Research Report

Interplay: Play, learning and ICT in pre-school settings

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1 Background

Earlier research showed that children’s use of computers (the dominant form of ICT in the playroom) was characterised by brief and often unproductive encounters. Children frequently experienced operational difficulties, were hampered by their inability to read instructions and failed to complete tasks when the games or activities they were interacting with were too conceptually demanding (Plowman & Stephen, 2005).

Practitioners were responsible for supervising play at the computer along with other activities. They placed considerable value on a child-centred approach, offering a nurturing and developmentally supportive environment and avoiding what they interpret as ‘teacherly’ interactions (Siraj-Blatchford, 1999). Accordingly, their supervision of children using the computer was opportunistic and reactive rather than proactive, a situation compounded by the children’s reluctance to seek help, and there were few examples of practitioners observing, recording and assessing children’s progress with ICT.

Given our aim of enhancing learning in the playroom we wanted to explore the benefits of joint mediated activity as well as attend to the ways in which both practitioners and children are active agents in learning. The design of Interplay is informed by sociocultural theory. Within this framework, learning is understood as the result of complex interactions between multiple agents in a cultural context rather than solely as an internal cognitive process. Learning is mediated through cultural tools (Wertsch, 1998) which, in the playroom, may include conversations, social practices and artefacts such as the technologies that we focus on here. Guided interaction is central to this study: it functions for practitioners as a ‘tool for seeing’, enabling them to look at their own practice in terms of supporting children’s interactions with ICT, and for researchers both as a tool for promoting dialogue with practitioners and as a theoretical framework to underpin analysis.

Using mediated action as a focus of analysis prompts a focus not simply on behaviour or on the individual, but on the links between cognition and culture through interaction with the environment. Video enables us to document some of these complex interactions although it does not equip us to identify learning directly and does not provide direct access to cognitive processes; for supplementary data that enables us to make judgements about children’s learning we have relied on the practitioners’ records.

2 Objectives

We set out to explore how practitioners can enhance three- and four-year-old children’s encounters with ICT in a pre-school culture of child-initiated learning through play. The following table represents the overall aim of the study, the objectives and the related research activities. The objectives are used to structure the results in 4.1 – 4.4 and are described in more detail in that section.
AIM
To explain and illustrate the role of adults and peers in enhancing children’s encounters with ICT

We have produced findings relating to practitioners’ and children’s learning (see 4.5). At an early stage of observations in the playroom we decided to focus predominantly on the role of adults in enhancing encounters with ICT because we found so few examples of peer support.

OBJECTIVE 1
To initiate an iterative, practitioner-generated process of guided enquiry through which practitioners can reflect on, and transform, practice.

We established a process of guided enquiry involving eight pre-school settings in two local authorities. Each cluster group of four nurseries within one local authority met on four occasions to view video recordings, discuss experiences, design small-scale projects and report back on them (see 4.1).

OBJECTIVE 2
To develop methods to represent children’s interactions with ICT.

We developed an innovative approach to representing interactions recorded on video using a comic strip format. The taxonomy of guided interaction provides a representation of children’s interactions with ICT that serves a different purpose. Both forms of representation underpinned our analysis of guided interaction (see 4.2).

OBJECTIVE 3
To operationalise guided interaction in authentic settings and child-directed learning situations.

Guided interaction describes the ways in which children’s interactions with ICT can be actively supported in pre-school settings. We produced a taxonomy to show how guided interaction operates in both distal and proximal dimensions, the modes through which it is enacted and the learning outcomes associated with its different forms (see 4.3).

OBJECTIVE 4
To compare children’s use of ICT in pre-school settings and at home.

The home-based studies enabled us to produce findings on the ICT competences that children develop at home and to investigate the extent to which socio-economic disadvantage makes a difference to the development of those competences (see 4.4).

Table 1: Aims, objectives and related research activities

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3 Methods

The study was based in eight pre-school settings which represented a range of types of provision and served 400 families with a broad range of socioeconomic status. The pre-school settings were formed into two cluster groups based on location and 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. The design of the study is summarised in Figure 1.

