Perspectives on Education in the Digital Age

NORDIC CHILDHOODS IN THE DIGITAL AGE

INSIGHTS INTO CONTEMPORARY RESEARCH ON COMMUNICATION, LEARNING AND EDUCATION

Edited by
Kristiina Kumpulainen, Anu Kajamaa, Ola Erstad,
Åsa Mäkitalo, Kirsten Drotner and Sólveig Jakobsdóttir

Nordic Childhoods in the Digital Age

This book adds to the international research literature on contemporary Nordic childhoods in the context of fast-evolving technologies. It draws on the workshop program of the Nordic Research Network on Digital Childhoods funded by the Joint Committee for Nordic research councils in the Humanities and Social Sciences (NOS-HS) during the years 2019–2021. Bringing together researchers from Finland, Norway, Sweden, Denmark and Iceland, the book addresses pressing issues around children's communication, learning and education in the digital age.

The volume sheds light on cultural values, educational policies and conceptions of children and childhood, and child–media relationships inherent in Nordic societies. The book argues for the importance of understanding local cultures, values and communication practices that make up contemporary digital childhoods and extends current discourses on children's screen time to bring in new insights about the nature of children's digital engagement.

This book will appeal to researchers, graduate students, educators and policy makers in the fields of childhood education, educational technology and communication.

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Perspectives on Education in the Digital Age

Series Editors: David Kergel and Birte Heidkamp

The process of digitalisation is leading to a fundamental social change affecting all spheres of social life. In the pedagogical field there is a need for re-structuring key concepts such as learning, teaching and education that considers socio-economic and cultural changes.

Perspectives on Education in the Digital Age explores the process of coming to terms with socio-economic and socio-cultural shifts arising from digitalisation and discusses this process with reference to its effects on education. The Series provides a forum for discussion of critical, integrative analyses of social transformations in the digital age, drawn from different fields such as the humanities, social sciences and economics. The aim of the Series is to analyse the implications of cultural change on education in the digital age by bringing together interdisciplinary dialogue and different theoretical approaches.

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Edited by Kristiina Kumpulainen, Anu Kajamaa, Ola Erstad, Åsa Mäkitalo, Kirsten Drotner, and Sólveig Jakobsdóttir

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Chapter 1

Introduction

Kristiina Kumpulainen, Anu Kajamaa, Ola Erstad, Åsa Mäkitalo, Kirsten Drotner and Sólveig Jakobsdóttir

Introduction

The expansion of digital technologies and media together with other social, cultural, and environmental changes, has resulted in major transformations in many children's lives with consequences for their communication, learning and education. Unsurprisingly, 'digital childhoods' has gained a lot of interest recently and is now a major field of international research. Although children's media use has been a core field of media research for several decades, the role and meaning of digital technologies in children's lives today have raised questions among parents, teachers, policy makers, and researchers (Danby, Fleer, Davidson, & Hatzigianni, 2018). More specifically, how digitalisation is impacting childhoods and children's lives, including children's play, communication, literacy, creativity, agency, learning, and wellbeing as well as how digitalisation is tied with educational in/equalities and opportunities, are pressing areas for scientific inquiry. Equally, how different aspects of digitalisation – automatisation, datafication, technological surveillance, online learning and training, cloud computing, e-commerce, and social networks, for example – are transforming cultures, structures and mobilities of childhoods, as well as notions of agency, learning and education in formal and informal institutions and communities calls for more research knowledge. Recent initiatives, such as the Australian Center of Excellence for the Digital Child (ACDC) and the European network of researchers (DigiLitEY), illustrate the importance of bringing knowledge in this field together to inform future research, policy, and practice (Erstad, Flewitt, Kümmerling-Meibauer, & Pereira, 2020).

Nordic insights to children's digital lives and learning

Despite considerable research activity on children's communication, learning, and education in the digital age in the Global North, research evidence stemming from the Nordic countries is scant and scattered. This edited volume addresses this gap by drawing on research insights framed by cultural values, educational policies, and conceptions of children and childhood, and child–media relationships inherent in Nordic societies. Specifically, the volume brings together researchers from Denmark, Finland, Iceland, Norway, and Sweden representing the fields of

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education, media, and communication studies and sociology of childhood to share their insights and empirical research findings on Nordic childhoods in the digital age. The volume stems from the Digitalising Childhoods (DigiChild) workshop program funded by the joint committee for Nordic research councils in the humanities and social sciences. The primary objectives of the program were to: (i) synthesise existing research in the area, and, based on this knowledge, further interdisciplinary research and innovation, (ii) develop a sustained network of Nordic researchers who are equipped to generate cutting-edge research knowledge about opportunities and risks of digitalisation in childhood for the benefit of Nordic countries and globally, and (iii) develop a research program that can generate necessary knowledge for research, policy, and practice about the way in which digital technologies and media can advance children's participation, learning, and development in and for the digital age. These objectives were discussed in a series of three workshops focusing on inequalities and opportunities of digitalisation for children's learning and education, civic engagement, social life, and leisure (Workshop 1), the impact of digitalisation on children's physical and mental wellbeing, health, and safety, security, and privacy (Workshop 2), and on research methods and ethics to study childhood in the digital age (Workshop 3).

The Nordic context on which the studies discussed in this volume are grounded creates an interesting frame of reference to study and understand the social and cultural practices that characterise children's communication, learning, and education in the context of fast-evolving technologies. Nordic countries stand out from the rest of the world with respect to their welfare and education policies based on the principles of universalism, social rights, and equality (Miettinen, 2013). The Nordic model is also known for granting children a great deal of autonomy and agency in their life worlds. Children's autonomy and agency are encouraged by family rearing practices as well as institutional and policy level efforts that are stronger than in many other countries in Europe and beyond (Broström, Einarsdottir, & Pramling Samuelsson, 2018; Kumpulainen, 2018). The Nordic emphasis on children's agency and participation in society is also reflected in educational efforts towards child-centeredness and less restricted accountability measures underscoring children's initiation, interests, cultures, activities, and knowledge. Viewing children as active and creative meaning makers and social actors, the Nordic model values reciprocal and transformational exchanges and knowledge practices between children, adults, and their communities. Further, the traditional ideals of the Nordic model also celebrate childhood and children in their own right, rather than viewing childhood narrowly only in developmental terms as a stage of 'becoming' or regarding children as 'projects of future citizens'. This volume shows how these cultural ideals inherent in the Nordic countries are enacted, challenged, and transformed in the everyday social practices of children's homes, communities, and educational and cultural institutions in the current turbulent, increasingly digital, and global times. In doing so, this volume also points out tensions, complexities, and controversies between the imaginaries of Nordic childhoods and their everyday realisation in today's world.

