**Editors' Introduction**

**The Emerging Field of Digital Literacies in Early Childhood**

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We live in a social world in which communication and everyday literacy practices have been transformed by the digital turn (Mills 2010). From birth, many young children's lives are immersed in their families' everyday use of multiple media (audio, video, print and screen-based resources) and even very young children are experiencing the 21st-century phenomenon of digital communication, entertainment and gaming. Technological change has inescapable implications for young children, not only for their early literacy development, but also in terms of how parents and professional educators can help to equip today's young citizens for a digitally connected future (Säljö 2010). But how and in what ways can we characterize and understand these new early literacy practices? What does it mean in terms of how children learn and how we can best support their learning in this fast-changing communications landscape? Our key aim in this Handbook is to begin to build a shared understanding of the challenges facing early literacy development that have been brought about by fast-evolving technological change, by global flows of people, multiculturalism and multi-literacies. Our focus is specifically concerned with children aged 0-8 years – younger than those covered by most research – and the extent to which digital technologies have changed their childhoods and literacy experiences.

We adopt the term 'digital literacies' to refer to the diversity of young children's literacy skills and practices across digital tools, technologies and media. The concepts of 'digital literacy' and 'digital literacies' have been much debated since the 1990s (Gilster 1997; Lankshear and Knobel 2008; Hobbs 2011; Ng 2012). In line with sociocultural perspectives on literacy as social practice (Street 1994; Gee 1996), we adopt the plural form 'literacies' in recognition of the diversity of contemporary digital literacy practices that young children take part in, and also the plurality of ways that this concept has been interpreted in academic accounts. We argue that this more expansive view of digital literacies is significant and beneficial for children's teaching and learning at home, in the community and in more formal

educational environments. We also suggest that 'digital literacies' captures the multimedia and multimodal nature of contemporary literacy practices where being digitally literate involves "being skilled at deciphering complex images and sounds as well as the syntactical subtleties of words. Above all it means being at home in a shifting mixture of words, images and sounds" (Lanham 1995: 200). Making meaning with digital texts involves comparatively new genres, and requires children to become skilled users and designers of new modal combinations.

The term 'digital literacies' has been, in both policy and research, increasingly linked to changes in the labour markets in developed economies, knowledge-based transformations and technological developments of our societies (New London Group 1996). As such, digital literacies have often been formulated within broader frameworks of 21st century skills (Binkley et al. 2012). However, there has been a lack of research targeting early years emerging literacies, and the importance of childhood practices of using diverse technologies, as the foundation for future development of skills and competences for living and growing up in a digital culture, and for further educational pathways, work and citizenship. From an early age, children develop skills, knowledge and attitudes of great importance for their personal development and as members of communities. Digital literacies and 21st century skills highlight core aspects of growing up in contemporary cultures and being supported by families, communities and education systems in creating conditions for life-long learning.

Given that the ability to be digitally literate will have a profound impact on all children's futures (International Reading Association 2001), a core aim of this Handbook is to make a unique contribution to the development of robust theoretical and analytic frameworks to:

- underpin interdisciplinary and cross-disciplinary research into young children's digital and multimodal literacy practices at home, in educational settings and in the wider community;

- understand how young children develop 'emergent digital literacy' (Marsh 2015) in homes, schools and communities, and how they use digital devices for

pleasure, learning, creating and communicating (Chaudron, Di Gioia, and Gemo 2018);

- identify and explore the affordances of digital devices and media as literacy tools and socially-negotiated sites that can promote children's operational, creative and critically reflective literacy practices;

- inform the development of literacy teaching and learning in a digital era, for parents, for educators, for policymakers and for the digital industry.

This international Handbook brings together key thinkers around the globe who are amongst the first to take forward this emerging field of research. The contributors are all affiliated with the European Union COST Action 'The Digital Literacy and Multimodal Practices of Young Children' (DigiLitEY), which operated from 2015-2019 and received funding from the EU Commission to bring together international networks of researchers focused on young children's digital literacies. We have purposefully invited contributions from diverse disciplinary perspectives, including education, applied linguistics, literary studies, media studies, cultural studies, sociology and psychology. In this introductory chapter, we outline some of the key issues that have emerged in our conversations with scholars during the collation of the chapter contributions, we introduce the thematic orientation of the Handbook and present summaries of each chapter to offer a snapshot of the diversity of content and research in this comparatively new field of scholarship.

We begin by presenting the rationale for the Handbook's focus on the digital literacy practices of children aged 0-8 years in response to the lack of systematised knowledge concerning this age span (Holloway, Green, and Livingstone 2013; Sefton-Green, Marsh, Erstad, and Flewitt 2016).