3.1 Collecting data

Researchers visited each of the pre-school settings on seven occasions and produced baseline information, a technology audit, field notes, focused 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 (see Table 2). During this period, each site identified two small-scale projects for implementation and evaluation that would either address recognised problems or explore new activities.

We interviewed the participating practitioners individually before and after the interventions and surveyed all 40 practitioners in the nurseries about their perceived level of ICT competency before and after the process of guided enquiry. Conversations with children about their use of ICT in the playroom were recorded on an opportunistic basis. The video recording of playroom use of ICT was supplemented with two types of structured observations: (i) scans at regular intervals of the use of all ICTs available in the playroom and (ii) observations of target children during the nursery session.
During the practitioners’ first project to explore guided interaction, we collected more video data (16 hours across the participating nurseries, recorded over the four phases of the guided enquiry cycle) and practitioners produced records of observations, typically on sticky notes or written in progress files. This new data was discussed in further cluster group sessions and the cycle was repeated as part of a practitioner-generated cycle of planning, action and review (see 4.1).

We conducted a survey of 400 families to establish attitudes to the role of ICT in the home and followed this up with sixteen case study families, eight selected to fit the criteria of ‘disadvantaged’, with an annual net income of under £10,000 and eight with a household income in excess of £20,000 per annum. In addition, an equal number of families from the two authorities, an equal number of pre-school girls and boys, and an equal number of three- and four-year-olds across the sample were included. Each case study family was visited twice and the interviews were audio recorded. Eleven of the case study families used a disposable camera to record their pre-school child using ICT at home and fourteen families compiled a diary detailing activities with ICT. We also interviewed members of the senior management team in four primary schools serving the nurseries to ascertain expectations about children’s readiness for school in terms of ICT competences.

Table 2: Timetable for data collection
3.2 Analysing data

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). 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. These sequences were presented to the two cluster groups as a series of vignettes designed to stimulate reflection on their practice. We had identified ‘guided interaction’ as a potentially useful term in an earlier study of pre-schools (Plowman & Stephen, op. cit.) and introduced it to practitioners in this study as a way of conceptualising different forms of support, although we had not yet exemplified its characteristics in detail.

This new data was discussed in further cluster group sessions and the cycle was repeated (Figure 2). During a later phase of the study, the analysis shifted to examination of adult-child interactions at a finer level of granularity. Using interaction as the unit of analysis meant that we were using the same evidence as practitioners to interpret children’s learning and behaviour. The key difference was 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. We supplemented video analysis with practitioners’ observation records and accounts to analyse changes in learning (see 4.5). We also analysed practitioner-generated written observations of implementing the intervention and responses to questions in a post-intervention interview for evidence of guided interaction. 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 (Annex 1).

3.3 The research warrant

Confidence in our conclusions is based on the testimony of practitioners regarding the changes in their practice and the process of testing and refining our findings through user validation and endorsement involving practitioners, managers of provision and policy-makers. Guided enquiry underpinned our findings. Combined with the plan-do-review cycle, this is a powerful way of engaging practitioners that enabled us to investigate our ideas in their context but also enabled them to bring to our attention issues of which we were not fully aware (such as constraints on resources). Although the research is based in eight sites, it is sufficiently grounded that practitioners at other sites will be able to recognise what is common to their own context.

The concept of ‘local proof’ (Lewis et al., 2006) highlights the ways in which local action and change can diffuse through word of mouth as practitioners adapt and spread innovations that they perceive to be valuable. Guided interaction worked in this way as, once the concept was illustrated, it was readily understood and was used in conversation and applied to practice.

3.4 Ethics

There were a number of aspects of this study that required special consideration: the meaning of informed consent for young children, the use of video and photographic images of children, and conducting fieldwork in homes. Ethical considerations were therefore fundamental and we were guided by the British Educational Research Association revised code of practice and ensured that the storage of data complied with the Data Protection Act. All members of the research team underwent Disclosure Scotland procedures and we were alert to the potential for ethical problems throughout the research, seeking advice from our advisory group as needed.