Introductions to the chapters

This volume provides 16 distinct but connected chapters that deal with three significant and complementary areas relevant to the Nordic perspective to researching and understanding digital childhoods. The first part of the volume elaborates on some of the key underpinnings and historical developments that reflect Nordic perspectives on children's communication, learning and education in the digital age. This section also illuminates tensions and complexities inherent in the very notion of 'Nordic childhoods'. The second part introduces and discusses empirical research studies conducted in the Nordic countries on forms of children's communication, literacy, and learning in the digital age. In contrast, the third part focuses on the notions of agency and engagement as they are recognised, promoted, and enhanced in children's communication, learning, and education in the Nordic countries. Together, these chapters shed light on the values, norms, and practices inherent in the Nordic societies as they relate to children and childhoods, as well as their communication, learning, and education.

The first thematic section of this volume Part I: Nordic perspectives on digital childhoods starts with Chapter 2 by Roger Säljö (Chapter 2), which explores the media changes in children's and young people's lives and considers how these historical changes have impacted children's communication and learning practices. Whereas in the past there was more adult control of the literacies of the younger generation and shared media experiences between children and adults, today children and young people in the Nordic countries encounter, communicate, and learn through increasingly complex and participatory practices across the home and communities both in and outside formal education. The chapter highlights the widened and complex communication and cognitive socialisation practices that characterise some of the epistemic practices of contemporary Nordic childhoods.

Kirsten Drotner in Chapter 3 focuses on the Nordic discourses around the child and media from a historical perspective. The chapter claims that digital media serve to complexify adult discourses on children's means of knowledge formation. This is because children's digital media usage both challenges and supports norms of correct knowledge formation that are traditionally codified by education. The chapter identifies two trends from its analyses of public discourses as they have played out in the Nordic countries. One is a focus on individual and nation state regulation with little attention being paid to transnational regulation of digital platforms. Another trend is defining digital media as technologies while neglecting their substance and communicative functions.

In Chapter 4, Ola Erstad and Kenneth Silseth discuss tensions that exist with the key conceptions of childhood, youth, technology use, and schooling within the Nordic countries, and in Norwegian settings in particular. The chapter pays particular attention to the issue of agency and how it has been part of the tensions about children and new media. Drawing on several empirical studies from Norway, the chapter shows how digital agency is part of broader social developments of twenty-first-century skills, civic engagement, and citizenship.

In Chapter 5, Kristiina Kumpulainen addresses current concerns and debates between the proliferation of digital technologies in children's lives and their developing relations with nature. The chapter suggests that rather than viewing digital technologies and media as the simple cause of children's perceived 'nature deficit disorder' there is a need for a critical and adaptive approach that considers the affordances and constraints of digital technologies in children's environmental engagement and learning. To overcome unnecessary dichotomous binaries, the chapter discusses the potential of relational ontology to generate novel understandings of the co-emergent role of digital technologies in environmental education that can enhance our understanding of the relations between children, nature, and digital technologies.

In Part II: Forms of Communication, Literacy and Learning we move to discussing empirical research insights into children's communication, literacy and learning in homes and schools situated in the Nordic countries and the tensions involved. Chapter 6, by Heidi Sairanen, Kristiina Kumpulainen, Alexandra Nordström, and Anu Kajamaa draws on an empirical study of two-year-old children's digital literacy practices in homes in Finland. Drawing on sociocultural theorising and a 'Day in the Life' (DITL) methodology, the chapter makes visible how the children negotiated their digital literacy practices with their parents and how these negotiations positioned the children in relation to digital literacies. The results evidence an active interplay of child- and/or parent-initiated activity that at times led to expansive development of the children's literacy practices in the home in which digital and non-digital practices became hybridised.

In Chapter 7, Ewa Skantz-Åberg and Annika Lantz-Andersson address the current challenges many teachers in the Nordic countries currently face in navigating the tensions between teaching of literacy that privileges phonics and skills and enhancing students' digital literacies including communicative skills, creativity, and critical thinking. The chapter explores the potentials of children's repertoire of semiotic means during tool-mediated literacy events, in the form of digital storymaking by drawing on an empirical study from a Swedish preschool education. The results show how the storymaking contributed to children's cognitive, emotional, and aesthetic experiences and how children's communicative skills, creativity, and critical thinking were enhanced by means of a variation of activities with digital texts. The events offered the children opportunities to explore their repertoire of semiotic means, in terms of selecting and combining different means to make new meanings, to a varying extent mediated by the inherent design of the digital technologies.

In Chapter 8, Dagbjört Guðmundsdóttir, Sigríður Sigurjónsdóttir, Iris Nowenstein, and draw on the 'Modeling the Linguistic Consequences of Digital Language Contact' project and consider how increased exposure to the English language due to digitalisation is changing children's and young people's attitudes towards Icelandic and English languages, and their use of language and skills. In addition, the chapter considers what children and Nordic societies are possibly gaining and losing in the changing language conditions of the digital age. The chapter also notes that the findings are generalisable to other Scandinavian

languages, which mostly face the same contact and input scenarios as Icelandic currently does.

In Chapter 9, Skulina Hlif Kjartansdottir and Gisli Thorsteinsson focus on children's multimodal meaning making in a Minecraft Virtual Learning Makerspace. The chapter draws on empirical data that stems from students in a rural school in a fishing village in Iceland who participated in the virtual makerspace. The chapter outlines how the children's playful engagement in the virtual makerspace supported their ideation and design literacy as well as social skills. It also highlights the Nordic interest in educational efforts to enhance engagement and learning with digital technologies through playful and creative activities, and efforts to ensure children's equal learning opportunities regardless of their geographical location.

In Chapter 10, Malin Nilsen and Mona Lundin shed light on preschool children's (im)material literacy events during their construction of Christmas wish lists in the Swedish context. Applying a sociocultural perspective to analyse the activities and the immaterial meaning-making that were taking place in the digital literacy events, the chapter unpacks opportunities and challenges in supporting children's developing digital literacy in early childhood education. This chapter illuminates the Nordic approach to education that values and builds up on children's cultures and interests. It also shows how in children's activities boundaries between offline and online, physical and digital, and material and immaterial become interwoven and enmeshed.

In Chapter 11, Jasmiina Leskinen, Kristiina Kumpulainen, and Anu Kajamaa consider how a novel student-centred creative learning environment situated in formal school settings challenged the traditional roles of the teacher and students from the perspective of leadership. The authors draw on interview data of teachers from a primary school in Finland that had introduced a makerspace into its program. Applying a narrative analysis to the interview data, the study reveals three competing narratives of leadership in the teachers' accounts (teacher-centred, student-centred, and shared leadership), showing how these forms of leadership interact with one another, with implications to the positioning of students, teachers, and knowledge.

Part III: Conceptions of Agency and Engagement elaborates how the digital age is transforming and challenging children's agency and participation in different Nordic institutions and communities, and how these are shaped by their interactions and relations with adults, other children, technologies, and other materials, and with the natural world. In Chapter 12, Anne Solli and Åsa Mäkitalo discuss how contemporary youth movements leverage digital media to achieve a voice that can have an influence in public spheres. The chapter draws on field observations of the 'Fridays for Future' movement in which youth in Sweden raise their concerns about climate change through public events. The authors demonstrate how young citizen engagement plays out in a networked society achieving a unique position in what is characteristic of participatory politics.