**Researching childhood in times of change**

The changes in everyday literacy practices brought about by the miniaturisation, mobility, personalisation and ubiquitous use of digital technologies are as profound as the changes brought about by the invention of the printing press (Kress 2003). Recent research about changing media use from analogue to digital, and about how digital media are often central to children's everyday interactions with the world, suggest a sea change in the way that children experience their literacy lives in contrast with previous generations. Whilst children continue to be avid meaning makers (Kress 2013) and to be multimodal, multisensory, active and interactive social beings (Kress 1997), digital media offer previously unavailable ways to explore and express meaning. Pan-European research indicates that very young children from birth to three years of age observe and participate in a wide range of digitally-mediated, everyday communications and literacy practices (Chaudron, Di Gioia, and Gemo 2018; Gillen at al. 2018). By the age of two, research has found that most children are using a tablet or laptop and for those children aged under five who have access to tablets in the home, approximately a third of them own their own tablet (Marsh et al. 2015). In the UK, national statistics report year-on-year increases in young children' digital media use, with children aged three to seven years spending an average of around one hour *per day* online, upwards of 45 minutes playing digital games and two hours watching television (on a television set) (Ofcom 2017). From this perspective, childhood can be seen as a period of agentive engagement with cultural tools and practices, which in most societies now include the possibilities provided by digital media and mobile technologies for children to interact with content and with people.

Yet the effects of emergent technologies for young children is a hotly debated topic, and there is a "climate of anxiety that surrounds new technology and [creates] a fiercely polarized debate in which panic and fear often drown out evidence" (Byron 2008: 1).  Of course, research on the relationship between children and media is not new. For more than half a century there have been public concerns about the influence of modern media on children, from violent cartoons in the 1950s, to the commercialisation of television programming for children and increasing concern about the commercialisation of childhood with the surge in child-related marketing (Marsh and Bishop 2012).

From a policy perspective, there have been different initiatives towards protecting children from negative content and influence from media, with international calls for children to develop "21st century skills and competences" (Ananiadou and Claro 2009). Terms such as 'media literacy' have emerged to describe media competent and critically reflective adults and children, with an increasing volume of research initiatives from the 1980s onwards, often influenced by cultural studies, towards studying what children do with media and the social practices that media use is embedded in (Buckingham 2003). As shown by Drotner and Livingstone (2008), the field of research on children, media and culture has evolved towards understanding the mediational complexity of modern childhood with new possibilities for information access, communicative practices and the creation of communities online and offline.

In this Handbook, rather than being viewed as victims of new technologies, young children are seen as emergent specialists in the design of digital texts, who, when given the opportunity and support to do so, can become highly skilled users of a range of modes (such as words, images and sound) with a variety of literacy tools, both traditional and digital. The last decade has seen an increasing tendency for younger age groups to become savvy and active users of digital technologies, supported by families and education professionals who make technologies accessible by investing in them, and who prompt children's creative and critical use of a range of digital devices during the course of their learning. In more affluent pockets of society, these may include an ever-changing array of digital devices, including desktop computers, interactive whiteboards, mobile devices (such as laptops, tablets, mobile phones, smartphones, games consoles), handheld digital recording equipment (such as flipcams, digital cameras, audio and video recorders – not to mention the inclusion of these facilities in smartphones), the World Wide Web and Web2 technologies (e.g. Dropbox, Cloud technologies, Skype, WeChat, WhatsApp, blogs and other social networking sites). At the same time, the digital industry and publishers have invested in the development of literacy-related software and apps, resulting in a plethora of content that is marketed as suitable for early childhood. Over the past decade, the advent of touch screen technologies has heralded a digital sensory revolution, where touch-sensitive interfaces are set to reconfigure what can be touched, and how, in digital and online environments. Yet "there is a significant gap opening between technological advancements and social science methodologies and understandings of

digital touch communication" (Jewitt and Leder-Mackley 2019: 92). Furthermore, access to the very latest technologies is inequitable within and across societies, so in addition to issues around child safety, anonymity and security when using digital media, the variable distribution of digital technologies risks worsening issues of child equity on a global scale.

**Conceptual and methodological framing**

As a field of research, digital literacies in early childhood is theoretically diverse. The chapters in this Handbook illustrate the different approaches and theoretical framings that researchers from diverse scientific communities bring to the field. This field of research is guided by theoretical traditions within socio-cultural perspectives on learning and development, cultural studies, the sociology of childhood, psychology of play, social semiotics, and others.

Still, as stated, the chapters in this Handbook are deeply influenced by the broad theoretical framing of New Literacies Studies (NLS) (e.g. Hamilton, Barton, and Ivanic 1994; Street 1995; New London Group 1996), and recognize the range of practices that can be characterized as literate activity (see: Sefton-Green, Marsh, Erstad, and Flewitt 2016). This perspective encourages a focus on multi-literacies and emphasizes the multiple social, cultural and linguistic ways of knowing and communicating that typify many young children's lives. A multiliteracies approach also draws the focus of attention to literacy practices as deeply enmeshed with thinking about, doing and reading in cultural contexts (Street 2001). The contexts of interest therefore extend beyond formal teaching environments, and include the vernacular practices that typify children and adults' everyday literacy lives. This makes way for the concept of 'emergent literacy' (Clay 1966) to be reviewed in light of the diversity of digital practices that hypermedia and global connectivity have introduced into young children's communication experiences. Authors in this volume argue that, long before beginning more formal learning in school, children build informal yet powerful conceptions of literacy through engagement in a range of literacy-related activities in different social domains (home, school, community, work) and in diverse networks of social practice that form part of their everyday lives (Gregory et al 2004) in diverse literacy eco-systems (Kenner 2005).

