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New technologies, new multimodal literacy practices and young children's metacognitive development

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This paper discusses concepts of learning through 'collaborative multimodal dialogue'. It draws on an ESRC-funded study (RES-000-22-2451) investigating 3- and 4-year-old children's encounters with literacy as they engage with a range of printed and digital technologies at home and in a nursery. The study goes beyond analysis of spoken language, giving a more complete understanding of literacy learning processes through detailed analysis of how children use multiple communicative modes as they experience literacy in different media. These experiences underpin metacognitive development and are crucial to children's abilities to act strategically in future situations. Drawing on notions of literacy as social practice, this paper discusses how the advent of new technologies has introduced new dimensions into young children's literacy learning, the implications of which have not yet been fully recognised in early years policy guidance, training or practice.

Keywords: collaborative multimodal dialogue; literacy practices; new technologies; early childhood education; metacognitive development

Introduction

Literacy as a communicative practice is inherently social, grounded in the need to compile and share information between individuals or groups of every size – families, organisations, communities, countries, etc. The purposes for which literacy is used range from expression of everyday needs through words, gesture and action to the human desire to participate in wider social and cultural practices and to 'fix' ideas for distant or future audiences. These 'fixings' or 'texts' (Pahl & Rowsell, 2005; Stein, 2003) – verbal tracts, images, objects, patterns, artworks, voice recordings, musical compositions – are shaped by the material resources available at any point in time and place and by the communicative networks to which individuals and groups have access. This article focuses on the ways in which new media and changing practices impact on young children's development as 'literate' beings, and on their learning more generally.

Current educational policy in England suggests that one of the primary functions of schooling is to equip all children with the knowledge and skills needed to access higher education, find employment and participate effectively in all aspects of contemporary life (Every Child Matters Green Paper 2003, revised April, 2008). Yet research

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indicates that pedagogic interactions have unequal consequences for children's learning depending on the ease with which individuals identify with schooled ways of doing things (Bernstein, 1996; Brooker, 2002). Bilingual students, children with disabilities and particularly boys from low income families can be disadvantaged by lack of familiarity with the language and patterns of interaction mediating instruction (Drury, 2007; Neuman & Celano, 2006; Warrington, Younger, & Bearne, 2006).

Teachers too find it difficult to step outside their experiences and build on children's 'funds of knowledge' (Moll, Amanti, Neff, & Gonzalez, 1992), and their cultural and cognitive experiences outside school (Au & Raphael, 2000; Gregory, 2007; Levy, 2008; Marsh, 2003). Disadvantage sets in at an early age. Close analysis of literacy practices and events allows us to explore potential differences between the modalities of interaction and the affordances of traditional and new media, in order to identify what early years practitioners need to know and do in order to support the developing literacy practices of all children across a range of media.

This paper draws on aspects of the ESRC-funded study *Multimodal Literacies in the Early Years*, which explores how 3- and 4-year-old children develop literacy knowledge and skills using 'traditional' and 'new' technologies at home and in their preschool. It focuses on two twin sisters' uses of traditional and digital technologies in the nursery and at home, and reflects on the potential of new media for promoting literacy learning through 'collaborative multimodal dialogue', defined here as the inter-subjective meaning-making processes that occur through interaction and joint engagement in activity and are expressed through multiple communicative modes, such as gaze, gesture, movement and talk. The importance of such investigations for early years education is overwhelming. As Au and Raphael (2000) argue, 'ensuring educational equity involves helping students become literate in all artefacts of literacy, not only those historically used and present in today's society, but those likely to become prominent in the future' (p. 170).

Literacy as social practice

The view of literacy as historically situated social practice (Lankshear & Knobel, 2003; Street, 1998, 2003) contrasts with conceptualisations of literacy as an individual cognitive activity associated principally with print-based media. Whilst the early years curriculum in England has begun to recognise how social practices underpin literacy development, there remains a strong focus on cognitive approaches, with a corresponding emphasis in early years practice on developing children's language and literacy skills through teaching about the sounds and rhythms of language. There is a similar emphasis on print rather than screen-related practices, introducing pupils to books and other versions of the printed word, sharing stories, visiting libraries, and making cards for special occasions, for example, with little equivalent introduction to literacy in new technologies. These practices and discourses are driven partly by socio-historically situated constructions of literacy, and partly by the requirements of assessment and demands for accountability in education. Furthermore, curriculum guidance on new technologies emphasises the technical aspects of ICT, rather than its meaning-making potential. This approach accords with the findings of previous research involving older children in schools in Canada (Asselin, Early, & Filipenko, 2005). Yet it misses an important dimension of what it means to be 'literate' in the world today where knowledge and communication are increasingly prized commodities and less reliant on 'book learning' than in the past.