In Chapter 13, Jenny Renlund, Kristiina Kumpulainen, Jenny Byman, and Chin-Chin Wong discuss how primary school children in Finland engaged in digital storying of their experiences of the natural world and how this storying

revealed the aesthetic and sensory dimensions of their sense making. The chapter makes visible how digital storying allowed room for the children to share and collectively discuss significant aesthetic aspects of their connection to urban green environments. The chapter sheds light on the aesthetic dimensions of children's being, learning and becoming through their outdoor exploration and storying of their experiences with digital means.

Chapter 14 by Gro Skåland addresses children's agency and engagement by focusing on collaborative creativity in makerspace-inspired learning environments and examining how children collectively generate new ways of seeing a design problem in their making in the Norwegian context. The chapter argues that handling things is more than just aimless play as it can help to see the potential in materials and tools in new ways, and in doing so it can help participants to reframe their activities.

In Chapter 15, Thomas Enemark Lundtofte, Kirsten Drotner. and Ane Bjerre Odgaard focus on young children's digital production practices with digital technologies in schools, after-school clubs, and private homes in Denmark. The chapter makes visible commonalities and differences in children's practices across the three settings in terms of playfulness, creative knowledge production, and knowledge sharing. The chapter also considers children's future learning and rights of expression.

In Chapter 16, Kenneth Pettersen, Kenneth Silseth, and Hans Christian Arnseth address how a sociomaterial approach can extend present day understanding of ubiquity and ephemerality of digital technologies in modern childhoods. Through a series of vignettes from an on-going ethnographic research project situated in Norway, the chapter discusses opportunities and challenges of sociomaterial theory to explain and describe contemporary digital practices of young children. The chapter shows how a sociomaterial approach not only challenges traditional understandings of the human/non-human divide but also holds ethical implications.

We end this volume with three commentary chapters and a conclusion chapter by the editors. The commentary chapters offer readers unique insights to (re)examine the chapters of this volume from an international perspective. In her commentary, Karen Wohlwend considers how the concept of 'nexus of practice' creates a fruitful lens to understand digital childhoods and the changing relationships between children and their material worlds. Importantly, she points out how the histories and expectations for people and materials in a place make up cultural ways of belonging. In his commentary, Michael Dezuanni approaches Nordic childhoods in the digital age from the perspective of entertainment 'supersystems'. He argues that scholars who are interested in understanding digital childhoods across communication, learning, and education might also productively pay attention to children's entertainment in digital contexts. Our third commentary is authored by Rosie Flewitt. In her chapter, attention is given to ethical provocations for early childhood research in the context of digital childhoods. This commentary points out the importance of ethical construction of academic studies that can support respectful research practice with young children. Our final concluding

chapter considers the implications of this volume for research and practice in the field of digital childhoods in the Nordic countries and beyond.

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Part I

Nordic perspectives on digital childhoods

Chapter 2

Child development in a digital age

Epistemic practices in media societies

Roger Säljö

Introduction

Most scholars would agree that human development is a complex process that is determined by a range of factors, all the way from genetic and biological factors to sociocultural and historical conditions characterizing the circumstances under which children grow up and develop. For a long time, in fact over centuries, this issue has been understood as a question of the relationship between nature (biology) and nurture (environment), and, when explaining development, the pendulum has swung back and forth between these poles. As an illustration, at the turn of the millennium, there was a period of 'gene worship' (Kaplan & Rogers, 2003). This gene worship was fuelled by the large international Human Genome Project (Collins, Morgan, & Patrinos, 2003), which generated worldwide media attention, and which was understood by many as a powerful demonstration of the functional mechanisms by means of which biology determines development (Lock & Palsson, 2016). During other periods, the environmental impact has been at the focus of attention. One example of this is the behaviourist programme during the twentieth century, which conceived of humans essentially as 'tabula rasa', and as subject to learning through conditioning in any direction by environmental conditions providing feedback and reinforcing specific behaviour patterns.

In the present chapter, the attempt is to view the study of development as a matter of understanding the nature of activities that children participate in and that co-determine their capacities as individuals (including interests, values, aspirations, and world-views) but also as citizens and as members of a diverse range of communities characterizing contemporary society. Thus, in a complex society, the issues of human development or learning cannot be understood on the basis of such abstract factors as nature vs nurture. Instead, children's capacities and engagement in social activities will be contingent on a range of sociohistorical and sociotechnical circumstances that characterise societies at a given time. If a child grows up in a literate society using text and other media in daily activities, the developmental paths will be very different compared to those of a child growing up in a society that does not rely on text and written language.

The specific argument here is that during recent decades the ecologies of communication that children participate in, and contribute to, in many (though not

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all) parts of the world, have changed in ways that are significant for how children come to know, i.e. for the epistemic practices they develop and learn to rely on. One element of this change is that arenas outside the family, local community and schooling now play an increasingly important role for socialisation, self-socialisation and identity development. Media involvement, directly and indirectly, forms a central element of these modified developmental trajectories that have emerged in the Nordic countries and elsewhere.

Conceptualising development in research and beyond

Child development is a field of research that has been torn between different conceptualisations about how to construe its object of research. On the one hand, we have traditions that view development as a matter of unfolding of capacities that essentially are biologically determined. Physical, social, and intellectual development follow patterns or stages that indicate the emergence and completion of levels of maturity that, by and large, are predetermined. This idea characterised the original formulation of the developmental theory of Jean Piaget (1896–1980) with four main stages, from the sensorimotor stage during the first two years of life to the period of formal thinking that the child reaches at about 12 years of age or so (cf. Ginsburg & Opper, 1979; Inhelder & Piaget, 1958). This stage of formal thinking at one level concluded cognitive development, and the formal thinker had the necessary intellectual resources for handling the world. This general line of thinking about development as a process of maturation determined by biology is not exclusive to science and research but rather spills over into many institutional arrangements and categorising practices (Mäkitalo & Säljö, 2002). For instance, in many countries, health care systems monitor children with respect to their physical, intellectual, and social development in order to ascertain how a child follows the expected developmental trajectory. If a child deviates in significant respects from what is the norm in terms of physical growth, linguistic, intellectual, and other capacities, measures may be taken to compensate for lags in development. There is an assumption of what constitutes normality that underpins such initiatives, and the general pattern of thinking is that in the phenotype there is a space for individual variations, but in principle the developmental trajectory is largely predetermined and closely connected to age.

On the other hand, there have been voices opposing these models of understanding development, and other 'Denkstile' (Fleck, 2012) focusing on the role of the cultural-historical and sociomaterial conditions for development have been launched. For instance, during the 1960s and 1970s, sociologically inspired models grew in popularity. These models focus on how society, social institutions, class structure, and other factors shape the life conditions of children and young people, and how they regulate their opportunities to learn and develop. Access to socially rich and intellectually stimulating environments has been shown to play a decisive role in children's possibilities to develop their potentials. Lack of access to such resources and settings imply limitations in social skills, language development and other avenues of growth central to an individual's life. Somewhere in between

these positions, we find models that emphasise the multiplicity and complexity of factors that interact and play a role in learning and development. One such famous model is Bronfenbrenner's systemic and bio-ecological model, where the impact and interaction of micro-, meso-, macro- and exosystems of society, and in its recent versions also the chronosystem, are held to co-determine children's development in complex patterns (cf. Rosa & Tudge, 2013, for an analysis).