Digital literacies can cross online/ offline and material/ immaterial boundaries and, as a consequence, create complex communication trajectories across time and space (Burnett et al. 2014; Leander and Sheely 2014). Using 'reading' and 'writing' in their broadest terms, digital literacies can involve accessing, using and analyzing texts in addition to their production and dissemination. Digital literacies also involve learning traditional skills related to alphabetic print, skills related to using digital technologies, and skills related to accessing, using and creating knowledge. In this sense, our understanding of digital literacies has synergies with definitions that focus on competences. However, we argue that we must move beyond a focus on basic literacy skills, and we draw on Green's (1998) model of literacy that considers the three dimensions of operational, cultural and critical literacy. The operational dimension refers to technical aspects such as being able to encode and decode language and other semiotic systems, and to use literacy artefacts (pens, paper, screens, keyboards, touchpads etc). The cultural dimension refers to being able to understand the social and cultural signs embodied in acts of meaning making. Finally, the critical dimension refers to the need to engage critically with texts and artefacts, and to ask questions about power, intended audience and reception (see Sefton-Green, Marsh, Erstad, and Flewitt 2016).

There are methodological and ethical challenges when conducting research with children aged under eight, particularly in digital and online environments or in the private spaces of children's home and out-of-school lives. Many tools and approaches used with other age groups simply do not work when researching with very young children who are in the early stages of acquiring language. Whilst much progress has been made in terms of understanding children's rights to actively participate in research, there is still much to be done to engage appropriately with issues of voice, agency and representation. This Handbook brings together cutting-edge research approaches in order to address these challenges, presenting critically reflective and well-designed research that can deepen our understanding of digital media in early childhood.

The Handbook also raises issues about methodological challenges and developments for researchers interested in the fast-changing field of digital literacies in early childhood, where

public debate and policy have tended towards protectionist approaches in face of the potentially damaging impact of digital technologies on children's lives. These concerns can sit in tension with the trend in qualitative research towards participatory approaches that enable children of all ages to have an active voice in the research process. Research presented in this volume draws from diverse methodological approaches, from highly structured quantitative methods to flexible and visual ethnographies, and from diverse populations. A conscious effort has been made to include research reporting on disadvantaged and minority communities across Europe, from the global South and North, as well as research with culturally dominant and more affluent communities. One example is the 'Day in the life' methodological approach (Gillen et al. 2007, 2018; Gillen and Cameron 2010), using a combination of interviews, field notes and video recordings to collect data, with the focus being on one day in the life of the child and their family. This observational approach provides extremely rich and authentic data about how technologies are embedded in the everyday lives of children. Below we present the different parts of the Handbook and its structure, and briefly introduce each chapter.

Key themes in the Handbook include: how young children around the globe learn with and from digital media; how multiple digital devices are integrated into their lives (or not) in education, at home and in the wider community; what 'being a reader' or 'being a writer' means in the 21st century; and how children negotiate their digital literacy lives in hybrid virtual and physical spaces. The Handbook concludes with a series of chapters that point to possible themes that we suggest can be carried forward to future research into young children's literacy practices in a digital age. Each chapter in this Handbook offers insights from cutting-edge research into digital literacies in early childhood, with close scrutiny of the contemporary literacy practices of young children around the globe. The Handbook explores knowledge about how young children interact and play with, through and around digital media, and how they use diverse devices to make meaning as they interact, communicate, play, tell and read stories, and seek information across offline and online environments.

**How the Handbook is structured**

The Handbook is structured in six parts, beginning with Part 1 *Perspectives on Digital Literacies in Early Childhood*. The five chapters in this first part present an overview of research into young children's digital literacy practices, scope out the current range of theoretical, methodological and ethical approaches to researching digital literacies in early childhood, and discuss changes to literacy practices as evidenced by large scale national and international surveys. Future technological innovations and their implications for early literacy are also considered, including implications for children's literature and the emerging design of sensory-based digital devices and environments in computer science and Human Computer Interaction (HCI), which herald a digital sensory revolution (Hoggan 2013). Future developments are discussed in more detail in the final part of the Handbook.

In the first chapter, Jackie Marsh presents the background to the DigiLitEY COST Action that led to the writing of this Handbook, which consisted of researchers in 35 countries in Europe and near-neighbour countries, in addition to partners in Australia, the USA and Brazil, and connections with wider, global networks. Collectively, this interdisciplinary group of researchers addressed some of the most pressing issues in the field of young children's digital literacies. Marsh's chapter provides a rationale for the Action, outlines the theoretical framework for its work, and offers an overview of the activities undertaken by its various working groups.