For researchers in the field of new literacy studies (NLS), literacy 'is about knowledge' (Street, 2003, p. 77) bound up with notions of 'identity' and 'being'. From this viewpoint, 'literate' individuals are able to 'read' social situations and understand what is required to participate effectively in particular practices. Lonsdale and McCurry (2004) emphasise the role of critical thinking in empowering individuals and suggest that certain skills might be considered generic to all contexts, including 'information literacy skills, critical thinking, reading, writing and listening' (p. 3). These ideas chime with Wells and Chang-Wells' (1992) description of 'literate thinking' involving mental strategies associated with reading and writing but rooted in certain types of spoken discourse and characterised by 'explicitness, connectivity, justification and relevance' (1992, p. 69). When the purposes of interaction demand, language is 'deliberately exploited as a tool for thinking' (1992, p. 76). The implications for teachers of young children are clear. In order to assist children's language and literacy development in different domains, educators need to help them make connections and reflect critically on the purposes of literacy.

To participate effectively in twenty-first century literacy practices, it is necessary (i) to have access to human and material resources – people, books, objects, mark-making equipment, computers, mobile phones or internet connections; (ii) to have the skills to operate or engage with them effectively; and (iii) to have a critical understanding of the potential of diverse literacy tools: how they might be used in different ways and for different purposes. Without this deeper understanding of the processes and meaning-making potential of the mediating tool or artefact its usefulness may remain untapped. This 'meta-level' knowledge derives from individuals' experiences as participants in socially-situated activity. Crucial then to young children's success in literacy learning is the nature of the learning environment – the human and material resources available, and the kinds of pedagogic interactions mediating those experiences.

Data collection and analysis

Data for the project were collected in the homes of 10 pre-school-aged children and in a nursery within a purpose-built children's centre heralded as the local authority's 'flagship early years centre for pre-school children'. Situated in a relatively affluent city suburb and also serving two large areas of social housing, approximately 60% of the nursery's cohort of children was from the local community ('community children'), and 40% of places were taken up by children identified with special educational needs from within and beyond the catchment area.

Data collection methods included: a review of documentation, which situated participant understandings of literacy within wider institutional and sociocultural contexts; questionnaires completed by nursery staff and parents, which explored children's uses of new and traditional technologies, home and early years literacy practices and beliefs about literacy learning; assessment of literacy provision in the setting based on the Early Childhood Environmental Rating Scale Extension (ECERS-E; Sylva, Siraj-Blatchford, & Taggart, 2003) and video case studies of 10 children, with repeated observations in the setting and at home over two nursery terms (total approximately three to four hours video recording of each child). Observations were supplemented with field notes and explored through semi-structured and informal interviews with parents and practitioners.

Anonymised questionnaires were handed out to all parents in the nursery setting (41 responses: 55% response rate). This elicited socio-economic data (parents'

educational qualifications, levels of education and ethnicity), information about their children (gender, position in family, age, statement of needs, etc), and provided background information on home ownership and use of new and traditional literacy artefacts (such as books, toys, computers, TV, games consoles), home literacy practices and children's access to and experience of new technologies at home. Parents were also invited to participate as case study families. From these respondents and in consultation with the nursery head, 10 case study children were selected following principled criteria to represent as broad a sample as possible, an equal number of boys and girls, a spread of socio-economic and ethnic backgrounds, and a range of educational needs and reported home uses of new technologies. A similar questionnaire was handed to all staff in the nursery setting, requesting information about levels of early education training and experience, and probing their views on early literacy education, experiences of and attitudes to new technologies (total 17 responses: 81% response rate).