It is important to observe that much of the research on child development and children's learning has emerged in the context of a functionalist perspective on socialisation (Turner & Maryanski, 1979), where implicit and explicit normative assumptions regarding how young people grow into adulthood and learn to regulate themselves underpin the theorising. Childhood and youth have been seen as preparatory stages for adulthood and citizenship. The underlying point of departure for research has been that socialisation practices must be organised in ways that avoid exposure to, and adoption of, what is conceived as deviant or culturally challenging behaviours. Instead, socialisation should maximise the likelihood that young generations will be able to assume roles and responsibilities expected of adults in a given society with a specific social structure. Hence, much of this research has had a focus on various forms of deviance that may occur during childhood and youth, and that may be associated with risks of maladaptation later in life.

Participatory frameworks and child development

During recent decades, alternative perspectives on childhood, learning and development have emerged, and these have also had political implications. One such line of research implies emphasising children as participants in social activities and as exerting agency in interaction and in their own lives. Thus, the traditional concept of socialisation as a process of reproduction, where children adapt to given norms and expectations, has been challenged by perspectives, where children are seen as agentic and as actively involved in shaping and co-determining their own developmental trajectory (Maccoby, 2015). This position of 'seeing the child as a person' and 'not as an object' (Sommer, Pramling Samuelsson, & Hundeide, 2013, p. 403) implies that children's activities, perspectives, and contributions are construed as meaningful constituents of social life in the same sense as we view those of adults. Activities such as playing, enjoying books, and other cultural expressions are not merely means to a pre-defined end; they are valuable experiences in their own right. Another important element of this shift in perspectives is that the issue of what types of activities and social practices children have access to is considered central for understanding development.

Sources of inspiration for this paradigmatic shift emphasising children as agents and as subjects can be found at many levels, in academia as well as in institutional policies and practices, and in society more generally (MacNaughton, Hughes, & Smith, 2008; Sairanen, Kumpulainen & Kajamaa, 2020). In research in many fields, child sociology, history of childhood, child and youth studies, media research and neighbouring areas, such perspectives have received increasing attention. In anthropology, for instance, the work by Rogoff (1993, 2004) shows how children

play an active role in cultural practices, and how they, while being 'guided' by adults, participate in and actively contribute to the unfolding of practices they engage in. Even when exposed to institutional arrangements, such as in pre-school or school, children are not passively reacting to adult initiatives (Seung Lam & Pollard, 2006). On the contrary, they are active and strategic participants who adapt and creatively co-construe the activities planned.

This view of children as active agents, co-determining their own development, has also become part of institutional definitions of childhood. In the Nordic countries, for instance, school curricula and curricula for early childhood education, to an increasing extent are built on values recognising children's rights of having an active voice and of expressing their ideas and opinions as participants in educational activities (cf. Sommer et al., 2013, p. 15ff). Another obvious example of this development at the institutional level has been the role that the UN Convention on the Rights of the Child, adopted by the UN Assembly in 1989, has played in discussing and reforming legal frameworks and daily practices in the welfare and educational sectors of society in the Nordic countries and elsewhere (Holtzscheiter, Josefsson, & Sandin, 2019). Here children's rights to be heard, to contribute, and to have a say in activities that they are involved in are clearly articulated.

This shift of from viewing children as research objects to understanding them as participants and agents in social interaction, from a kind of pre-citizen status to citizens, from less knowledgeable to competent actors in their own environments, represents a powerful redefinition of the meaning of childhood, and the rights and obligations that are relevant to consider when analysing development. In a long-term perspective, this development is a product of ideas about childhood that emerged during the Enlightenment, but the significance and material consequences of these assumptions were strengthened in the twentieth century through the expansion of welfare states with democratic ambitions and an increasing number of public institutions catering to the needs of children (Sandin, 1995). In developmental research, broadly defined, this shift became visible also in the ways in which children were referred to when studied. Children were no longer just 'experimental subjects' exposed to 'treatments', or 'respondents' to interview questions. Rather, increasingly they now are referred to as 'informants' and 'participants', thus recognising a different position from which they are involved in social practices with implications for how their activities have to be theorised.

It seems reasonable to argue that these shifts in our conceptions of children and childhood necessitate critical scrutiny of the agenda for research on learning and development, even when it comes to theorising. The issues of participation and access to opportunities for learning become critical when scrutinising how children come to know and how they develop epistemic practices by engaging in activities. The development of children's access to, and involvement in, media experiences in contemporary society is a productive context for raising such issues. This position implies that the abstract concept of 'nurture' is deconstructed and understood in terms of engagement in media and other practices consequential for how children come to know about the world and how they gain access to the cultural memory of their society.

Literacy and epistemic practices: from print technologies to digital media

Following the idea of development and learning as contingent on the opportunities for participation that children have in social practices, the issue of media use, in all its historical and contemporary variations, is an interesting context to consider. Media experiences enrich people's lives, and resources such as books, newspapers, film, radio, television, and other media widen perspectives on the world. Much of what we know in the twenty-first century, we know through such experiences. This was not the case for people as late as in the nineteenth century, when most societies were still predominantly oral with a slower and geographically more limited spread of information and news. Media experiences contribute to a social dynamic where new knowledge and ideas are encountered and adopted, and where established social habits and authority patterns may be challenged. But, involvement in media presupposes mastery of epistemic practices that are relevant and expected.

Following the invention of book-printing in the mid-fifteenth century, books quickly spread all over Europe. As a consequence, literacy rates began to rise, slower in some parts of Europe and faster in others (Graff, 1981). The dynamic that was introduced by the printing press and the spread of books in itself is one of the major social and intellectual transformations of the past 500 years (Eisenstein, 1979). And, as the anthropologist Jack Goody (1987, p. 3) points out, there is an interesting duality to 'systems of communication' in the sense that they 'are clearly related to what man can make of his world both internally in terms of thought and externally in terms of his social and cultural organization' (1987, p. 3). Thus, both how and what we learn, as well as how we organise social life, are contingent on 'systems of communication'. Access to texts is regulated by literacy skills, and such skills are learned through schooling. During the first few hundred years after book printing was introduced, literacy skills were low. Also, there were few texts or books that were written with children or young people as readers in mind.

One of the first printed books specifically designed for children is the picture book *Orbis Sensualium Pictus* (The visible world) by the educationist and philosopher Johann Amos Comenius (1592–1670), originally published in 1658 (English version in 1659). The book is instructional in nature and it was originally printed in both German and Latin in parallel columns on the page. The style of writing is particular with short sentences that introduce pictures and terminologies in a range of areas such as religion, biology, zoology, and other fields. The instructional nature of this book set the standards for children's books for a long time, and the assumption was that books should be educative and introduce children to suitable moral and religious messages. *Orbis Pictus* was meant to be read by an adult (a teacher or a governess) to a child. The many pictures accompanying each statement or term added to the possibilities for a child to understand the information presented, and, thus, to be actively involved while listening to the adult. In modern parlance, the book is multimodal, which increased the accessibility. In terms of the epistemic practices relied on, this implies that when seeing the picture of a bird or a tree, children could participate in novel ways by asking questions and

commenting on the pictures. In other words, children could engage in meaning making that contributed to their knowledge of the world, but their contributions were heavily dependent on those of the adult partner.