In chapter two, Ola Erstad and Julia Gillen outline ways of theorizing digital literacy practices in early childhood, and argue that in present day research in this field of enquiry, there is not a universally acknowledged sense of progress along a linear line of thinking, but rather a somewhat chaotic yet fruitful state of co-existence. Structured around two broadly defined theoretical orientations: 'digital literacy as multimodal meaning making' and 'digital literacies as embodied, material and socio-spatial', the chapter discusses highly influential attitudes in defining literacy in early childhood leading up to more diverse orientations during the last decade. The authors conclude by drawing out some implications and issues around theorizing digital literacy practices in early childhood.

The third chapter, by David Poveda, reviews key issues in the methodologies employed to investigate young children's digital literacy practices around the globe, focusing on interpretive and innovative methodologies. The chapter pays particular attention to three issues: the challenges involved in observing and documenting young children's digital literacy practices; how children's digital literacy practices are construed and represented in research; and the imperatives associated with involving children in the research process. This review draws from a critical-reflexive approach to social research and is closely interrelated to the ethical framework developed in chapter four.

In chapter four, Rosie Flewitt reflects on ethics and researching young children's online and offline digital literacy practices. To understand the complexity of influences on ethics in this field, Flewitt looks to the past, present and imagined future of digital technologies in social life and in social research. The chapter problematizes universal research ethics codes and the institutional governance of research ethics practice, and proposes a reflective, situated and dialogic ethics framework to guide future development in this field, focusing on the familiar concepts of voluntary informed consent, confidentiality, privacy and anonymity, potential benefits and harm, and research integrity and quality.

In chapter five, Sonia Livingstone, Sun Sun Lim, Anulekha Nandi and Becky Pham examine evidence regarding young children's digital literacy practices around the world. Although comparatively little is known about the digital lives of children under eight years old, especially on a global comparative basis or beyond the West, this chapter identifies such research as exists, including from East Asia and the global South. The authors discuss how barriers to access represent the major challenge globally, a problem often obscured when research focuses on wealthy countries. Some challenges are shared cross-nationally, albeit in different forms, including inequality, curriculum development and the home–school connection. The chapter reports on experimentation with ways of appropriating digital technologies for learning that is occurring in diverse contexts, and on how valuable lessons are beginning to emerge.

The six chapters in Part 2 *Young Children's Digital Literacy Practices in Homes, Communities and Informal Learning Spaces* consider young children's informal reading, writing and meaning-making with digital texts alongside more conventional literacy media, such as printed resources, both at home and in community spaces. The focus here is on how young children develop their awareness of literacy through their everyday immersion in a range of socially situated literacy practices, many of which are mediated through digital devices. The chapters explore how even very young children are strategic in their approaches to literacy, and display understanding of how literacy works in digital media. Of relevance also are ways of understanding context and situated literacies, and the connections between literacy environments and practices.

This part opens with a literature review by Kristiina Kumpulainen and Julia Gillen, which reviews the latest research knowledge on young children's digital literacy practices at home, identifies recent research trends, and proposes key research directions for future study. Focusing on papers published in 2016-2017, and building on their earlier review of literature on 0-8 year-old children's digital literacy practices in homes published between 2005-2015 (Kumpulainen and Gillen 2017), this chapter responds to the urgency in today's rapidly changing world to conduct and in turn review the latest research into children's digital literacy practices in homes. The authors approach the notion of children's digital literacy practices broadly, and include all research studies that deal with young children's (aged between 0-8 years) engagement with digital technologies and media in homes. The chapter offers important messages for educational researchers interested in tackling established and emerging areas in the study of young children's digital literacy practices in homes.

Chapter seven, by Marta Morgade, Cristina Aliagas and David Poveda, presents a conceptual framework where 'home' is theorized to understand young children's digital experiences, drawing from work on network systems theory (Neal and Neal 2013), children's intimate geographies (Valentine 2008) and socio-cultural theories of development (Rogoff, Mejía-

Arauz, and Correa-Chávez 2015). The authors propose a future research agenda around key themes at the intersection between childhood and digital technologies, namely: children's everyday activities; digital media within transnational families; and children's exclusion from the digital home. Furthermore, the authors emphasize the need for more research in this field to investigate the experiences of children in residential care settings and children with developmental needs.

In chapter eight, Andra Siibak and Elyna Nevski provide insight into the daily media patterns of very young infants and toddlers (aged 0-3 years old). Focussing on the mediating roles older siblings can take in influencing, guiding and meditating younger children's (digital) media use, the authors review current research on this topic, and then home in on an ethnographic case-study of how an Estonian four-year-old girl mediates her two-year-old sister's use of media. The chapter concludes by problematizing the roles that older siblings play as gatekeepers, guides or windows when mediating their younger brothers' or sisters' (digital) media use.

Chapter nine, which is co-authored by Stéphane Chaudron, Rosanna Di Gioia and Monica Gemo and draws on research coordinated by the European Commission Joint Research Centre (JRC), gives an overview on safety (and security) issues in relation to young children's home uses of digital technology and digital literacy practices based on interviews of 234 families in 21 countries. The authors present research on young children's digital engagement at home and the influence of parental mediation, and discusses safety (and security) concerns and measures, including elements of digital literacy that foster children's criticality and resilience. The chapter concludes with recommendations on how parents, schools, policy makers and industry can support safety and security while enabling digital literacy.