All children gave their verbal consent to the video recordings and all parents gave informed consent for their children to be recorded. However, the permission given was for photographs and video recordings to be used for ‘educational purposes’. This was adequate for sharing data with practitioners in different nurseries but is more ambiguous for use in journal papers or web sites. We therefore decided to use only images in which children could not be identified for these purposes and used staged photographs of children known to us for illustrations. Ethical issues arising from collecting data in homes were the subject of Legitimate evidence: using and interpreting what we see and hear in home case studies, a paper presented at our TLRP-sponsored seminar on conducting research in the home. Industrial action in the nurseries also
required sensitivity by the research team.

4 Results

In this section we take each of the objectives of the research in turn and describe how it was achieved. We then return to the overall aim of the project and describe the ways in which the cumulation of the objectives has led us to achieve the aim.

4.1 Objective 1: To initiate an iterative, practitioner-generated process of guided enquiry through which practitioners can reflect on, and transform, practice

We were keen to ensure that our findings were rooted in the realities of busy pre-school playrooms where play is the favoured medium for learning, children exercise choice about what to do and practitioners have to balance the conflicting demands that arise from responsibility for a range of activities with attending to the children’s social, emotional and cognitive needs. The credibility of our findings would be enhanced if they were derived from authentic settings, had received user affirmation and drew on the tacit knowledge of experienced pre-school staff. At a more pragmatic level, involving practitioners in the research process offered the advantage of generating data about their perceptions and experiences that would not otherwise be available and extended the duration and number of people involved in data collection. The latter is a particular advantage when, as in this case, the events under study (adults supporting children’s engagement in ICT activities) cannot be predicted and may be infrequent.

The process of guided enquiry is set out in Figure 2 and described in sections 3.1 and 3.2. The practitioners were invited to plan two interventions that would address difficulties with ICT or that would allow them to explore new activities, one of which featured a form of ICT other than computers. Interventions included stimulating the use of the listening centre, children using digital video or still cameras and developing children’s independent use of resources in the music area. Editing digital photographs, using a microscope attached to a PC, and exploring the use of a drawing package were among the computer-based interventions.

As they put their interventions into action practitioners collected evidence to bring to the next cluster meeting. They were asked to record their experience of the process they initiated and collect evidence of the impact that the change of practice or new use of resources had on playroom activities. In order to ensure authenticity, minimise the additional work load and maximise the data collected they were invited to gather evidence in whatever forms were usual.

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**Figure 2: The process of guided enquiry**

As they put their interventions into action practitioners collected evidence to bring to the next cluster meeting. They were asked to record their experience of the process they initiated and collect evidence of the impact that the change of practice or new use of resources had on playroom activities. In order to ensure authenticity, minimise the additional work load and maximise the data collected they were invited to gather evidence in whatever forms were usual.
practice in their setting, such as notes of playroom observations, photographs and extracts from children’s profiles. In addition, they provided evidence from their playroom planning and review records and informal accounts of their own response to the intervention. The discussions between practitioners at the cluster meeting were audio recorded and were a further source of evidence about the nature of guided interaction and changes in practice. Our emerging understanding of guided interaction was presented to practitioners during the cluster meetings where it was endorsed, challenged or subjected to amendment.

4.2 Objective 2: To develop methods to represent children’s interactions with ICT

Guided interaction is multimodal in nature, encompassing language, gesture, touch, gaze, and physical movement within a sociocultural framework. Identifying a way to capture multimodal interactions was therefore central to Interplay as we would not be able to identify the characteristics of guided interaction unless we could analyse the range of modalities involved and the ways in which they interact. To enable us to do this, we used a hybrid of mediated discourse analysis (Scollon, 2001), mediated action analysis (Wertsch, 1998) and interaction analysis (Jordan & Henderson, 1995) which was designed to illuminate our interest in mediated action, context, verbal and non-verbal interaction and support for learning. The analysis enabled us to devise a taxonomy of guided interaction as one form of representation of children’s interactions with ICT. This shows examples of different types of support, the different modes in which that support is enacted, and the learning that follows from the interactions (Annex 1).