The production of books specifically intended for children grew in the eighteenth and nineteenth centuries, and even though most of them continued to be educative and religious, new genres of texts meant for enjoyment and entertainment eventually appeared. The idea that reading could be a pleasure and a worthwhile experience in its own right represents a major cultural innovation with considerable consequences. Children were invited to share experiences through stories that triggered their imagination and capacity for reflection. In the twentieth century, publishing of children's books increased rapidly, and new technologies, such as colour print of pictures, triggered the consumption further. Children's books became popular cultural artifacts and ideal gifts for birthdays and Christmas. In addition, independent reading eventually came to be seen as a significant activity and an important element of the epistemic practices by means of which children and young people learn about the world and expand their horizons.

When it comes to accessing literature, books, even those intended for children, have to be read by an adult. In this sense, adults at one level have control over the literate experiences children made. This does not mean, however, that children engaged in listening are passive. As the anthropologist Shirley Brice Heath (1982, 1983) has shown in her studies of reading habits in different communities in the USA in the mid-twentieth century, bedtime stories are an example of an important 'literacy event' that may serve as a powerful context for practising a range of literacy skills. Children in some communities learned sophisticated 'ways of taking from texts' (Heath, 1982, p. 49) under adult guidance during bedtime story reading, an activity practised in many families across the world. The children in Heath's study would ask questions about the content, they would use the information in other settings when making claims about what they know about the world, and they learned about the ways in which stories may be different from what happens in the physical world. In many respects, children involved in such activities at an early age engaged in literate practices and virtual worlds well before they could read (1982, p. 55). This participatory framework implied that they approached literacy events with specific expectations of how to take meaning, enjoy, and integrate their virtual experiences with what happened at school or in other settings. They learn to go from 'text-to-life' and from 'life-to-text'. One of Heath's specific points is that children who participated in such practices are well prepared for schooling. In fact, in some cases their 'ways of taking from texts', i.e. their epistemic practices, were more sophisticated than those practised in schools, which in many cases still prioritised rote learning.

Thus, even though they are read to, children's involvement in book-reading does not imply a passive mode of reception of messages. And, given the observation that texts provide an avenue to experiences and knowledge that may not be easily accessed through other means, the significance of reading as a core element of central epistemic practices is now accepted almost everywhere. In fact, governments in many parts of the world, including the Nordic countries, nowadays spend large sums of money to stimulate reading among the young. The skills involved in

abilities to take meaning from text are seen as central for participation in social life. An important element of this development is the recognition that reading is not a separate and isolated activity: it is key to knowing about the world and to what we do in our daily lives, where conversations to an increasing extent seamlessly move between media experiences and other sources of information and knowledge.

To make a complex story short, during the twentieth century, media have come to play an increasingly important role in society and in our daily lives. Radio, film, television, video, and most recently digital media have broadened our experiences of the world. These media have also attracted child audiences, and already during the 1930s children in the USA spent between one and three hours per day listening to the radio (Jersild, 1939, p. 153). The impact of television during 1950s resulted in a similar pattern, where children in many studies were reported spending about three to four hours per day watching (Bogart, 1958, p. 71ff). These resources opened up important avenues to learning about the world at the same time as they provided entertainment.

During recent decades, we have seen a dramatic shift in terms of the extent to which children and young people engage in social activities involving media. Digital media are different from traditional mass media in the sense that they are interactive and allow for the development of a wider range of epistemic practices. Inventions during the recent decade such as the touchscreen, the tablet, smartphones, and apps have made it possible for children, even at a very early age, to engage in communicative experiences and share information and knowledge in new ways (cf., e.g. Kucirkova & Falloon, 2017). The pace at which these media activities have developed during the past two decades is quite dramatic. Using Sweden as an example of the Nordic situation, 80 per cent of preschool children now use the Internet, and their first experiences are in the home using a tablet (Internetstiftelsen i Sverige, 2019; Statens Medieråd, 2019). The pace of this development is also visible in benchmarking. In 2000, the average age at which 50 per cent of a cohort would use the Internet was 14 years, in 2005 it was nine years, and in 2014 this average had dropped to three years.

What is interesting in this development of children's involvement is that when monitoring media activities, researchers have been forced to restructure their investigations in order to describe how media habits evolve. For instance, a few years ago it was necessary to add the age group of one to two years to the research agenda, since it was found that large groups of children at this age were reported to be using tablets in their homes. Recently, it was necessary to even add the age group zero to one, since parents reported that as many as 26 per cent were on the Internet, and, by then, the corresponding figure in the age group one to two years had gone up to 37 per cent (Internetstiftelsen i Sverige, 2018). By the age of six and seven, practically all children are on the Internet and the activities they engage in become increasingly diverse. While during the first few years, activities such as watching film clips and gaming dominate, writing, communicating with others, and using the Internet to deal with school tasks become more frequent when children are at the age of six to seven. By the age of ten children engage in a diverse range of activities, including social media that require writing and design of messages.

Another interesting observation of this development that illustrates the rapid pace of these changes concerns tweens and teenagers. When investigating the media habits of these groups, there was a classification in studies conducted around 2005 where the category of 'high consumer' was used to describe those who spent more than three hours per day on the Internet. Already in 2014, this category of exceptional consumption lost its meaning since 75 per cent ended up in this category, i.e. high consumption had become the rule (Statens Medieråd, 2019). What was extreme just a few years earlier quickly became normal.

The conclusion is that children nowadays live digital lives from a very early age, and it is no longer meaningful to make a distinction between involvement in media and other activities. Digital resources, in one way or another, are involved in the daily flow of activities as a source of information and as a context of engagement and communication. This has been a rather quick transformation of ecologies of communication accelerating with the introduction of the tablet in 2010. Given this, it is interesting to note that there is a repetitive pattern of initial, negative reactions, sometimes even moral panic, to such increasing levels of involvement by children in digital media activities (cf. Erstad and Silseth, 2021, this volume, who analyse the 'controversies' on the relationship between digital technologies and schooling). These reactions are reminiscent of what we have seen throughout the last century.

Discussions of the problems of excessive screen time and the moral and other dangers of the Internet in many respects mirror those that were expressed in relation to the radio, television, and even literature, for instance comic books. Already in the early 1930s, researchers and the public made complaints that the '"new generation" failed to read books and newspapers and did not know how to study because of their interests in radio' (Dennis, 1998, p. 35). In the case of television, many such claims were made based on the assumption of children and young people as passive consumers who uncritically adapted to violence and other immoral acts (Bogart, 1958; Luke, 1990). An infamous example in the case of reading, is the moral panic around comic books appearing in the middle of the century. Comic books were held to cause juvenile delinquency and encourage anti-social and immoral behaviours in young people (Wertham, 1954). Following these accusations, moral crusades attempting to ban comic books from libraries and from being printed were launched.

