

Learning, literacies and new technologies : the current context and future possibilities

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Learning, Literacies and New Technologies: The Current Context and Future Possibilities

Cathy Burnett and Guy Merchant

INTRODUCTION

In its repeated questioning of models of natural development, childhood studies has increasingly turned attention to the ways in which social and cultural influences intervene from the very beginning (Gardner, 1991). Although interaction with adult caregivers and siblings may be of primary importance, early childhood is also very much concerned with the material artefacts to hand. To suggest that childhood is infused with technology may at first sound extreme, but when we consider the context of affluent and highly-digitized societies, it is not in fact an over-exaggeration of the current condition. Rather, digital technology must be factored in from the prenatal stage, when the first images of a baby are the scans displayed on computer screens and mobile phones, circulated to family and friends by email and via social networking sites. And of course, technology is there from birth, not only in the hands of parents and relatives but also in the service of health care professionals and others attending to the newly born.

We know relatively little about the ways in which the very young react to technology, but we can observe that most babies will look at television screens in the first few months (Rideout and Hammel, 2006), may well be shown a mobile phone as a pacifier (Oksman and Rautiainen, 2003), and that some of a baby's first toys will have digital components. Whilst views on the possible enriching or detrimental effects of growing up in such an environment are hotly debated (Plowman, McPake, and Stephen, 2010a), it does seem that childhood is highly technologised. Regional, social and familial variations in ownership, access and use

notwithstanding, learning with and learning about technology are undoubtedly important parts of growing up in the twenty-first century.

Literacy is deeply implicated in any consideration of technology and childhood, particularly since the rapid adoption of new practices in everyday life is closely tied up with meaning-making and communication, predominantly, although by no means exclusively, through the use of lettered representation. The proliferation of tweets, text messages, status updates and emails are potent contemporary reminders of this. Even very young children are part of a society in which these new forms of communication are taken for granted. But it is not simply the case that writing has ‘gone digital’ since, as many have observed, new communications are also multi-modal in character (see for example: Kress, 2010) and new technologies themselves involve new ways of being literate for young children (Hesse and Lane, 2003).

Despite such developments, reviews of technology and education have revealed a lack of evidence related to the impact of new technologies on literacy and learning (Stephen and Plowman, 2003; Andrews, 2004; Yelland, 2005). A major theme here is the scarcity of research focused on early childhood – systematic reviews have consistently failed to produce more than a handful of studies that could be seen as methodologically rigorous (Lankshear and Knobel, 2003; Burnett, 2009, 2010). Moreover, reviews of research spanning the last 50 years (Labbo and Reinking, 2003; Lankshear and Knobel, 2003; Merchant, 2007; Burnett, 2010) have highlighted that the majority of studies focus on using technology as a tool to support the development of the kinds of reading and writing associated with print literacy. There has been little work that explores children’s reading, writing and interactions with digital texts. This scarcity may well be linked to a discomfort amongst practitioners and theorists with respect to the appropriateness of technology-use for very young children, seen by some as a distraction from more ‘natural’, ‘healthy’ and ‘developmentally appropriate’

activities (Miller, 2005). We see this in surveys of practitioners' views on the role of technology in the early years (Stephen and Plowman, 2003). Uncertainty about the place of digital literacy in the early years curriculum is further complicated through 'back to basics' discourses, particularly those that adopt a narrow definition of literacy and advocate simplified instructional practices. As Yelland observes: 'Paradoxically, the use of new technologies is discouraged by both those who advocate traditional play-based curricula, and those who want standardisation and the practice of defined (industrial) basic skills via clearly constructed and limited tasks.' (2010: 12).

The limited focus of research can also be linked to the predominance of cognitive models of reading, which have tended to position technology as a tool for literacy development as opposed to a medium for diverse literacy practices (Hassett, 2006). We see this in the multiplicity of studies that have explored the impact of software packages on specific aspects of children's literacy development (for example, Macaruso, Hook, and McCable, 2006; Chera and Wood, 2003). While such studies are valuable in supporting practitioners' evaluation of such resources, they do little to enable educationalists to understand the connections between children's digital lives within and outside educational settings, or to consider the processes or possibilities associated with new literacies.