The taxonomy is not very accessible for practitioners. For this, and as an analytical tool in its own right, we used a comic strip format (Annex 2). The commentary in the caption boxes indicates some of the ways in which the children’s interactions are being guided and is the outcome of discussions with practitioners combined with the development of the taxonomy of guided interaction. A sequence of images provides a short narrative that exemplifies different aspects of guided interaction and demonstrates its multimodal nature, showing gesture, speech and presence as means of support. The comic strip format is ideal for representing a dynamic process within a sequence of static images, making it easier to isolate key gestures and responses, non-verbal means of interaction and the ways in which multiple participants orient to each other and to features in the environment. As an analytical tool they make explicit interactions that had not been visible to us in the moment, or to practitioners, as the frame-by-frame process of producing comic strips prompts the researcher to identify the key actions and transitions.

For our purposes, the comic strip format provides a number of advantages over alternative forms of representation, but there are shortcomings. The main problem is that the ways in which encounters with technology are supported in the distal dimension (such as planning and recording) are less visible and so less amenable to representation in such a format.

A full account is provided in the nominated output The big picture? Video and the representation of interaction.

4.3 Objective 3: To operationalise guided interaction in authentic settings and child-directed learning situations

Throughout Interplay, guided interaction functioned as a conceptual tool for both practitioners and researchers and its definition evolved over the one-year period of fieldwork and beyond. The 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. (See Annex 1 for a more detailed account.)

Guided interaction is located within a Vygotskian tradition of understanding supported learning and relates to concepts such as scaffolding (Wood, Bruner & Ross, 1976), assisted performance (Tharp & Gallimore, 1989), dialogic inquiry (Wells, 1999) and guided participation (Rogoff et al.,

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1993). In attending to mediation and the role of artefacts there are important areas of overlap between guided interaction and 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 conceptualised within a sociocultural framework, many studies focus on the site of engagement and the immediate learning environment. Guided interaction shares this focus but also 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.
- The ‘interaction’ in guided interaction refers to interaction with technology, as well as interaction with the environment and other people. As our earlier studies showed, technology-mediated learning requires specific forms of support.

The concept of guided interaction had value for both practitioners and policy makers as it legitimised shifts in approaches to pedagogy that were in harmony with the culture of the playroom whilst emphasising the mediating role of the adult in supporting children’s learning.

A full account is provided in the nominated output ‘Guided interaction in pre-school settings’.

4.4 Objective 4: To compare children’s use of ICT in pre-school settings and at home

In the proposal we stated that we would seek funding to develop the aspects of Interplay concerned with children’s uses of ICT in their homes. We made a successful application for a BECTA research bursary for the project Children’s access to ICT at home and their preparation for primary school, in conjunction with Joanna McPake, which enabled us to extend the survey to every family with children at the nurseries (over 400, rather than the 100 originally proposed) and to double the number of case studies undertaken for Interplay. Emerging findings enabled us to build on both projects and make a successful application to the ESRC’s e-Society programme. Entering the e-Society: Young children’s development of e-Literacy began in spring 2005 and is now regarded as a TLRP progression project given its high degree of synergy with Interplay.

The home studies showed that although high income families tended to have more ICTs at home this did not necessarily mean that children had more access: the ICTs in low income households were sometimes older or not fully functioning but this meant that adults did not restrict children’s use in the same way. High income families had more concerns about children damaging equipment, especially if it was used for work purposes by adults in the house. Ownership does not therefore correlate with access, demonstrating that income is not the only factor to take into consideration when investigating the digital divide. Both parents and practitioners were very enthusiastic about young children using technology. Perhaps surprisingly, given that the children in our sample were aged three and four, almost all parents considered that their children would need to know about ICT for work (96%), slightly more than thought they would need it for school. Nearly all (98%) parents agree with the statement that playing with ICT helps children learn and parents felt it was their role to help children learn to use ICT (96%), although the same percentage also felt they should control the amount of time their children spend playing with ICT.