Epistemic practices and child development

What these patterns reveal is that even though there may be public debates about the dangers of 'screen time' and other features of digital media, and in some countries even legislation to prevent children from using digital devices in school (even during breaks), the public acceptance of digital resources as an element of daily life is obvious, and this goes for the Nordic countries as well. And it is hard to see that this development will be reversed or even halted. Children encounter these resources in their homes, and they develop their skills in using them largely outside formal instructional settings. This is an interesting observation also in the sense

that schools in some respects have lost control of young people's access to information and knowledge. Children's epistemic practices, to a large extent, nowadays are shaped by experiences outside the formal educational system. Digital technologies, with touchscreens and apps, allow children to circumvent reading as a premise for finding out about the world. On the other hand, when engaging in media activities, children learn to use symbols, including the alphabet, numbers, and other representations in these environments, and they often do this without continuous adult support. Instead of, as in traditional literacy, mastery of the alphabet as a precondition for engaging with most media, such skills emerge in the context of a communicative ecology where children constantly find themselves in 'zones of proximal development' (Vygotsky, 1978) as they explore mediated communication in novel settings and for new purposes.

Interactive media allow for novel forms of engagement and new epistemic practices. Children are not just consumers of messages produced by others, they very early on learn to produce symbolic messages and texts while interacting with others in shared spaces (Skantz-Åberg, 2018). This role of actively designing messages must be seen as an important addition to early literacy skills triggered by the combination of technological tools and the collaborative nature of the tasks engaged in.

The basic argument here is that involvement in media use implies that children and young people have to familiarise themselves with the epistemic practices that are relevant and productive to meaning making. In the context of digital media, these skills go beyond what was relevant in traditional print media, and they imply a unique coupling between minds and media, artifacts and messages that has not existed earlier in history.

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Chapter 3

Nordic children, media, and technologies

A contested ensemble

Kirsten Drotner

Introduction

For at least 200 years, adults in the global North have discussed children's means of knowledge formation. Ranging from concerns over young women's poetry reading in the eighteenth century to current debates on children's use of mobile and connected devices, the focal means of public debate have changed, and discussions of these means have intensified in tandem with two important developments: the expansion of formal education and the diversification of media technologies. Formal education serves to codify certain forms and aims of knowledge, and media technologies serve to generate, communicate, and store knowledge across time and space (Thompson, 1995). The present chapter claims that adult discussions on children's means of knowledge formation have not only intensified, they have also added complexity and importance.

The Nordic countries of Europe offer a felicitous vantage point to document this claim for three reasons: they are mature parliamentary democracies that put a premium on universal education as a lever of citizenship as well as employability; their welfare ideals are marked by child-centredness (Wagner & Einarsdóttir, 2008); and Nordic children are among the world's most media-rich in terms of uptake and diversity of use. From this analytical vantage point, I ask: what contestations do recent public Nordic discourses on children's digital means of knowledge formation display, and what can a Nordic perspective contribute to international insights on children's future knowledge formation? Exploring children's means of knowledge formation is important because it illuminates how children act in the world and on the world – be the means physical tools, language, or media and communication technologies; and focusing on public discourses is important because it reveals how tacit values and views affect policy and power decisions about children's actions.

Based on a brief overview of Nordic trends in research on children, I underpin my answers with examples of public discourses about digital means of knowledge formation over the past two decades in order to map patterns of contestation. I then discuss these patterns in relation to changing conditions for children's future knowledge formation pointing to possible challenges of making these policies materialise.

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Research trends on Nordic children

Much research on Nordic children is framed by welfare studies. Even if the word 'welfare' derives from old Norse velferð, welfare states come in many shapes and forms. They are compound concepts that are historically contingent (Edling, 2019). Yet, even if no discrete Nordic welfare model exists, researchers agree that Nordic welfare policies are centrally inflected by widely held assumptions of children's rights as important (Therborn, 1993; Bartley, 1998). Among these rights is universal and free education to be secured by the state and with a focus on children's democratic voice and a rounded character development (Bildung). Yet, after World War II, the Nordic countries are also marked by accelerated modernisation with dual-career families and an expansion of the service and care sectors. Childcare from an early age becomes professionalised in tandem with pedagogical supervision and educational division (Brembeck, Johansson, & Kampmann, 2004). On a wider canvas, dynamic modernisation processes catapult children into focal adult attention since they are harbingers of change and future options. So, the combined forces of welfare ideals and modernisation processes are decisive for the Nordic child-centredness.

A large number of studies on Nordic children have explored the challenges posed when welfarist rights and equity ideals meet modernisation demands of efficacy and stratified employability. So, legal, social, and pedagogical approaches abound, and these include studies of analogue and digital educational materials (e.g. Selander, 2008). Less is made of research taking a child-led perspective, and few studies adopt an interdisciplinary approach.

Another, more limited, line of research focuses on Nordic children's culture including their media cultures. In line with the child-centred ideals of Nordic welfare states, cultural policies since the 1970s have prioritised children's culture to the extent that 'in national cultural policies and the discussions that surround them, the phrase "children's culture" appears to be limited almost exclusively to the Nordic countries' (Johanson, 2010, p. 388). Of particular note is that the Nordic countries are host to some of the few remaining full-scale public-service providers whose services are based on a national licence fee or similar, encompass all media technologies, and aim at universal access and diversity of output produced for the common good, not commercial stakeholder value. This funding model is now under severe pressure from transnational commercial platforms where automated algorithms drive personalised user experience and business expansion.

Research on Nordic children's culture encompasses studies on cultural policies, on cultural provision for children as well as studies focusing on children's own cultural practices (Sparrman, 2019). Many identify familiar binaries when lofty policy aims of children's inclusion meet mundane policy practices favouring established cultural institutions, and scholars point to persistent socio-cultural inequities of access and application. Yet, few studies of Nordic children's culture address culture as a form of knowledge formation. This lack implies that the means through which children generate, share, and store knowledge about themselves

and the world through cultural modes of expression remain rather marginal to scientific interest, particularly when the means are technologically mediated.

Yet, children's technological means of knowledge formation are central to public discourse in the Nordic countries now and in the past. A closer analysis of recent discourses not only helps fill a scientific gap. It may also illuminate tacit contestations framing policies and practices of relevance for children's lives and future prospects.

Nordic discourses on children's digital means of knowledge formation

Public discourses on children's digital culture and means of knowledge formation encompass a wide range of actors – high-profiled individuals, interest groups like trade councils and professional organisations such as teachers' and librarians' associations. In addition, the Nordic countries have a long tradition of wide support of NGOs and other civil-society organisations, which also impact public discourses on children's current knowledge formation.

The following examples are generated by input from authors and co-editors of the present volume and based on the following selection criteria: data generated after 2000, indicative of significant public discursive trends at the time and with publication venues reaching diverse audiences. So, the examples are not representative in a statistical sense, nor are they meant to be particularly Nordic in nature.