Chapter ten features research from University of Cape Town, South Africa, where Mastin Prinsloo considers children's divergent practices and access to digital media in home, school and neighbourhood communities. The case is argued for deeper understanding of children's digital literacy *practices*, rather than simply *skills*, as digital practices are always situated in

and influenced by ideologies of social class, race, gender, language and place. Digital media, from this perspective, exist in the local despite their translocal origins and offer particular kinds of agency and engagement to situated young children. The chapter illustrates and elaborates on this argument by drawing on contrastive research about children, teachers and their parents in educational and play settings in middle-class and in township and shack settlements in South Africa.

Chapter eleven by Edward Rivero and Kris Gutiérrez then takes the reader across the Atlantic to explore the emergent digital literacies of an eight-year-old child as he participated in the practice of 'glitching' in video game play in the USA. In this chapter, the authors identify glitching as a form of boundary crossing wherein children identify, document, distribute, and repurpose system errors, or glitches, within the video games they play. Through robust analyses of the data in a multi-sited ethnography, they document the learning processes that took place as a child learned to glitch through his engagement with various digital tools, YouTube, and an online community of gamers.

Moving from the home to the classroom, Part 3 of this Handbook considers *Young Children's Digital Literacy Practices in Early Education Settings*. The six chapters in this part present an overview of key challenges for early education brought about by the potential of digital literacy practices to transform early literacy pedagogy. In particular, they discuss international political positioning regarding digital literacies as established in early years curricula and teacher education concerns. This part offers insights into pedagogical principles that sustain innovative digital learning practices, and the implications brought about by children's digital experiences of play-based pedagogy. The impact of digital literacy practices and learning in special education as well as innovative pedagogical responses to multilingual and multicultural contexts that draw on digital affordances are also reviewed and discussed. Furthermore, Part 3 offers a posthumanist view on pedagogies for digital literacy as a process of relational becoming.

The first chapter in this section, chapter twelve, co-written by Christine Trültzsch-Wijnen, Sascha Trültzsch-Wijnen and Kjartan Ólafsson, examines media and digital literacy public policies and their implementation in kindergartens and primary schools in three European countries, namely, Iceland, Germany and Austria. Strategies for implementing media literacy in these contrasting countries are analyzed, and commonalities and differences in policy development are discussed and problematized. The authors reflect critically on the complexities of enacting the international political drive to promote digital literacy in early education, including the difficulties associated with teachers' professional development, which research suggests is highly dependent on teachers' personal motivation for promoting digital and media literacy.

Chapter thirteen, by Stavroula Kontovourki and Eufimia Tafa, reviews existing knowledge on pedagogical principles and innovative teaching practices in early years classrooms where digital literacies are embedded in children's learning. Focusing on studies published between 2010-2017, it features three key issues: first, the notion of 'appropriateness' as a key pedagogical principle; second, the emphasis on reaffirming long-held pedagogical assumptions about early childhood education; and, third, the differential use of digital technologies and devices, and their pedagogical potentials. The chapter concludes by discussing ways in which the digital might help reconfigure pedagogy in early education and by identifying possible areas of future research.

In chapter fourteen, Grace Oakley discusses inclusivity and young children's digital literacy practices in early education, paying close attention to the potential of mobile technologies, particularly tablets, due to their prevalence in early childhood. She considers diverse pedagogical frameworks that can assist educators in designing inclusive digital literacy education for young children in the context of mobile technologies. Oakley argues that mobile technologies can be used to overcome barriers associated with time, space, pedagogies and modes, thus opening up new opportunities for creative, authentic, multimodal and collaborative literacy learning for young children with diverse needs.

In the next chapter, chapter fifteen, Elizabeth Wood, Joyce Nuttall, Susan Edwards, and Sue Grieshaber draw on the concept of converged play and funds of knowledge to examine changes that might be needed to ameliorate the differences between children's use of digital technologies at home and provision in early childhood education settings. The authors link the concept of converged play to a web-mapping tool (Edwards 2016) to illustrate ways in which the participating teachers developed their understanding of children's interests and funds of knowledge within digital play, and examine the implications of new play pedagogies for teachers' knowledge and curriculum.

In chapter sixteen, Heather Lotherington reports on an innovative pedagogic approach that promotes and celebrates multilingualism and multiculturalism through the use of digital media in kindergarten and elementary school settings in Canada. The approach was developed by acknowledging the complex role kindergarten teachers play in managing the linguistic and cultural diversity of school entrants to enable school socialization and emergent literacy education. Drawing on rich empirical data from a decade-long collaborative action research project, this chapter discusses a participatory approach to inviting children's and teachers' language and cultural backgrounds into multimedia project-based learning.

Chapter seventeen, by Candace Kuby and Tara Gutshall Rucker, explores the possibilities of thinking about early childhood and literacy education through the lens of Barad's posthumanist agential realism theory. The authors discuss 'literacy desiring' as a way to know/be/do literacies. Kuby and Rucker analyze one particular spontaneous episode taking place in the 'Writer's Studio' of one classroom in North America to argue for the need to consider the pedagogy of digital literacy as relational becoming that involves children's desiring, time, agency and close interaction with others and with digital tools. The chapter concludes with questions and invitations for readers to consider with regard to pedagogy and possible future areas for research.