In this chapter, we argue that there is an urgent need for more extensive and varied research relating to digital literacies in the early years. We begin by reviewing recent studies which have explored young children's engagement with digital texts in educational settings and summarise the insights gained from such work. Then we consider what can be learned from children's encounters with digital technologies at home and from the kinds of connections that children themselves seem to make between digital literacies in different domains. We use these insights to generate a series of recommendations for further research. In doing so, we note that literacy itself has become a contentious term, with some advocating a broad

definition to include a wide array of meaning-making practices and others arguing for a narrower view which anchors literacy to lettered representation (Merchant, 2007a). In what follows, we adopt a broad definition of literacy, focusing in particular on meaning-making in technologically-enriched contexts.

NEW TEXTS AND TECHNOLOGIES IN EDUCATIONAL SETTINGS

We identify two groups of studies that have investigated young children's uses of digital texts in educational settings. The first includes work focused on using digital texts to support learning that is framed by conventional descriptions of print literacy. The second explores the possible role of digital texts in mediating new relationships to support more diverse kinds of learning.

Using digital texts to meet print literacy objectives

This first group of studies investigates how reading and writing in digital environments impacts on comprehension or composition. Beck and Fetherston (2003) note how opportunities to word-process their writing may motivate reluctant writers by relieving anxieties about their handwriting. This lends further support to the evidence cited by Clements and Sarama (2003: 13) who suggest that working on-screen can promote a 'fluid idea of the written word.' Other studies adopt more open-ended approaches, aiming to capture children's responses to particular opportunities and resources. Kuhlman, Everts Danielson, Campbell, and Topp (2005) describe a project where first graders were given handheld computers. They observed how children integrated these into their play. For some but not all, the use of handheld computers seemed to impact on motivation and on their engagement with planning activities that the teacher was trying to introduce to support their writing. Tancock and Segedy (2004) compared children's comprehension following readings

of printed and online texts. Their work suggested that children were more motivated by the opportunity to search online but learned more from the printed texts.

Such studies, focusing on specific skills or tasks, locate the role of digital texts firmly within the dominant paradigm of print literacy: technology then is seen as a tool which may, or may not, enhance literacy learning. Others report studies which focused on embedding new technologies within more open-ended and project-based approaches. Voogt and McKenney (2007), for example, explore the use of Pictopal to support emergent reading and writing skills whilst Labbo, Eakle, and Montero (2002) explore the integration of digital photography within a language experience approach, encouraging children to take, select and annotate images of their activities. In these examples, working with images on screen helped children capture ideas and experience and use these as a stimulus for writing. They illustrate how digital texts can be used to support the writing process in motivating and enabling children to experiment with meaning. They also highlight the semiotic possibilities of digital texts and provide ways that these can be harnessed to engage children in the processes of composition and comprehension. This work suggests that digital environments can provide meaningful and motivating contexts for literacy development whilst drawing attention to the skills children need to operate within such environments.

Introducing new technologies may also result in unintended consequences. For example, Schiller and Tillett (2004) describe an action-research project through which 7–8-year-old children captured their perceptions of school – again using digital images. The authors note how relationships between teachers and learners seemed to shift as they worked together to learn how to use the new technologies. Pedagogy, in this context, became more aligned with enquiry-led approaches.

Using digital texts to mediate new relationships

The second group of studies explores the potential of new literacies to help generate new kinds of relationships or contexts for meaning-making through connecting children with one another and those outside the classroom. Teale and Gambrell (2007) describe a project in which email was used to mediate discussions about literature between young children and adult penpals. This seemed to have significant impact on children's attainment in reading, which Teale et al. attribute both to the value of the online community and the opportunity to engage meaningfully with high-quality texts. In another study Pelletier, Reeve, and Halewood (2006) explored using a networked learning environment to enable 4-year-olds to post, review and comment on their own and others' photo-journals in order to explore how they might be involved in knowledge building. Such studies explore children's responses to planned interventions and offer models to educators looking for ways of using networked technologies within language and literacy provision. Like those in the previous section, these studies use new technologies to try to raise attainment in relation to specific literacy outcomes. However they do so by focusing on how new technologies may be used to mediate relationships within and beyond the classroom.