Denmark

Danish children are early and eager adopters of digital technologies for leisure pursuits, and educational provision of digital tools started in the 1990s and remains diversified and wide ranging. Until recently, public discourse has focused on the perceived ill-effects of children's screen time, irrespective of the contents and contexts of use. Lead critics are high-profiled individuals mostly with a medical, including neuroscience, background. First among these is Imran Rashid, medical doctor and best-selling author of the book *Sluk* (*Off*) (Rashid, 2017). Catapulted into public limelight as a winner in the popular TV show *The Lion's Den* (a local variation of the Japanese *The Tigers of Money*), he speaks of children's mobile communication as brain-damaging narcotics whose key remedy is educational and parental banning, or at least firm limitation, of mobile devices. His claims about young mobile users' dopamine dependence and loss of concentration and empathy are underpinned mainly by online and newspaper articles (called 'scientific articles' in the book). The claims have had tremendous resonance in policy and practice circles, leading a number of politicians to call for a ban of mobiles in schools and many school leaders to act on this call. The discourse focuses on the effects of mobile communication on users (and their brains), and it assumes stark contrasts between online and off-line communication.

An alternative, and highly optimistic, discourse on children's digital knowledge formation has gained ground since around 2015. In widely read news media, blogs

and educational niche media, individual researchers and representatives of teacher-training colleges, as well as industry associations and e-learning firms, argue for the urgent need to introduce computational thinking as a statutory subject in the K-9 curriculum. For example, a large ed-tech provider promotes its interactive learning portal for computational thinking as a means to 'form the digital society of tomorrow' by training students to provide 'innovative digital solutions to real-world problems and reflect on the societal impact of digital technologies' (Clio, n.d.). These thoughts resonate with many policy makers, and the Danish Ministry of Education has initiated a project, 2019–2021, to test a full-scale adoption of the subject in the national curriculum.

The discursive binary of pessimism and optimism when it comes to children's digital means of knowledge formation is found in all the Nordic countries. But the themes and priorities underpinning the binaries vary considerably.

Finland

Finnish children have traditionally combined high rates of leisure reading with early and wide uptake of new media. Perhaps not surprisingly, public discourses display a concern over children's declining interest in print reading for pleasure and large-scale support of digital technology use in education.

The Finnish Reading Centre, Lukukeskus, is an NGO engaged in documentation and promotion of 'reading, literacy and literature' as it states on its website (Lukukeskus, n.d.-a). The Centre equates literacy with print reading and oral communication, and this definition also colours its engagement in public discourse. Here, the Centre cautions against declining rates of children's print reading as a likely hindrance of children's future well-being. For example, the Centre acknowledges that 'multiliteracy, i.e., the analysis and production of various text types as well as verbal, visual and audio materials using various tools, is an essential competence in modern society'. Yet, 'digital platforms may easily lead to short text production only', so 'reading literacy' is essential because it 'provides tools for navigation in versatile text environments and allows the readers to participate in the daily functioning of the digital society' (Lukukeskus, n.d.-b).

This type of discourse buys into two familiar media debates: does the advent of new media replace the uses and gratification served by older media (Himmelweit et al., 1958)? Does society need a hierarchy of importance in terms of technologically mediated knowledge formation? Answers to both of these questions demonstrate that public discourses largely differ from scientific ones in that public discourses tend to set up normative binaries (good/bad, positive/negative) and hierarchies of use (book reading is the pinnacle).

In tandem with public concern in Finland over children's declining print reading, optimism prevails when it comes to educational promotion of digital tools. In public discourse, the Internet, computers, and mobile devices are largely seen as neutral purveyors of effective learning that optimise students' acquisition of twenty-first-century skills. While the reasons for this optimism are less than fully explored, likely indicators are Finland's early and wide adoption of mobile

devices (the Nokia effect) and Finland's ranking at the very top of international surveys such as PISA and TIMMS. Both make for widely shared assumptions that digital technology use is good and that schools are on the right course. This may also explain why the Finnish discourse is less marked by loud-mouthed individuals.

Iceland

Like Finnish children, children in Iceland have traditionally combined high rates of leisure reading with early and wide uptake of new media. Yet, public discourses on children's digital means of knowledge formation differ in the two countries. In Iceland, the primary discourses are children's use of mobile phones and children's screen time. Use of mobile phones is primarily related to education where it is seen as a disturbance of teacher authority and student concentration. For example, in 2017 the country's public-service provider, RÚV, ran an online news story 'Höfum gífurlegar áhyggjur af símanotkun' [We're extremely worried about phone usage]. The story reports on a class of 8th graders who hand over their phones to their teacher for 24 hours to run a fundraising marathon. Their teacher notes that luring students away from their mobile phones 'is one of our biggest struggles in teaching, day in and day out, unfortunately'. So, outdoor activities offer a welcome alternative since students 'enjoy being together, talking together and playing together and cooking' (Magnúsdóttir, 2017, n.p.).

Two interlocking binaries are set up here: one between pedagogy with and without technology, and one between interpersonal and mediated communication. Not only is school positively correlated with phone-free concentration and interpersonal communication, being in nature is also held up as a carefree alternative to educative socialisation.

Another typical example is a newspaper article detailing a secondary school teacher's own computer rehab. Accounting for his youthful progression in various gaming universes as a route to ill health and social isolation, he advises parents to regulate children's computer time and use gaming time as a token of good behaviour in other respects. If the children 'drop out of school, arrive late or do not do homework and grades drop, then computer time can be reduced' (Líndal, 2018, n.p.). The discourse offers a negative and normative view of children's digital means of knowledge formation; it is technology-focused, and the remedies it offers to mitigate the negative effects for children are directed at parents and individual teachers.

Taken together, public discourses in Iceland mostly paint a negative picture of children's digital means of knowledge formation focused on individual outcomes and implications.

Norway

Since 2006, the Norwegian national curriculum has included students' ability to use digital tools as a core competence, making Norway a frontrunner in the Nordic

countries in this respect. In 2014, Finland follows suit with its national K-9 curriculum specifying statutory training in 'digital competence' including computational thinking, programming, and problem-solving. The same goes for Sweden since 2018. This early adoption, combined with a close and continued public monitoring, may be a reason why public discourses on Norwegian children's digital means of knowledge formation tend to take a tech-led approach.

Among the recurring controversies are whether there should be an age-dependent introduction of digital tools in education, who should control children's use of digital technologies (parents, teachers, children themselves), and learning outcomes when students use digital vs analogue tools in education (see Erstad and Silseth's chapter in this volume). In a much-touted book, *De digitale prøvekaninene* [The digital guinea pigs], architect Gaute Brochmann argues that educational digitisation has gone too far, since the application of digital tools do not seem to result in students' digital literacy (Brochmann, 2020).

As is evident in other Nordic countries, discursive disagreements in Norway focus on digital technologies, but they reveal underlying divergences when it comes to power arrangements across generations (adults, children) and social spheres (home, school). Yet, Norwegian discourses stand out as being less about mediated communication, screen time, ill health, and juvenile dependence.