Practitioners’ knowledge of children’s ICT experiences at home was gathered informally during the induction period, from daily contact with parents, and from conversations with children. Some commented on the greater confidence demonstrated by children who use computers at home, others were concerned that too much exposure to ICT could be damaging to young children’s social and cognitive development, commenting on the length of time that children spend watching
television or playing computer games. Practitioners tended to consider home use of computers and electronic games to be qualitatively different from the computer play offered in pre-school settings. They saw the role of ICT in pre-school as principally to develop basic technical skills rather than children’s understandings of the social and cultural roles of ICT, and so this aspect of children’s home experiences was rarely considered.

More information is available in the report to BECTA (Already at a disadvantage? ICT in the home and children’s preparation for primary school) and McPake et al. (under review).

4.5 **Overall aim: To explain and illustrate the role of adults in enhancing children’s encounters with ICT**

Although our overall aim was to enhance children’s learning the agents of change in achieving this were the practitioners, supported by us through the process of guided enquiry. Our analysis of the role of adults in enhancing children’s encounters with ICT therefore produced findings in two main areas: practitioners’ developing pedagogy for supporting children’s use of ICT and children’s learning with and through ICT. In our analysis of outcomes for learners it became apparent that the domains of learning were similar across both practitioners and children. As practitioners’ skills, confidence and knowledge increased the opportunities that they afforded children expanded. As a result, children’s encounters became more varied, sustained and productive so practitioners became more confident about what the children could achieve and they became emboldened to try new approaches, creating a virtuous spiral.

4.5.1 **Practitioners’ learning**

The research team provided no training for practitioners but confidence in using ICT in the playroom grew as the cluster group sessions enabled them to share experiences and the two interventions enabled them to observe children’s use of ICT more closely than hitherto. They also developed pedagogical knowledge about the value of particular resources and ways of recording, assessing and integrating ICT activities into nursery planning. Changes were also evident in identifying areas where they had previously both over- and under-estimated children’s capabilities, questioning the role of ICT in the playroom and recognising that ICT can be used to access and support learning throughout the curriculum. Practitioners reported (i) developing more positive dispositions towards technology, (ii) extending their pedagogical knowledge and (iii) acquiring operational skills.

4.5.2 **Children’s learning**

Our evidence about children’s learning comes from practitioners’ observation notes, interviews, discussions at the cluster meetings and extracts from their written accounts of the interventions. We identified three areas of learning that can be supported by play with ICT: (i) developing dispositions to learn, (ii) extending knowledge of the world and (iii) acquiring operational skills. These categories are not intended to be exhaustive (physical development is missing, for instance) but they enable us to identify more clearly the broad areas of learning that can be supported by ICT, as indicated in the tables in Annex 1. 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.

4.5.3 **Discussion**

Suggesting that young children need adult support for interacting with complex artefacts is not perhaps a particularly striking finding. However, this can be seen as a strength of the research rather than a weakness as the need for changes in practice was seen as obvious once it was pointed out. The process of guided enquiry, in tandem with the ‘tool for seeing’ of guided interaction, enabled practitioners to look afresh at pedagogy. Nevertheless, the question of why it was not a part of usual playroom practice remains. The lack of direct, extending interactions through talk and other modalities is not only a characteristic of practice in the settings included in Interplay. A recent report on Scottish pre-school provision based on 1600 inspections called for
enhancements in the nature of the interactions between adults and children to support learning (HMIE, 2006). Similarly, an analysis of pedagogical practices in settings involved in the Effective Provision of Pre-school Education study concluded that ‘the most effective settings encourage ‘sustained shared thinking’ but we also found that this does not happen very frequently’ (Siraj-Blatchford et al., 2002).

Practitioners have an antipathy to didactic teaching and 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. Guided interaction is 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. A discussion of why these aspects of practice are not more frequently observed when children play with technology and a more detailed account of practitioners’ and children’s learning is provided in Enhancing learning with ICT in pre-school.

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.