Semi-structured, audio-recorded interviews lasting 30–50 minutes were conducted with the parents of the case study children, and with the children's teachers and keyworkers in the nursery setting. Interviewees were invited to recall and reflect on the children's interests and preferred activities, their uses of traditional and new media literacy artefacts (such as books, comics, pens, pencils, computer, digital games). Adult respondents were also asked about their expectations of nursery school education, their understandings of early literacy development, the place, if any, of new media in their children's present and future lives, and their own confidence with and use of electronic media. In addition, the researchers recorded in field notes any data relevant to the study gathered during countless informal conversations over the course of the ethnographic study.

This paper reports on findings relating to summer born twin sisters Elizabeth and Jane,[1] who lived with their professional parents in a terraced cottage close to the city centre. Whilst their father went out to work, the children were cared for in the home by their mother and occasionally by the maternal grandparents. In this family, the mother was a skilled user of new technologies who supported her daughters' purposeful use of a wide range of literacy resources. The data cited here are illustrative of trends observed across the data set in those families where new technologies formed a regular part of daily life.

The computer assisted qualitative data analysis software package Atlas.ti is currently being used for ongoing data analysis, along with interpretive and multimodal analytic frameworks developed by Flewitt (2005) and further refined. Working with uncut video, field notes and transcripts of interviews with parents and practitioners, data have been coded according to domain (home/school), interaction frame (i.e., whether the activity was carried out individually or by children working as a group collectively or collaboratively), meditational means (books, computers, puzzles, etc), modes of operation (gesture, language, embodied action, etc) and affordances (opportunities and constraints) of practices in different domains. In this way it is possible to explore co-occurrences and discrepancies in the data with a view to gaining a deeper understanding of the means and modes of engagement used by children at an early stage of literacy development, and the possibilities for promoting their knowledge of the structure and nature of the practices in which they were engaged, i.e., their metalevels of awareness and learning more generally. For, as Vygotsky writes of language, 'once children learn how to use the planning function of their language effectively, their psychological field changes radically. A view of the future is now an integral part

of their approaches to their surroundings' (1978, p. 28). We propose that by extension the same might be said of multimodal means of communication.

In the following section, we report on preliminary findings emerging from the ongoing data analysis of the complex, multimedia data set.

Access and attitudes to new technologies in the nursery

In the nursery, practitioners expressed some concern about the potential dangers of technologically-dominated childhoods. Some feared that children's lives were being made toxic through increasing use of new technologies, inactivity and an inability critically to evaluate competing sources of information. As one member of staff observed:

> I think in moderation new technologies are a good thing however they can be damaging… 'family-time' and communication can suffer because of children being allowed to absorb themselves within these 'electronic worlds'. (Questionnaire comment: anonymous EY practitioner)

Other practitioners seemed bewildered by the pace of technological change and lacked confidence either to set up or support children's interactions with computers. Invited to comment on the advent of electronic media and the role of ICT in early learning one key worker in our study noted: 'It's *there*, whether they like it or not, and children have to learn to cope – to be able to deal with that don't they? It is very fast… keeping up is really hard' (Key-worker, 28 March 2008).

Consequently, although computers with internet access were usually, though not always, available for children in the nursery, computer use was rarely actively encouraged, and there was little curriculum guidance for practitioners to follow. As one young early years practitioner (Lauren, a respondent in the study with less than five years experience) observed of the requirements of the Foundation Stage Curriculum:

> There's a lot more of an emphasis on books… having a respect for books, being able to hold them correctly, understand the structure of stories, etc, whereas when it comes to ICT, there is mention of it but it's about showing an interest in ICT and being able to complete a program. There's not the emphasis on it from a literacy point of view at all, so a lot of what happens when we sit down and observe children at the computer, is looking that they can do hand, eye co-ordination and that they understand what clicking the mouse means. (Lauren, 28 March 2008)

Practitioners reported that they only occasionally supported children's use of new technologies although a clear role was identified for their use to assist the learning of children identified with special educational needs. For some of these children, computers were seen to offer elements of control and choice lacking elsewhere in their lives. Overall, early findings from the study support the suggestion that there is considerable uncertainty surrounding practitioners' roles with regard to new technologies (Marsh, Brooks, Hughes, Ritchie, Roberts, & Wright, 2005).