Two further studies locate the significance of technology in a different way. Rather than using digital texts as media for exploring a wider world, they are used to make connections between different domains of children's lives, addressing notions of identity and community. Auld (2007) describes a project which involved recording the telling of indigenous Australian stories as talking books for use by children at home. She recognises a number of cultural tensions inherent in the project but describes how, by being flexible with how computers were used, the sharing of these stories was accommodated within existing social practices. In Taylor et al.'s (2008) project, technology was used to scan dual-language home-made books which captured 4–5-year-old children's home experience for sharing shared with the wider

family. This was designed to highlight the significance of family members' multilingual literacy practices in children's ongoing literacy development, and to legitimise community practices. In so doing, they aimed to draw on family members' 'cultural' and 'linguistic capital' (2008: 270), in supporting their children's literacy development as a way of helping them to 'reconceptualise their literacy practice' (Taylor et al., 2008: 286).

Whereas the significance of new technologies in the previous section is seen in terms of semiotic affordances, the studies summarised in this section could be conceived of in spatial terms. Teale et al.'s study *expanded* the classroom, whilst Pelletier et al. argued that theirs provided a 'shared virtual space' (2006: 340) in which children were able to develop their ideas collaboratively. They noticed an impact on children's early reading and writing skills (relative to children who engaged in similar print-focused activity). Auld's (2007) and Taylor et al.'s studies seemed to shift classroom boundaries in other ways through creating new spaces which gave status to established but marginalised communities and identities.

Projects such as these illustrate how digital environments can be embedded in practice that builds on well-established principles of literacy provision. These are not 'digital literacy projects' but projects designed to enable children to engage with digital technologies alongside other texts and resources in meaningful contexts- much as children may do in their own lives. We could argue here that technology 'becomes invisible'. For those committed to a socio-cultural perspective, such work may offer a welcome complement to the still growing literature on the impact of specific programmes on specific reading/writing skills. At the same time, there is perhaps a danger that in naturalising the use of digital texts we miss some of their implications for literacy itself. Indeed, when such projects are evaluated, they tend to be done in ways that refer to well-established educational aims and objectives – relating to literacy skills or motivation, for example, or social relationships and self-esteem. In this way

the skills, knowledge and possibilities associated with digital texts themselves may become just as invisible as the technologies which mediate them.

If we are to integrate digital literacies in ways that more effectively build on the new possibilities offered for meaning making through new media, we need to know more about the possibilities and challenges associated with children's engagement with digital texts and the skills and understandings associated with them. In beginning to address this, the following section draws on studies that have focused on young children's responses to and interactions with and around digital texts and technologies through looking beyond educational settings. First we consider studies that have documented children's experimentation in the home environment, and second those which have explored continuities and discontinuities between literacies in educational settings and homes.

YOUNG CHILDREN'S ENGAGEMENT WITH NEW TECHNOLOGIES AT HOME

Our understandings about young children's engagement with new technologies at home come from a group of small-scale, primarily qualitative studies that explore the nature of children's interactions with digital texts. Much of this work has highlighted the playfulness, agency and creativity of very young children. For example, Marsh's study of 2½–4-year-olds draws on interviews and observational data to describe how young children respond to technologies such as televisions, computer games and mobile phones (Marsh, 2004). Challenging notions that technology encourages passive engagement, the practices observed by Marsh and described in parental interviews show children engaged meaningfully with computer games drawing on 'emergent techno-literacy' supported by (often male) family members. These children were not simply learning operational skills but developing complex understandings about how people communicate using electronic media. The role that new technologies play in wider practices was also evident in the ways in which the children integrated these technologies in their play. As such, the children's 'techno-literacy practices' were often

connected to multiple literacy events, as children drew not just on new technologies but on a wide range of communicative practices. Marsh's work highlights a number of themes that are reflected in other studies of young children's technology use: the significance of family members; children's recontextualisation of understandings; and their active engagement. Whilst these themes are interconnected, they are explored separately below, drawing on other exemplar studies.