Part 4 of this Handbook *Reading and Writing on Screen* takes a timely and focused look at the rich, multimodal and sensory textual landscape of contemporary literacy and literary

practices, and the complexities of learning to read and write both on and off-screen. The six chapters in this part focus on how children make meaning with contemporary texts as they play and interact within and across digital media, including touch-sensitive screens, such as iPads and LearnPads. The chapters reflect on what reading and writing mean in digital environments in relation to printed media, and consider collaborative reading and writing with e-books and apps. Issues raised in this part are closely connected to the question of how children's experiences of storytelling and narrative span across traditional print books, interactive digital texts, and transmedia storytelling, and how meanings are elicited by video games, moving images and film. Finally, consideration is given to multimodal and multi-sensory authoring on tablets, and to how storybook apps and alphabet book apps that are currently found on the European book market may (or may not) enhance children's cognitive and narrative development.

In chapter eighteen, Clare Dowdall writes about how current recommendations for policy and pedagogy in England relating to children's writing focus on the development of technical skills, with scant regard for the opportunities available to educators to promote children's literacies in global and digital contexts. In a diverse and evolving 21st century multimodal textual landscape, these requirements can be regarded as anachronistic and at odds with contemporary, socially-driven interpretations of what it means to be literate in the digital age. Through close analysis of a key extract from one conversation with early childhood educators, the author proposes a more expansive way of conceptualizing the writing process for young children as developing writerly behaviours in the 21st century textual landscape.

In chapter nineteen, Íris Susana Pires Pereira, Cristina Vieira da Silva, Mônica Daisy Vieira de Araújo and Maria Manuel Borges offer further insights into digital reading in the early years. This chapter begins by presenting a conceptual framework that relates the multimodal, interactive and interconnected nature of digital texts to the multi-skilled, embodied, metacognitive and critical dimensions of digital reading. This framework is used to conduct a narrative literature review of pre-school children's digital reading, identifying expertise, engagement and enhanced learning as key issues in current research. These findings are

discussed vis-à-vis the concepts of *pre-reading* and *pre-readers*, and the chapter concludes by setting out an agenda for future research.

In alignment with contemporary theoretical models of reading on screen, chapter twenty by Natalia Kucirkova suggests avenues for future multi-method research by drawing on psychological as well as socio-cultural aspects of reading. Experimental and meta-analytical studies can help develop a more refined understanding of the added value of specific new features in digital books. Kucirkova argues that the key contribution of qualitative studies is the theoretical extension they provide to cognitive models of reading, including the focus on socio-emotional outcomes and corporal responses to texts. Interdisciplinary approaches can provide complementary perspectives and convergent recommendations for the children's digital book and app publishing industry, and for adults mediating children's use of digital books and apps.

In chapter twenty-one, Margaret Mackey investigates the role of moving image in young children's literacy practices. She argues that many contemporary children, in the West and elsewhere, are regularly exposed to moving image texts, which may be stable or interactive. Children must learn different forms of interpretive engagement with this material, depending on whether their own actions make a difference to the outcome of the text. Mackey discusses what kinds of new viewing models are needed in a world where babies learn that a moving image on FaceTime can offer personal engagement, where toddlers learn that the way they handle the icons on a screen can change the outcome of the story, and where film representations can move from a large vertical screen to a portable horizontal one.

The main aim of chapter twenty-two, written by Adriana Bus, Trude Hoel, Cristina Aliagas Marin, Margrethe Jernes, Ofra Korat, Charles Mifsud and Jan van Collie, is to describe the availability and accessibility of digital books for children aged 0 to 8 years with narration as a main source of information. The authors focus on the availability of digital narratives for children in 'small languages', that is, comparatively less widely used languages. Five

geographic areas are featured: Malta; the Northern part of Belgium (Flanders)/ the Netherlands; Israel; Norway and the Catalan area of Northeast Spain (Catalonia). In these areas, less widely used languages are the official language and the language of teaching in school. The chapter aims to illustrate the availability of digital books for young children in these languages, as opposed to the abundance of international narrative apps in the English language.

Chapter twenty-three by Mary Miller and Deborah Wells Rowe describes a study where second grade emergent bilinguals used digital cameras and touchscreen tablets to take photos in school, at home and in their communities, and then used the images in the classroom to compose eBooks. The analyses examine how children came to understand the affordances of digital tools, and composed and shared their eBooks, which included digital photos and sound recordings. The authors conclude that the multidirectional travel of digital tools between home and school encourages young students, families and teachers to select from and learn about resources that draw from a complex circulation of interests, cultural experiences and languages.