The research led to an outline of a range of strategies to support learning with ICT that maintain a balance between child-initiated and adult-led activities and are rooted in the dynamics and constraints of authentic settings. The study challenges the widespread belief that free play is a sufficient condition for learning and emphasises the practitioner’s role in a pedagogy that promotes social and cognitive development in the early years. This framework enabled practitioners to see how their current practice can constitute guided interaction and raised awareness of existing, if isolated, practices. Although it was new to them, guided interaction was a term with which practitioners felt comfortable, so they were able to use this concept to reflect on practice and explore how they could enhance children’s learning with ICT.

5 Activities

An Interplay website is available at www.ioe.stir.ac.uk/Interplay/. This provides a set of links to related sites, background on the project and papers.

With support from the TLRP inter-project fund we held a seminar on Researching Children at Home: Exploring methods for conducting studies with children and their families at home in Edinburgh 14th-15th February 2005. This was over-subscribed and attracted participants from throughout the UK.

Futurelab funded a collaborative doctoral research studentship for three years to research The Digital Play Ecology of Young Children. With the studentships funded at Bristol and Nottingham this has created a small network of students, their supervisors and researchers at Futurelab which meets twice each year.

Christine Stephen was a member of the ICT Early Years Steering Group which oversees implementation of the national strategy for ICT in early years, gave evidence to the Independent Commission on 3-12 Educational provision in Clackmannanshire and was invited to contribute to the Inquiry on Provision of Pre-school Education and care for the Education Committee of the Scottish Parliament.

The list of presentations (Annex 3) shows that this research has been disseminated widely, both in the UK and abroad, to audiences ranging from early years practitioners to academics working
in the areas of cultural studies, developmental psychology, artificial intelligence and computers in education.

6 Outputs
Please see Annex 3.

7 Impacts

Our main link with research users was the advisory group, made up of representatives from the two local authorities, Learning and Teaching Scotland and the Scottish Executive. Its remit was to advise the research team on the design and conduct of the study, make suggestions for dissemination of findings, alert the team to policy developments that could impact on the research and identify ways in which the research could benefit the constituent organisations.

As indicated, Interplay has adopted a broad definition of ICT as we see technology as being embedded in a range of children’s everyday experiences. ICT has hitherto been mainly described in terms of computers and peripherals and this has led to a narrow, and sometimes inappropriate, approach to its use in teaching and learning, particularly for this age-range. Based on the earlier studies for LT Scotland that informed Interplay we were able to persuade the Scottish Executive of the importance of building its policy making on this broad definition and we believe this has had an impact on practice across Scotland. This research has informed the leaflet produced by the Scottish Executive Making the difference: New technology in learning which has been distributed to every family in Scotland.

We introduced this broad definition to practitioners in the cluster meetings. Instead of seeing ICT as just another resource they started to see how ICT could be used to support learning across the curriculum and to use it as a focus for discussing pedagogy. There is evidence that purchasing decisions for nurseries were informed by the need to provide a broader range of ICT resources and they were able to identify opportunities for guided interaction in a range of pedagogical interactions and in other playroom activities.

8 Future Research Priorities

Our immediate research priority was to develop our work on the role of ICT in children’s homes and this is being conducted with Joanna McPake as part of Entering the e-Society: Young children’s development of e-Literacy.

A similar study in primary schools would investigate the impact of different approaches to pedagogy and concepts of learning and would provide an opportunity to look at transition from pre-school to school in terms of children’s ICT competences. A longitudinal study would be able to explore whether children who have limited access to ICT in the home are disadvantaged as they move through primary school.
References


McPake, J., S. Downey, L. Plowman, D Sime & C Stephen (under review). Already at a disadvantage? The impact of socio-economic disadvantage on young children’s developing ICT competences in the home. Accepted for publication subject to revision in *Contemporary Issues in Early Childhood*.


ANNEX 1 TAXONOMY OF 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. Guided interaction was 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.

The tables are not designed to provide information on the frequencies of different types of interaction. Representing guided interaction in this way is a means of both analysing what was happening in these learning interactions and documenting the range of practitioner activity that supports learning, helping us to identify responses to two questions we posed at the outset of this study: i) how does guided interaction fit into a pre-school culture of child-initiated learning through play and ii) how can practitioners find a space for guided interaction amongst their many other responsibilities in the playroom?