Collection of the data coincided with a period in which practitioners were re-examining resources in the setting with a view to promoting learning driven by children's choices and prior experiences. The programme of 'Continuous and Enhanced Provision' fostered by the local authority, originated in a training and resource centre (Early Excellence Ltd, Huddersfield) which aims to support the development of good practice (3–5 years). It relies on (i) the existence of a co-ordinated network of teachers and key-workers who can really get to know individual children and

liaise with their families; and (ii) consensus regarding the nature of the 'core provision' and the resources available to all children (i.e., displayed within their reach) at all times. These were the priorities of practitioners in the setting as they began to consider the types and uses of new media and digital technologies for young children's learning generally. Nevertheless, research suggests that in addition to the availability of resources, sustained focus on the nature and quality of relationships mediating children's experiences around different media and texts is crucial to the effectiveness and depth of learning for all children (Green & Hannon, 2007; Neuman & Celano 2006; Yelland & Masters, 2007). This is a point to which we return in a later section.

Access and attitudes to new technologies in the children's homes

The initial questionnaire to all parents in the setting indicated that ownership of computers and terrestrial and satellite TVs was widespread. Indeed, all but two of the respondents had access to computers and the internet at home. Significantly, the exceptions were two of only eight families in the lower income bands (<£20,000). Mobile phone ownership was also high, as was ownership of CD and video players, but ownership of other recreational new technologies, such as hand-held games, was comparatively low. Parents reported that adults and/or friends often shared children's screen-related activities, such as watching TV and using a computer, and also shared in traditional literacy activities, such as reading books and comics.

Comments made by the parents in the questionnaire, along with interview and observational data, suggest that children's access to computers at home was often carefully controlled and constrained by the location of equipment – in converted attics, adult studies or a stairwell for example. This 'parental policing' of new technologies reflected concerns shared by many parents about the effects of screen-based activities on children's overall development, and resulted in restricting the time that children were allowed to use computers/TVs.

Literacy and metacognitive awareness

As noted above the quality of relationships and interactions mediating children's activities are central to their literacy development. One outcome of our study was the opportunity to explore any overlap and/or gaps between children's home and school literacy practices, and how children develop metacognitive awareness of literacy resources and skills in a range of media. This is a relatively new field of enquiry, although some related studies have been conducted, such as Neuman and Celano's (2006) Philadelphia-based study of librarians' attempts to raise the achievement levels of children from low-income families by increasing the provision of print and technological resources in branch libraries (2006, p. 181). Their study found that despite transforming the provision of material resources, differences in 'literacy habits' around print and electronic media appeared to widen between middle and low income families. The authors suggest that for all children to gain maximum benefit from resources, librarians require training that focuses on 'affect and attachment, informal instruction, guidance and informal monitoring very early on' (2006, p. 199). Ongoing analysis of our data is revealing more subtle factors of home and school interactions, relating primarily to the level of education of the child's main carer and to home–school beliefs and practices around new technologies.

The case study data afford particularly rich insights into how some children in the nursery engage with a range of human and material resources in more strategic ways than others, either reflecting or contrasting with characteristics of their learning experiences at home. These differences cut across socio-economic factors. Through a variety of modes (such as gaze, language, gesture, movement) children display their cognisance of particular kinds of practices (doing puzzles, reading books, using computers) in terms of required content, understanding of participant roles and familiarity with collaborative interaction. Moreover, children's levels of awareness are at times heightened through interactions with adults who explain and model processes through multiple modes in response to the children's goal-orientated actions and questions. The following example focuses on twin sisters Elizabeth and Jane, as they engage in joint activities with their mother Mandy at home. The first example focuses on interactions around a traditional puzzle-making activity, the second on the children's joint engagement in a computer game. Mandy herself valued traditional childhood pastimes and considered her children too young for prolonged exposure to computers. Nevertheless she understood the affordances of new media types and was competent and confident in her own computer skills and ability to surf the web for information and research purposes.

Developing metacognition through traditional and new literacy activities

Initial observations of the twins in the nursery revealed both girls engaged in a range of self-selected activities including reading (comics and books), imaginary (largely pirate-related) and socio-dramatic role-play, music-making, painting and other creative activities, construction games and outdoor play. They also participated in more structured, adult-led activities including shared reading and music/singing sessions.