Sharing expertise: the significance of family members

Various studies have explored how informal interactions with family members can support children's learning in the context of new technologies and the meaning-making practices that are involved. Davidson's (2009) analysis of one family's conversations around a computer highlight how such interactions upheld and re-worked social relationships in everyday life. Such opportunities seem to offer rich opportunities for learning: children are able to draw from both digital and print resources to explore interests, learn from the combined expertise of parents and siblings, and share or refine their own understandings. The value of this kind of shared activity is endorsed by Plowman, Stephen, and McPake (2010b) who contrast the 'guided interactions' that occurred around new technologies at home and those that took place in early-years settings. They found that children had a wider variety of opportunities to engage with technologies at home, and that they were often guided by family members who provided direct support for technology use as and when it was needed. Children also saw family members using new technologies and so became more aware of its potential and how it might be useful in particular contexts. This availability of support combined with models of purposeful use meant that children learned about 'the cultural roles of technology' (2010b: 105).

Other studies have explored how children may act as mentors to older relatives. For example Kenner, Ruby, Jessel, and Gregory (2008) explored how bilingual children and grandparents

mentored one another as they engaged in computer activities, with children leading their older relations in navigating the computer whilst their relatives supported them in making meaning from the texts they found. Such studies highlight the significance of the social in both the use and development of understanding of new technologies.

Making sense of new technologies: re-contextualising understandings

In providing insights into how children negotiate understandings around computers with other family members, the studies cited above focus on the significance of events centred on technology – using the internet to search for information or working out how to send a text message. Other studies explore what children take from these encounters and how they make sense of them in other contexts, re-contextualising their understandings and experiences. Smith (2005), for example, explores how her daughter re-created both the form and content of a CD-ROM storybook drawing on objects and places in the home and through embodying elements of this herself. Similarly Pahl (2005) describes how three 6–7-year-olds used narratives and characters borrowed from console games as ‘cultural resources’ to create new texts such as videos, drawings and conversations. These studies highlight how children re-contextualise their experience and in doing so develop new concepts and find new spaces for identity play.

Meaning-making around digital texts: active engagement

In demonstrating how young children engage actively with and through digital texts, a small set of studies have explored children’s linguistic experimentation. Mavers (2007) analysed the design choices – relating to grammar, punctuation and layout – made by a 6-year-old girl as she exchanged emails with her uncle. These innovations could be seen as transductions in that they may begin as attempts to translate a message into written form but then take on new dimensions as the affordances of the medium become apparent and this both enables child and uncle to play out their relationship in new ways. In some senses, this sort of exchange is

what Plowman et al. (2010b) describe as a ‘distal’ guided interaction – through his emails, the uncle provides a model for what is possible and gently scaffolds the child’s communication. This is also a theme in Merchant’s account of exchanging emails with young children as part of a school project (Merchant, 2005a). Here, children took up and innovated with the kinds of textual innovations Merchant introduced. His emails gave children permission to draw on conventions developed in out-of-school contexts and also offered them resources for meaning-making including linguistic structures and innovations such as emoticons, abbreviation and figurative language.

There are fewer studies which explore young children’s screen-based meaning-making in non-formal contexts without an adult model. Whilst understandings about this are only just emerging, some studies have begun to trace and articulate patterns of meaning-making in digital texts. One such study is Marsh’s analysis of young children’s engagement with the Disney-owned virtual world, Club Penguin (Marsh, 2010). In a development of this work Marsh (2011) explores children’s literacy practices in this environment and investigates how they managed relationships and exchanges. Drawing on Goffman’s notion of social order she describes conventions that are developed and sustained in order to manage or avoid interaction with others in what initially seemed a chaotic environment.

This small group of studies illustrate how young children can participate in meaningful exchanges that are relevant to their current lives: making and negotiating meaning rather than developing skills to be used at some future date. Engaging with digital texts then is about ‘being rather than becoming’ literate (Mavers, 2007: 172). This meaning making, however, plays out in different spaces and is embedded in other social interventions – whether face-to-face with peers or family members or through on-screen interactions with familiar and unfamiliar others.