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, or as susceptible to categorisation, as proximal interactions and it is partly for this reason that these less visible aspects of support for learning do not receive as much research attention. The modes by which support was enacted in the distal dimension were broadly categorised as policy and practice. Policy refers to actions taken in order to comply with policy directives and curriculum guidelines, including planning and recording children’s learning, and practice is an umbrella term which refers to the ways in which pedagogy and concepts of role shape actions in the playroom.

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<tr>
<th>Form of guided interaction</th>
<th>Example</th>
<th>Mode</th>
<th>Learning</th>
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<tbody>
<tr>
<td>Arranging access to ICT</td>
<td>using sand timer to structure turn-taking</td>
<td>practice</td>
<td>learning</td>
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<tr>
<td></td>
<td>recording patterns of use</td>
<td>practice</td>
<td>dispositions</td>
</tr>
<tr>
<td>Ensuring access to help</td>
<td>making adult (or peer) help available</td>
<td>practice</td>
<td>learning</td>
</tr>
<tr>
<td></td>
<td>checking on levels of engagement</td>
<td>practice</td>
<td>dispositions</td>
</tr>
<tr>
<td>Modelling</td>
<td>using technology for a purpose, eg</td>
<td>practice</td>
<td>knowledge of the world</td>
</tr>
<tr>
<td></td>
<td>making video to show at parent’s evening</td>
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<td></td>
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<tr>
<td>Monitoring</td>
<td>planning child’s return to activity</td>
<td>policy, practice</td>
<td>knowledge of the world, learning dispositions or operational</td>
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<td>Planning</td>
<td>ensuring balance across the curriculum</td>
<td>policy</td>
<td>knowledge of the world, learning dispositions</td>
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<td></td>
<td>ensuring range of activities for each child</td>
<td>policy</td>
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<td></td>
<td>identifying learning needs</td>
<td>policy, practice</td>
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<tr>
<td>Providing resources</td>
<td>making broader range of ICT available</td>
<td>policy</td>
<td>knowledge of the world, learning dispositions, operational</td>
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<td></td>
<td>including disposable camera in story packs for taking home</td>
<td>practice</td>
<td>knowledge of the world, learning dispositions</td>
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<tr>
<td>Setting up activities</td>
<td>changing location and presentation of listening centre</td>
<td>practice</td>
<td>learning</td>
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Table 1: Characteristics of guided interaction (distal)
The distal nature of the support is demonstrated by the lack of learning outcomes categorised as operational (which generally requires face-to-face interaction) and an emphasis on dispositions for learning and knowledge of the world, principally through planning and provision. The ways in which practitioners thought about their role in children’s learning and their implicit and explicit ideas about good practice made a difference to the guided interaction that children experienced. Some practitioners implicitly privileged the planning and providing aspects of their role and saw child-led exploration as the means of learning. In these circumstances children were offered freedom to choose from a well resourced environment but were less likely to be involved in face-to-face interactions with adults.

**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 making an action for the first time.

Dispositions to learn encompass 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. 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. There are few examples here of intended outcomes that could be classified as knowledge of the world, which is more likely to be enacted in the distal dimension through the provision of resources aimed at specific areas of the curriculum. Interventions were rarely explicitly cognitive in orientation, such as developing learning in terms of the subject content, and most interactions were operational. 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. 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.

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. 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.

These categories overlap. 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.

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.

<table>
<thead>
<tr>
<th>Proximal (Direct interaction)</th>
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<tr>
<td><strong>Form of guided interaction</strong></td>
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*Table 2: Characteristics of guided interaction (proximal)*
ANNEX 2  COMIC STRIP REPRESENTATIONS OF GUIDED INTERACTION

FIGURE 1: MAKING COOKIES
(Used to exemplify the ways in which practitioners support interaction in other contexts.)
FIGURE 2: THE LISTENING CENTRE

RED & GREEN STICKERS PROVIDE OPERATIONAL SUPPORT

WHAT'S HAPPENING HERE? IT'S JUST STARTING. PUT THESE ON

PROVIDE RESOURCES TO SUPPORT ACTIVITY

OPERATIONAL SUPPORT

IS IT PLAYING? YES?