These traditional activities were replicated during setting observations and the first home visit when the twins were 3-years and 4-months-old. Again, the girls were observed reading picture books and comics, playing with dolls, drawing, and doing jigsaws, but at home they also watched CDs and television, which they operated themselves. At home, Elizabeth and Jane had limited access only to a desktop computer which was located in a converted attic room with awkward access. A laptop was considered too fragile for unsupervised use although occasionally a computer game on this substituted for a bedtime story. Nevertheless, despite parental reservations noted here and elsewhere, during a second home visit, some months later, video recordings captured the twins' growing interest in computers as observed in their preschool setting and reported by mother and keyworker, Lauren. The girls were beginning to access online programs such as 'Rubbadubbers' from the BBC's CBeebies site, and also enjoyed using CDs to practise and extend their language and literacy skills. At the age of 3-years 10-months, Elizabeth and Jane were now more actively encouraged by their mother to use the laptop which was within permanent reach on a low table in the sitting room.

Collaborative multimodal dialogue

To illustrate how the twins developed meta-level awareness of activities in which they engaged through collaborative multimodal dialogue, we begin by examining in detail one observation of the girls completing a jigsaw with their mother during the first period of home observations. The puzzle depicted the cycle of seasons, months of the year and annual festivities (Easter, Halloween, Christmas, for example). In addition to

their understanding of the task, completion of the puzzle contributed to development of the girls' literacy skills for it relied on their abilities correctly to identify and fit pieces together (visual literacy) and contributed to the development of their 'linguistic habitus' (Bartlett & Holland, 2002).

Street (2003) draws attention to Bourdieu's notion of habitus defined as 'history brought to the present in person' (p. 81). For the twins, talk about the weather and seasons, along with discussion of cultural-historical events all contributed to their 'stock of information' (Moll et al.'s 'funds of knowledge', 1992) and future abilities to read meaning into and draw assumptions from spoken and written 'texts', images and artefacts. Indeed from this perspective, talk around many socially situated activities can be viewed as essential to establishing evocative, if not literal, meanings, that are a crucial element of 'literate thinking' in any domain.

The collaborative interaction was mediated through spoken language, actions and artefacts, as Mandy and her daughters sat together on a carpet with the puzzle pieces spread around them. Although sitting to one side out of full camera range, the twins' mother was instrumental in sustaining and bringing the activity to a successful conclusion and introducing the girls to the knowledge required for effective participation in future 'puzzle-making' events. Her words, gestures and movements served many purposes such as signalling who had agency in the control of the activity, and, through short episodes of action, demonstrating strategies for completing a puzzle. Closer examination of the episode reveals details of the multiple modes employed.

Adopting an encouraging, light-hearted tone, Mandy reduced the task to a series of achievable goals – the girls were tired after a long morning at nursery and were having a drink whilst doing the puzzle. Firstly she marked the 'start' and stages of the activity verbally. Suggestions for 'doing-the-puzzle' introduced the girls to salient features of the activity: 'start with the middle pieces… it's easier… you can go round it'; 'spread all the pieces out so you can see them'; 'give the pumpkin a bit of a wiggle, it's not quite in properly'. Mandy's words were accompanied by sweeping arm movements that indicated general directions and areas of the puzzle, gestures that reinforced meaning, and by pointing with her hand to be more precise about the items referred to in words. For example, she spread the pieces out, turned them face up and made sure that the completed part of the jigsaw was conveniently orientated (i.e., facing the girls) and in a clear space at all times. Gaps in the puzzle, next steps and 'wrong-way-round' pieces were indicated verbally and with gestures. Mandy encouraged the girls to attend to particular aspects of the images and to check these against the picture on the box in order to complete the puzzle successfully, and she selected and slid key pieces silently into the girls' lines of gaze. Although these strategies were delivered in a relaxed manner and were integral to the completion of the task, Elizabeth recognised their instructional overtones, and asserted her right to act independently, declaring towards the end of the session 'I already don't need help' as she confidently and accurately positioned the next piece of puzzle.

During a second home visit three months later the twins were observed as they played 'Match-it' on screen, a computer game in which players are required to 'turn over' cards in rotation and memorise the position of objects beginning with the same letter. Each object is identified in writing (a word in a speech bubble) and by a computer 'voice-over'. As with the jigsaw puzzle episode Mandy participated in the girls' activity although her involvement was less obviously 'visible'. She sat on the sofa, watching quietly from behind and there was no direct eye-contact between her and her daughters. All participants focused on the screen and levels of concentration

were intense. Indeed Mandy commented on the motivational value of activities around the computer noting how Jane, who was particularly prone to tiredness mid-afternoon, was alert and eager to 'have her go'.