The six chapters in Part 5 of the Handbook *Negotiating Digital Literacy Lives in Hybrid Virtual and Physical Spaces* address recent work around the relationships between young children's digital literacy lives, digital data and virtual environments. The chapters explore the often complex notions of collaboration and intergenerational practices between young children and adults, their peers or siblings. Consideration is given to how children negotiate the multiplicity of 'presence' in hybrid virtual and physical spaces and different media ecologies, as they play or communicate online whilst also interacting with others who are physically co-present. This is an emergent area of research, where the authors argue the need to develop understanding of how the complex interactions afforded by virtual/physical interaction both influence and are influenced by children's developing social relationships. Further chapters in this part consider research on communal literacy practices, notions of collaboration when participants are interacting in hybrid physical and virtual worlds (Burnett and Merchant 2014), adult digital literacy practices about young children's lives, and the notion of the 'quantified' self.

In chapter twenty-four, Cathy Burnett and Guy Merchant reflect on children's virtual play, using the term 'a baroque sensibility' to explore the use of iPads in the early years. Recent studies of children's play with video games and virtual worlds have emphasised the importance of conceptualising children's meaning making across on- and off-screen sites. However, researching meaning making in virtual play is a complex endeavour given the multiple and kaleidoscopic ways in which on and off-screen activities fold into one another. After exploring what has been learned by researchers investigating the nexus of activities that constitute children's virtual play, the authors argue that a baroque sensibility recognizes and interrogates multiplicity, and underlines how different interests and engagements intersect during virtual play.

The authors of chapter twenty-five, Giovanna Mascheroni and Donell Holloway, examine emergent research on the datafication of children – that is, the process through which children's identity, play, learning and health information is turned into digital data, stored in online corporate platforms, analyzed and monetized, through wearable devices, the Internet of Things, children's apps and adult social networking sites. Concerns are discussed about how the organisational appropriation of children's online information compromises the privacy and data security of children. Issues in these debates lead the authors to identify key themes for a future research agenda, namely: the consequences of a surveillance economy for children's lives; the risks for children's privacy rights and data security; the changes in parent-child and teacher-child relationships; and the consequences of neoliberal self-tracking for children's development and self-identity.

In chapter twenty-six, Michael Dezuanni considers children's digital play and socio-material literacy practices when playing the game *Minecraft* at home. Dezuanni argues *Minecraft* involves distinctive social-material literacy practices across virtual and physical spaces in the family home, and suggests *Minecraft* is experienced through 'worldness' that traverses online and physical spaces in ways that are becoming common in children's lives. This often includes complex negotiations of collaboration, and the blending of online communication with physically co-present instances of communication and interaction. The chapter draws on

ethnographic research in the author's family home to explore *Minecraft* as a media production platform that enables even young children to become media producers and informed participants in digital media experiences.

Chapter twenty-seven, by Pål Aarsand and Helen Melander Bowden, focuses on young children's use of digital technologies and participation in situated digital literacy practices within and across activities and institutional settings. The authors present a review of research focusing on digital literacy as embedded in children's everyday lives and on multimodal engagements with and around digital technologies with peers, siblings and adults. Drawing on data about three mundane activities involving different participant constellations, technologies and settings, and using the dual analytic lenses of ethnomethodology and conversation analysis, the authors discuss theoretical challenges related to the notion of digital literacies as situated.

Karen Wohlwend's chapter twenty-eight considers young children as consumers of 'transmedia playgrounds' during their online play. Wohlwend reflects on how children engage with their favourite media toys as interactive assemblages of virtual and real worlds, through popular characters and media narratives that ground a franchise's constitutive products, such as toys, video games, films, clothing, and other consumer goods. This chapter proposes that toy transmedia retail websites resemble online playgrounds while advertising toys, games and apps to young children, and constitute dense webs of consumer and imaginative practices, commercial products, playful desires, and embodied and digitized practices. The author problematizes the blurred practices of playing and paying on transmedia websites, and how these practices entangle children, popular toys, apps, avatars and game mechanics as co-actants in assemblages in these contemporary play worlds.

In chapter twenty-nine, Susan Danby and Christina Davidson problematize how young children manage their knowledge worlds and their social worlds when engaged in Web searching. The authors report on how children draw on both digital and social resources to support their search practices, often assembling social relationships involving educators, peers

and family members. The authors illustrate how through talk around and about the Web, children make sense of their social, physical and cultural worlds, gain access to local, community and global knowledge, and to technological understandings and practices. The children's orientation to the digital screen shows complex, sustained and multifaceted knowledge construction, and their communicative competence when engaging with the Web both blurs and connects their experiences across physical and digital spaces.

In the final part of the Handbook, Part 6 *Emergent Themes and Future Visions,* four chapters draw out connecting themes from across the Handbook, and develop an agenda for future research into digital literacies in early childhood. The chapters in this part discuss critical issues that have emerged in this field of research, look to future developments in technological innovation, and consider their likely impact on young children's experiences of literacy. The chapters in this Part also indicate possible future directions for pedagogies to promote and sustain young children's digital and multimodal literacy practices, and to engage confidently with digital literature and emerging technologies.