CONTINUITIES AND DISCONTINUITIES BETWEEN HOME AND EDUCATIONAL SETTINGS

Analyses of classroom interactions and literacy practices have explored how children draw on varied resources in enacting and transacting relationships and improvising within official and unofficial discourses as they author classroom texts (Dyson, 2008). In doing so, children often integrate or recontextualise learning from out-of-school literacies. It is perhaps unsurprising then that recent classroom studies have revealed how such improvisations often reflect children's engagement with *digital* texts. Wohlwend (2009), for example, describes how young children integrated digital literacies into their role play even though available resources were designed to promote print literacy. By using a plastic carrot to simulate a mobile phone, for example, children garnered available resources to serve their own interests and create classroom spaces that resonated with their lives outside the setting.

In Wohlwend's study, the open-ended role-play activity provided a space for children to improvise and 'reinscribe' classroom discourses (Wohlwend, 2009). Other studies illustrate how children may use their digital experience to serve their own purposes even within the context of closed tasks. Siegel, Kontorourki, Schmier, and Ennquez (2008), for example, showed how one child, working with a friend, drew on her knowledge of digital texts to experiment with design as she composed texts on screen, chatting with her friend, for example, about favourite colours as they selected fonts. In doing so, she drew from her out-of-school experience to create social capital in the classroom even though these experiences were not acknowledged by the teacher.

Studies such as Siegel et al.'s illustrate how such activities occur even when they are not recognised in dominant discourses. In some cases teachers may be unaware of children's experiences, knowledge and skill. We see this in McTavish's (2009) case study of an 8-year-old boy, whose individualised and print-based school literacies contrasted with his

multilingual, digital home literacies. Whilst these literacies sometimes crossed boundaries – for example, as he did homework in the dining room or used graphics from computer games in his school work – the skills and understandings he brought from home or the possible value of this to his identity as a learner went unrecognised in the classroom.

Of course these differences may play out in different ways for different children. Wolfe and Flewitt's (2010) multimodal analysis of young children's engagement with literacy in an early years setting demonstrates how digital technologies may diversify modalities for children's meaning-making whilst acknowledging that individual children will draw from these possibilities to varying degrees. To some extent a child's perceived success at school may be linked to her ability to recognise these different discourses and shift identities as they move between them. For some children, such changing expectations, and the resources and possibilities associated with them, may have significant implications for how they see their reading and writing and their associated sense of confidence and competence. Levy (2009), for example, demonstrates how young children may develop identities as readers/writers of digital texts at home which are incompatible with the readers/writers they are expected to be at school. She describes how such contrasts may impact negatively on some young children's chances; whilst children may engage meaningfully with multimodal screen-based texts at home, knowledge about meaning-making and the confidence associated with this may be undermined as they encounter 'schooled' approaches to literacy.

Taken together these studies highlight how children may negotiate shifts between the predominantly print literacy practices of school and the more diverse and often digitally mediated literacy practices they encounter in the rest of their lives. They demonstrate how children may do so in different ways, sometimes finding ways to draw on digital literacies within print-dominated educational settings, sometimes shifting between different kinds of

literacies and sometimes facing feelings of failure due to the mismatch between the reading and writing they engage in at home and in educational settings.

IMPLICATIONS AND FUTURE DIRECTIONS FOR RESEARCH

When we consider the place of digital communication in everyday affairs and the growing significance of new technology in the lives of young children it is surprising how little empirical work focuses on new literacies in the early years. The dominance of developmental models that emphasise what is ‘natural’ or ‘age-appropriate’ may all too readily combine with discourses that encourage a return to the basic skills of print literacy with the effect that digital literacy is often seen as something that older children do, and then only after the mastery of alphabetic skills. This is clearly not the case, as studies of home literacies are now beginning to show. Research that focuses on ‘being’ rather than ‘becoming’ literate begins to draw our attention to the place of new technology in the ecology of meaning-making which in itself provides a context for children’s early learning. The interplay between active engagement, guided interaction and shared expertise in new kinds of meaning-making offers rich opportunities for future research.