Throughout this episode, both girls used gaze direction, movement and talk to articulate their thinking processes for the benefit of each other and their mother, thus prompting opportunities for completion of the task through collaborative multimodal dialogue. At one point for example, Elizabeth clicked on the image of an 'ice-cream' saying the word aloud as she scanned the screen for its correct 'pair'. Jane, standing to her right, with her gaze also fixed on the screen, whispered the initial sound 'i' and her sister lighted on the 'iron' with a triumphant declaration 'iron and ice-cream'.

Mandy's interventions were strategic in terms of development of the twins' language skills. She helped them to sound out initial letters of objects depicted on the cards and to recognise rhyming words. However she also supported their 'know-how' skills when using the computer. For example, Mandy was instrumental in drawing attention to salient aspects of the activity, through her utterances ('Click on the rabbit opens the Matching Pairs game') and by pointing to the screen. In addition, in order to solve immediate problems, she would lean forwards and, cupping her hand over the girls' hands, take direct control of the mouse. Although the girls were content to relinquish temporary control of the computer in order to move the activity on, they nevertheless continued to assert their rights to independent action, taking back the mouse or brushing off their mother's hand once problems were resolved.

Despite the technical challenges of clicking and holding down the mouse and making sure that the pointer (in the form of a hand, which they called 'pointing magic fingers') remained in view on screen, the girls appeared to have developed a clear ability to read and respond to graphic images. Since the sound was switched off, Mandy was convinced that the twins were relying on the screen layout and images for meaning. As they played, the girls identified the PLAY icon with confidence and recognised the cue for action – signified subtly by a change in colour of the cuff on the hand pointer, as the cuff turned from purple to red. They understood that the 'pointing (magic) fingers' icon produced an effect when moved and positioned over an object on the screen, but were frustrated by its lack of precision. The finger pointed to the left and the thumb to the right and it was unclear which part caused the change.

In just a few weeks between the first and second sets of visits Elizabeth and Jane had acquired some level of ability to read or decode the signs and symbols on screen and to understand how they interrelated to produce meaning. With increasing practice they were gaining confidence in controlling the medium itself. Indeed in our final observation in the nursery setting (July 2008) both sisters were observed learning how to log on to the computer with their names – a procedure that tested their abilities to match upper and lower case letters in their names with the symbols on the keyboard. Although initially supported by a teacher, Jane returned to the computer to rehearse the skills that would allow her independent access to games on CD at a later date.

Discussion

The first episode above revealed how participation in a traditional activity (construction of a puzzle) set the context for Jane and Elizabeth's literacy and language development and afforded opportunities for them to develop a meta-level of awareness of the activity as a whole. Through collaborative multimodal dialogue, the twins were introduced to effective 'ways-of-doing-a-puzzle' and to cultural–historical knowledge

likely to help them interpret semiotic references in books, images, dance and other 'texts' in the future. In the second episode, the girls were observed using a computer to practise specific language skills – matching initial sounds and objects. Although the medium for learning about language had changed, the girls were effectively 'inducted' by their mother into a new practice through collaborative multimodal dialogue.

Comparing the modalities of meaning-making observed lends insight into links between the types and uses of different media and the diversity of modes of engagement and communication observed. The puzzle-making activity was physically dynamic; the girls moved about a great deal as pieces were selected, compared and fitted into the emerging picture. Mandy's words were accompanied or replaced by pointing gestures and actions as the sisters raced to finish the picture ahead of each other. As the puzzle grew towards completion, so the interaction space and level of excitement increased. In contrast, the computer activity was physically relatively static and contained in a smaller physical space. The girls and their mother were orientated towards the screen and there was little or no gaze exchange between them. Unlike the jigsaw activity which relied on close co-ordination of physical actions between the participants, in the computer activity actions were determined by screen images and channelled mostly through a single individual although hand-over-hand movement was also a feature of interaction, as noted above. The negotiation of tactics and control of the activity were mediated primarily through talk, with some use of gestures. The gaze of all participants tended to remain fixed on the computer screen as an object of shared attention. Interestingly, this appeared to generate some genuine collaborative problem-solving as the twins watched attentively and supported each others' efforts.