This concluding section of the Handbook opens with a systematic review of literature on classroom pedagogies for multiliteracies by Anne Jyrkiäinen, Kirsi-Liisa Koskinen-Sinisalo, Pirjo Kulju, Reijo Kupiainen, Marita Mäkinen and Angela Wiseman (chapter thirty). The methodological framework for this review is driven by clear theorisation of multiliteracies pedagogy, and six key themes are identified that can drive the future research agenda in this field: social change; social diversity and multilingual classrooms; third space; digital technology and multimodal learning; embodied and situated learning; and designing as meaning making.

The next chapter by Bettina Kümmerling-Meibauer, chapter thirty-one, explores the intricate relationship between digital literacy and children's literature, thus opening up new vistas on the investigation of children's digital literature. Four key issues are discussed: the significance of materiality that impacts on children's understanding of narratives; the mutual influence of printed and digitized children's books, which is mirrored in the multimodal

design, content, and narrative structure of digital books; the concept of the storyworld (i.e. the distinction between the user's own 'real' world and the fictional world(s) depicted in children's stories); and finally, the apparent changes evoked by children's growing sovereignty in creating their own artworks via the digital medium.

In chapter thirty-two, Becky Parry and Fiona Scott investigate how digital media provide children with new imaginative spaces to develop literacies and identities. The authors argue that in the context of the neo-liberal university, the pursuit of the new is difficult to resist, enabling researchers to be seen as being at the cusp of digital innovation. However, older media forms such as film and television retain their importance to children and are increasingly accessible digitally. In this chapter, the authors argue for more holistic research focused on children's socio-dramatic play where the child is constructed as having agency and expertise and where digital media are drawn on as cultural resources, which are assembled with everyday experiences as children explore their emerging identities.

In the final chapter thirty-three, Amélie Lemieux and Jennifer Rowsell take a wide-angled view on contemporary digital literacy. They point to the observation that early childhood digital literacy has been revitalized over the past decade through immersive worlds, forest schools, toys, consoles, and gadgets. These all offer diverse spaces, places and identities, which complement traditional early childhood literacy paradigms that parents, carers, pedagogues and researchers are more familiar with and trust. With so many interlocking theories and innovative methodologies, the authors argue the need to take a road trip around these new ideas to contextualize their impact within the broader field of early childhood literacy. This chapter therefore addresses broad issues around digital literacies in the early years and looks ahead to the future and implications for such work to reimagine childhood.

**The future for a multidisciplinary, international field of research**

This Handbook raises pressing questions about childhood in contemporary cultures – for researchers, policy makers, professional educators, and indeed for everyone who works with

young children in educational settings, homes, communities and informal learning spaces. These questions represent global trends as well as local framings and diverse cultural practices.

Together, the chapters in the Handbook build a truly international research agenda that connect researchers from many parts of the world and from diverse disciplinary traditions. Pressing areas for development include working with parents and educators to promote pedagogies that embrace the social, collaborative, communicative, cognitive, creative and critical learning potentials afforded by digital technologies, both at home and in early childhood education, and to forge greater synergies between children's home and school literacy practices. This in turn implies the need for enhanced and specialised programmes of initial teacher training and continuing professional development to enhance current practice, and for greater home-school and school-home liaison with regard to young children's digital practices. Further research is also needed to understand the complexities for young children of mastering on-screen multimodal meaning making, of negotiating different semiotic systems as they learn to read and write texts that include multiple modes, media and (for many children) multiple languages, and as they move between online and offline lives. It seems likely that if we can work towards supporting *all* young children's equitable, confident and creative use of digital media, then their future uses of these comparatively new communicative media will soon begin to step far beyond our current imaginings.

Despite a growing body of research in this area from around the globe, it remains the case that there is currently an imbalance in the geographic distribution of this work, with a preponderance of studies conducted in the Global North, a term that is often used to refer to Europe, the United States, Canada, Australia, New Zealand and developed regions of East Asia (such as Japan, Hong Kong, Singapore, South Korea and Taiwan). One of the additional challenges, therefore, is to reach out to develop partnerships with individuals, institutions and organisations that are working in the Global South, including Central and South America, Africa and developing regions of Asia, and the Middle East. Given that this Handbook arises from an EU COST Action, the insights offered here are skewed towards a European vision, yet some valuable insights are also offered into research across continental and population divides.

The intentions of the DigiLitEY COST Action that lays the foundation for this Handbook were partly to bring together existing research in this field and to develop strong links with the children's media and cultural industries. We strongly recommend that greater understandings of young children's digital literacy practices can develop through enhanced collaboration between academics, industry partnerships, parents and education policy makers. All of these parties have specific knowledge and expertise to bring to the shared aim of furthering knowledge in the area and improving the learning experiences of 21st century children.

The importance of establishing partnerships and networks to address key questions about young children's engagement with digital technologies is paramount; single individuals, or even institutions, cannot do very much alone. We suggest that the kinds of research questions raised which the COST Action and this Handbook aim to address can only be fully explored through collaborative endeavour in inter-disciplinary, cross-national networks. As such, we also challenge research funding agencies to develop mechanisms to better fund such inter-disciplinary research on digital literacies in early childhood as it concerns the future condition of citizens in our societies.

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