The short history of research and development work in this field is characterised by an unhelpful polarization of what technology can do and what children can do. In part this appears to stem from a struggle to conceptualise new technologies and the literacy practices associated with them. Conceiving of new technology as a tool – a sophisticated teaching machine – tends to position children as passive recipients of skills and knowledge, irrespective of any perceived notions of ‘interactivity’. Here technology is at best used to motivate children or to enrich traditional literacy practices and at worst it is pressed into the service of efficiently delivering the skills of print literacy. An alternative view is one which sees new technology as a gateway to new communicative spaces, and this, as we have seen, has proved more fruitful. To the extent that this view allows for a consideration of how

young children are placed in new kinds of relationships through new meaning-making practices it has the potential to tap into the distinctive qualities of new literacies.

This underlines the pressing need to redefine what we mean by literacy and its role in play, creativity and in the wider communicative landscape of the early-years curriculum. Some innovative work has begun to explore this territory. For example, Marsh's (2006) work with 3- and 4-year-olds explores the creation of short animated films. She traced how children worked as designers and bricoleurs to create first paper-based storyboards and then simple animations using stop-frame animation. This work provide insights into how children approached composition and the understandings and intentions they seemed to bring to this, particularly in relation to the challenge of creating movement through the juxtaposition of a series of still images. Understanding how children engage in such multimodal interactions around texts (Taylor, 2006) may help us to learn more about young children's approaches to composition. Indeed, Marsh argues that there is a need to supplement knowledge of children's development as readers and writers of printed texts with knowledge of their involvement in broader 'communicative practices' (Marsh, 2006: 504). These analyses highlight the need to re-frame understandings about young children's literacy learning. Research-informed attempts to do so are scarce. One example is work by Merchant (2005b) which draws on analysis of observations in a children's centre in which he explored young children's interactions with a variety of technological tools, toys and applications. He uses this analysis to re-interpret Clay's *Concepts of Print* in terms of writing on screen, drawing attention to the work that still needs to be undertaken in mapping what we understand by new literacies in the early years.

In this chapter, we have repeatedly drawn attention to the place of new technology in young children's lifeworlds and, by implication, to the cultural and linguistic capital associated with digital literacy. However it is clear that inequities in access and meaning-making practices are

as evident in digital worlds as they are in other domains of social life, even though they may be patterned differently. Whilst the concept of a digital divide masks much complexity (Selwyn, 2004), young children in home and school contexts are differentiated by their access to ‘advantageous practice’ (Greenhow and Robelia, 2009; Burnett and Merchant, 2011). This is true both within and between societies (Prinsloo, 2005) and points to the need for large-scale studies with the capacity to map the patterns of young children’s engagement with new literacies across contexts. At the same time there is a need for research embedded in the particular contexts of family and institutional life that provides a more fine-grained analysis of young children’s interactions with and around digital texts over time.

REFERENCES

- Andrews, R. (ed.) (2004) *The Impact of ICT on Literacy Education*. London: Routledge Falmer.
- Auld, G. (2007) ‘Talking books for children’s home use in a minority Indigenous Australian language context’, *Australian Journal of Educational Technology*, 23(1): 48–67.
- Beck, N. and Fetherston, T. (2003) ‘The effects of incorporating a word processor into a year three writing program’, *Information Technology in Childhood Education Annual*, 2003(1): 139–61.
- Berson, I. and Berson, R. (eds) (2010) *High-Tech Tots: Childhood in a Digital World*. Charlotte, NC: Information Age Publishing.

- Burnett, C. (2009) 'Research into literacy and technology in primary classrooms: An exploration of understandings generated by recent studies', *Journal of Research in Reading*, 31(1): 22–37.
- Burnett, C. (2010) 'Technology and literacy in early childhood educational settings: A review of research', *Journal of Early Childhood Literacy*, 10(3): 247–70.
- Burnett, C. and Merchant, G. (2011) 'Is there a space for critical literacy in the context of social media?', *English Teaching: Practice and Critique*, 10(1): 41–57.
- Chera, P. and Wood, C. (2003) 'Animated multimedia "talking books" can promote phonological awareness in children beginning to read', *Learning and Instruction*, 13(1): 33.
- Clements, D. and Sarama, J. (2003) 'Strip mining for gold: Research and policy in educational technology – a response to "Fools Gold"', *Educational Technology Review*, 11(1).
- Davidson, C. (2009) 'Young children's engagement with digital texts and literacies in the home: Pressing matters for the teaching of English in the early years of schooling', *English Teaching: Practice and Critique*, 8(3): 36–54.
- Davies, J. and Merchant, G. (2009) *Web 2.0 for Schools: Learning and Social Participation*. New York: Peter Lang.
- Dyson, A.H. (2008) 'The Pine Cone Wars: Studying writing in a community of children', *Language Arts*, 85(4): 305–15.
- Gardner, H. (1991) *The Unschooled Mind: How Children Think and How Schools Should Teach*. New York: Basic Books.
- Greenhow, C. and Robelia, B. (2009) 'Informal learning and identity formation in online social networks', *Learning, Media and Technology*, 34(2): 119–40.