CHECK'S SOUND - MODELLING AND OPERATIONAL
ANNEX 3 OUTPUTS

PUBLICATIONS (FORTHCOMING or UNDER REVIEW)

McPake, J., S. Downey, L. Plowman, D Sime & C Stephen (under review). Already at a disadvantage? The impact of socio-economic disadvantage on young children’s developing ICT competences in the home. Accepted for publication subject to revision in Contemporary Issues in Early Childhood.


PUBLICATIONS


The following outputs were published during the lifetime of Interplay. The content has mainly been drawn from studies that preceded Interplay but there has been cross-fertilisation of ideas and content.


FORTHCOMING CONFERENCES

Plowman, L. (forthcoming, 2006). Invited panel speaker to debate the use of technologies by young children at Happy Families? conference organised by the National Family & Parenting Institute to promote the wellbeing of parents, families and children, to be held November 2006.


ACADEMIC CONFERENCES AND WORKSHOPS
(in date order, most recent first)


Plowman, L. Play and learning. Presentation at ESRC research seminar on Play and learning: Educational research and the design of interactive media, Edinburgh. September 2004

Sime, D. 'I control my toys, I tell them what to do.' Interactive toys and children's family and peer relationships. Digital generations: children, young people and new media conference, London July 2004


Plowman, L. Play, learning and technotoys. Invited talk at ESRC research seminar on Digiplay: Experience and Consequence of Technologies of Leisure. CRICT, University of Manchester. January 2004


PRACTITIONER AND USER CONFERENCES AND WORKSHOPS
(in date order, most recent first)

Plowman, L. Supporting learning with technology in pre-school settings. Invited talk at the AV 06 Festival, Sage Centre, Gateshead, March 06.

Plowman, L. Using educational research to inform the design of children’s technologies. Invited panel presentation at 4th International Toy Research Association world congress on Toys and Innovation, July, 2005, Alicante, Spain.

Stephen, C. Interplay presentation to staff and students from Department of Early Childhood
Education, Taipei Municipal Teachers College, Taiwan, July 2005, Glasgow.
Plowman, L. & C. Stephen. Invited participation at NESTA Futurelab innovations workshop on
technologies for pre-school, Bristol, June 2005.
Stephen, C. Making Sense of Pedagogy: an evolving conversation. Keynote address at
Perspectives on the Early Years: In conversation with Prof Carlina Rinaldi, Prof Tina Bruce
and Dr Christine Stephen, Learning and Teaching Scotland, Glasgow, May 2005.
SETT is a conference for policy makers, teachers and other education managers and
practitioners. September 2004
Sime, D. ICT in the home and pre-school settings. Invited keynote presentation for conference on
ICT in the Foundation Stage, Robinson College, Cambridge. October 2004. This conference
was for teachers and early years practitioners.
Stephen, C. ICT in pre-school settings. Workshop at launch of Early Learning, Forward Thinking:
the ICT strategy for early years for Scottish Executive Education Department and Learning
and Teaching Scotland. Mainly practitioners and local authority advisers and managers.
October 2003
Stephen, C. & Plowman, L. ICT in pre-school settings. SETT (Scottish Education and Teaching

PRESS COVERAGE
Sunday Times, p.26, 16 April 2006, Age of the techno-tweens, Katrina Manson.
Vision (NESTA Futurelab magazine), pp.15-17, Issue 2, Spring 2006, Tots, toddlers and
technology.

WEB PRESENCE
Story on ‘How valuable are educational toys?’ front page of ESRC Society Today website,
October 2005.

TLRP PUBLICATIONS
Briefing for ESRC Teaching and Learning Research Programme for wide dissemination of project
findings.
and Learning in Schools, a commentary by ESRC Teaching and Learning Research Programme.