expression	learning dispositions
	says 'That's beautiful' when child shows picture on camera	oral	
supporting	stays close to child using video camera for safety and emotional support	physical presence	learning dispositions; operational