These then were some of the differences observed between the two literacy-related activities, but what of any similarity? In both examples children's understandings of the processes and practices in which they were involved were developed through collaborative multimodal dialogue with their mother: Mandy not only focused and monitored her daughters' efforts, she also responded to their questions and suggestions and explicated the processes in which they were involved either verbally or through action. Although the mediating artefacts were very different, the girls were effectively 'inducted' into both the traditional and new forms of activity through multiple modes of communication in the 'context of a dialogic relationship' which gave meaning to the signs (Wegerif, 2008, p. 352).

Wegerif suggests that the quality of human relationship is an important precondition for effective learning. Drawing on theoretical perspectives and research into autistic and infant children's use of pointing, he argues:

> As with infants' learning to point, a dialogic perspective argues that education more generally takes place within dialogic relationships in which students see things from at least two perspectives at once, their own point of view and that of their teacher. (Wegerif, 2008, pp. 352–353)

In our data, Mandy collaborated with her daughters in ways that supported the processes of their learning. Ensuring that her verbal, gestural, visual and kinaesthetic actions were contingent on theirs, she drew attention to 'ways-of-doing' the activities and helped them establish a shared understanding of the signs and symbols they encountered along the way. Since development of the metacognitive system of thought is deemed essential for effective learning (Marzano, 2001) we might speculate that these activities served to heighten the children's awareness of the nature of the

practices and discourses in which they participated and their ability to act strategically in the future.

Conclusion

Marsh draws attention to Clay's (1998) conceptualization of literacy development as 'the increasingly proficient way in which children develop inner control over the complexity of meaning-making systems' (2004, p. 115). The examples above offer insights into children's changing literacy practices at home, and show how their learning with both new and traditional literacy-related technologies is supported through collaborative multimodal dialogue. However, the analysis has shown how there were profound differences in the ways that participants drew on different verbal and embodied modes when interacting with different technologies. Multimodal analysis of children's literacy activities involving new technologies is only just beginning to reveal how children's learning might be 'scaffolded' in the 'information age' (Yelland & Masters, 2005), and much work remains to be done in order to understand more fully the nature of the relationship between media types, modes of interaction and the affordances for learning offered. In this paper, we have reported on findings related to two young white British girls, and we are currently extending our analysis to further case studies of children identified with special educational needs, and children from mixed ethnic, bi-lingual and tri-lingual families.

Central to this field of research using multiple, visual media for data collection and analysis is the development of robust frameworks for the analysis and representation of multimodal activity, and formats for presenting data which facilitate the reconstruction and interpretation of sequences of non-verbal and verbal interaction that are often intricately interwoven and overlapping. Flewitt (2006) and Plowman and Stephen (2007) consider similar themes in their discussions of representing video data. Whilst the questionnaire and interview data from this study offered broad insights into contemporary practices around new technologies and young children's literacy learning, the ethnographic case study video data from home and nursery settings has revealed the multimodal detail of how some children acquire the skills and practices needed to underpin metacognitive development through collaborative multimodal dialogue.

Understanding the role of digital technologies in the processes of young children's literacy development is crucial to ensure that all children have equal access to opportunities to learn in schools today. Observations of the twins and of other case-study children at home suggest that some 3- and 4-year-olds are already capable of navigating effectively around screens, connecting and taking meanings from a myriad of interrelated images (still and moving), words and sounds. Others have more limited access to computers and use of the internet. These differences were manifest in the nursery setting where more confident children were seen to access online programs independently whilst their less experienced peers participated in repetitive low-level activities or were frustrated by their inability to 'make things happen'. Nevertheless if *all children* are to achieve their full capabilities as members of a society in which knowledge and communication are highly prized commodities, then *all children* need opportunities to become proficient or 'literate' in their uses of new media. It is essential for early years practitioners to be provided with the curriculum guidance and training they need to help them understand how this might be achieved most effectively. This paper suggests that observation of children's uses of computers at home might

help to convince some practitioners of the pedagogical benefits and imperatives for developing young children's literacy in diverse modes and media.

Note

1. All names have been changed for the purpose of anonymity.

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