- Hassett, D. (2006) 'Signs of the times: The governance of alphabetic print over "appropriate" and "natural" reading development', *Journal of Early Childhood Literacy*, 6(1): 77–103.
- Hesse, P. and Lane, F. (2003) 'Media literacy starts young: An integrated curriculum approach', *Young Children*, 58(6): 20–6.
- Kenner, C., Ruby, M., Jessel, J., and Gregory, E. (2008) 'Intergenerational learning events around the computer: A site for linguistic and cultural exchange', *Language and Education*, 22(4): 298–319.
- Kress, G. (2010) *Multimodality: A Social Semiotic Approach to Contemporary Communication*. London: Routledge.
- Kuhlman, W.D., Everts Danielson, K., Campbell, E.J., and Topp, N. (2005) 'Implementing handheld computers as tools for first-grade writers', *Computers in Schools*, 22(34): 173–85.
- Labbo, D.L. and Reinking, D. (2003) 'Computers and early literacy education', in N. Hall, J. Larson, and J. Marsh, *Handbook of Early Childhood Literacy*. London: Sage. Pp. 338–54.
- Labbo, L., Eakle, J., and Montero, M.K. (2002) 'Digital Language Experience Approach: Using digital photographs and software as a Language Experience Approach innovation', *Reading Online*, 5(8): 1–19.
- Lankshear, C. and Knobel, M. (2003) 'New technologies in early childhood literacy research: A review of research', *Journal of Early Childhood Literacy*, 3(1): 59–82.
- Levy, R. (2009) "'You have to understand words...but not read them": Young children becoming readers in a digital age', *Journal of Research in Reading*, 32(1): 75–91.
- Macaruso, P., Hook, P., and McCable, R. (2006) 'The efficacy of computer-based supplementary phonics programs for advancing reading skills in at-risk elementary students', *Journal of Research in Reading*, 29(2): 162–72.

- Marsh, J. (2004) 'The techno-literacy practices of young children', *Journal of Early Childhood Research* 2(1): 51–66.
- Marsh, J. (2006) 'Emergent media literacy: Digital animation in early childhood', *Language and Education*, 20(6): 493–506.
- Marsh, J. (2010) 'Young children's play in online virtual worlds', *Journal of Early Childhood Research*, 8(1): 23–9.
- Marsh, J. (2011) 'Young children's literacy practices in a virtual world: Establishing an online interaction order', *Reading Research Quarterly*, 46(2): 101–18.
- Mavers, D. (2007) 'Semiotic resourcefulness: A young child's email exchange as design', *Journal of Early Childhood Literacy*, 7(2): 155–76.
- McTavish, M. (2009) "I get my facts from the internet": A case study of the teaching and learning of information literacy in in-school and out-of-school contexts', *Journal of Early Childhood Literacy*, 9(1): 3–28.
- Merchant, G. (2005a) 'The Dagger of Doom and the Mighty Handbag: exploring identity in children's on-screen writing', in J. Evans (ed.), *Literacy Moves On: Popular Culture, New Technologies and Critical Literacies in the Elementary Classroom*. Portsmouth, NH: Heinemann.
- Merchant, G. (2005b) 'Barbie meets Bob the Builder at the Workstation: Learning to write on screen', in J. Marsh (ed.), *Popular Culture, New Media and Digital Literacy in Early Childhood*. London: Routledge. pp. 183–200.
- Merchant, G. (2007a) 'Writing the future in the digital age', *Literacy*, 41(3): 119–28.
- Merchant, G. (2007b) 'Digital writing in the early years', in D. Leu, J. Coiro, M. Knobel, and C. Lankshear, *The Handbook of Research on New Literacies*. New York: Lawrence Erlbaum.
- Miller, E. (2005) 'Fighting technology for toddlers', *Education Digest*, 71(3): 55–8.

- Oksman, V. and Rautiainen, P. (2003) “‘Perhaps it is a body part’; how the mobile phone became an organic part of the everyday lives of Finnish children and teenagers’, in J.E. Katz (ed.), *Machines that Become Us: the Social Context of Personal Communication Technology*. New Jersey: Transaction. pp. 293–311).
- Pahl, K. (2005) ‘Narrative spaces and multiple identities: Children’s textual explorations of console games in home settings’, in J. Marsh (ed.), *Popular Culture, New Media and Digital Literacy in Early Childhood*. London: Routledge. pp. 126–43.
- Pelletier, J., Reeve, R. and Halewood, C.(2006) ‘Young children's knowledge building and literacy development through knowledge forum’, *Early Education and Development*, 17(3): 323–46.
- Plowman, L., McPake, J., and Stephen C. (2010a) ‘The technologisation of childhood? Young children and technology in the home’, *Children & Society*, 24: 63–74.
- Plowman, L., Stephen, C., and McPake, J. (2010b) ‘Supporting children’s learning with technology at home and in pre-school’, *Research Papers in Education*, 25(1): 93–113.
- Prinsloo, M. (2005) ‘The new literacies as placed resources’, *Perspectives in Education*, 23(4): 87–98.
- Rideout, V.J., and Hammel, E. (2006). *The Media Family: Electronic Media in the Lives of Infants, Toddlers, Preschoolers and their Parents*. Menlo Park, CA: Kaiser Family Foundation.
- Schiller, J. and Tillett, B.(2004) ‘Using digital images with young children: Challenges of integration’, *Early Child Development and Care*, 174(4): 401.
- Selwyn, N. (2004) ‘Reconsidering political and popular understandings of the digital divide’, *New Media & Society*, 6(3): 341–62.
- Siegel, M., Kontorourki, S., Schmier, S., and Ennquez, G.(2008) ‘Literacy in motion: A case study of a shape-shifting kindergartener’, *Language Arts*, 86(2): 89–98.

- Smith, C. (2005) 'The CD-ROM game: A toddler engaged in computer-based play', in J. Marsh (ed.), *Popular Culture, New Media and Digital Literacy in Early Childhood*. London: Routledge. pp. 108–25.
- Stephen, C. and Plowman, L. (2003) 'Information and communication technologies in pre-school settings: A review of the literature', *International Journal of Early Years Education*, 11(3): 224–34.
- Tancock, S. and Segedy, J. (2004) 'A comparison of young children's technology-enhanced and traditional responses to texts: An action research project', *Journal of Research in Childhood Education*, 19(1): 58.
- Taylor, R. (2006) 'actions speak as loud as words; a multimodal analysis of boys' talk in the classroom', *English in Education*, 40(3): 66–82.
- Teale, W. and Gambrell, L. (2007) 'Raising urban students' literacy achievement by engaging in authentic, challenging work', *Reading Teacher*, 60(8): 728–39.
- Voogt, J. and McKenney, S. (2007) 'Using ICT to foster (pre)reading and writing skills in young children', *Computers in Schools*, 24(3/4): 83–94.
- Wohlwend, K. (2009) 'Early adopters: Playing new literacies and pretending new technologies in print-centric classrooms', *Journal of Early Childhood Literacy*, 9(2): 117–40.
- Wolfe, S. and Flewitt, R. (2010) 'New technologies, new multimodal practices and young children's metacognitive development', *Cambridge Journal of Education*, 40(4): 387–99.
- Yelland, N. (2005) 'The future is now: A review of the literature on the use of computers in early childhood education (1994–2004)', *Association for the Advancement of Computing in Education Journal*, 13(3): 201–32.
- Yelland, N. (2010) 'New technologies, playful experiences, and multimodal learning', in I.R. Berson and R.J. Berson (eds), *High-Tech Tots: Childhood in a Digital World*. Charlotte, NC: Information Age Publishing. pp. 5–22.