Sweden

Like Iceland and Denmark, public discourses in Sweden repeatedly focus on individuals, often with a medical background, warning against children's screen time. Emeritus professor of paediatrics Hugo Lagerkrantz is one of the most outspoken critics and indicative of the tone. Backed by the World Health Organization's contentious recommendations in 2019 to limit screen time for children below five years of age (World Health Organization, 2019), his recent claims of negative effects include lack of concentration and risk of nearsightedness (Amorelli, 2019; Lagerkrantz, 2016). As antidotes, the critics recommend parental encouragement of screen-free play and outdoor activities.

While the screen-time debate resonates with health-care professionals and some politicians, the education sector is equally influenced by research-led debates on the proper use of digital tools. These debates illuminate strands similar to the neutral stand taken in Finland on to more contextualised strands influenced by research results documenting the critical importance of didactics to avoid drills-and-skills approaches (Kjällander et al., 2018).

Common trends and new complexities

Across the Nordic countries, public discourses on children's digital means of knowledge formation display common trends also found in full-blown media panics over the years and in many countries (Drotner, 1992). These trends include a normative approach expressed as stark binary claims. Also, the explicit discussions of media or technologies hide tacit power divides across generations, institutions,

and cultural tastes. Still, the Nordic contestations also illuminate variations to these common trends. Until very recently, very little has been noted on commercial platform providers' responsibility, while much is made about individual and nation state responsibilities. These variations may be a result of widely held welfarist assumptions that the 'benevolent' state will fix things. To these trends may be added repeated recommendations of play and outdoor activities as alternatives to preoccupation with digital devices.

Yet, the recent public discourses in the Nordic countries of Europe not only display variations on a common theme. They also illuminate added complexities to those found in earlier discourses. One is that the familiar normative binaries are overlaid by media-led and technology-led binaries. Digital means of knowledge formation are both data infrastructures, modes of communication, and technological tools. So, some discussants focus on the communicative dimensions illuminating modes of representation and use. Others focus on the technological dimensions, especially children's interaction with and design of tools. Naturally, these differences imply rather different recommendations for policy-making and practices in a vein similar to what Kathleen Tyner has termed 'literacies of representation' and 'tool literacies' (Tyner, 1998, pp. 94–95).

To this set of complexities is added an intensified contestation in the Nordic countries between a welfarist ideal that defines the aims of education as formation of democratic citizens and a modernity ideal of training competences for effective employment, as noted in my introduction. In short, a binary of character formation (Bildung) and competence. While research has explored these divergent ideals as necessary backdrops to discourses on Nordic children and childhood (Brembeck, Johansson & Kampmann, 2004), the constitutive role for these discourses played by today's connected digital culture remains understudied.

New discursive conditions and implications

Today, digital, and often mobile, media are constitutive for virtually all dimensions of our environment. They are also globally connected data-generating technologies. This combination fosters 'deep mediatisation' where 'analysis of algorithms, data and artificial intelligence become crucial to our understanding of the social world' (Hepp, 2020, p. 7). Deep mediatisation transforms the conditions on which discourses on children's means of knowledge formation play out, and it impacts their implications.

While inequities of access and use remain, the current plethora of digital media technologies serve to diversify the means of knowledge formation for large numbers of children. This diversification potentially challenges traditional educational priorities of the book and the spoken word, and it can also add to a functional division of work. For many children and adults alike, mobile devices are associated with leisure pursuits, with social networking and cultural entertainment. So, use of mobile devices in school is easily seen as a disturbance of established pedagogical routines rather than as an option for different knowledge formation and use, as is evidenced in public discourses.

Nordic children's wide uptake of mobile devices also accelerates a dispersion of learning sites (Drotner, 2007). School no longer holds an unquestioned monopoly on learning, since means of knowledge formation are literally at hand 24/7. This dispersion not only lowers barriers to knowledge acquisition, it can also challenge established power relations between educators and students and between parents and children. Such potential challenges resonate in public discourses as issues of juvenile (not adult) dependence and insurrection.

Yet, perhaps the most profound implication of deep mediatisation, the commodified datafication of all digital technologies, has remained fairly absent until recently in the public discourses analysed here. Whether proponents take a media-led or a technology-led approach, most focus on what can be observed, and they offer individual or institutional solutions to the perceived problems under discussion. The hidden data infrastructures and their lack of public governance and accountability easily slips attention. An obvious result of this inattention is that children's privacy issues remain a private responsibility.

In sum, Nordic discourses offer illuminating insights into complexities and contestations that are of principal importance to children's present lives and future prospects also beyond the Nordic region. As this chapter has demonstrated, what is voiced and what is muted in these discourses is often at odds with children's actual practices, and yet the choices deeply implicate these practices. It is also evident that the discursive vacillation between a tech focus and a media focus tends to obfuscate children's comprehensive and diverse appropriations. Last, but not least, this chapter indicates a deep disconnect between public discourses and research results. To minimise this disconnect is not an easy feat. As a start, researchers need to embrace the complexities of children's digital means of knowledge formation through holistic research approaches while acknowledging that academic results often paint a picture in grey tones while public discourses tend to be black and white.

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Chapter 4

Transformations and unresolved tensions

Children, school, and technology

Ola Erstad and Kenneth Silseth

Introduction

One key issue that regularly surfaces in the media and among policy-makers is the polarisation between digital technological developments in society and the role of education in preparing future citizens (Binkley et al., 2012; Selwyn, 2011). This polarisation has been manifested in different ways over the last two decades and has dominated public discourse on children, schooling, and the educational use of technology. We believe that analysis of the socio-historic developments of technology and education at the intersection of policy and research is of utmost importance for understanding the contemporary perspectives on the role of new digital technologies within formal learning cultures in school. More specifically, we believe that conceptions of students' agency in using digital resources and how such conceptions change over time is a key aspect of the polarisation mentioned above. The agency of learners – what some describe as 'agentive selves' (Hull & Katz, 2006) – refers to the 'ownership' that students experience of their own learning process and to their involvement and identity formation as learners in relation to others (Bender & Peppler, 2019; Mäkitalo, 2016). The Nordic education systems are of interest to a more global audience due to the extent of the implementation, the methods of using digital technologies within school settings, and the positioning of the child within the learning environment, even though the contentious nature of children's agency has also been criticised in a Nordic context (Brembeck et al., 2004).

The aim of this chapter is to shed light on the following issues: What are the key unresolved tensions concerning digital technologies in school practices in Norway from the last two decades, and what are the implications for how students' agency in using digital technologies, as defined within school curricula and relevant research projects, is understood? We use the term 'unresolved tensions' to refer to specific issues that have dominated both practice and research concerning children, school, and technology over the last two decades, that are characterised by being neither resolved nor stabilised and that appear as differences in perspective that seem to define the field and take on new shapes over time.

In the first part of this chapter, we present some important curriculum developments relating to the uptake of digital technologies in education in Norway, with

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a focus on how the student role – particularly as it relates to their agency – is described. Next, we identify some key unresolved tensions that have defined the field of children, school, and digital technology over time. The third section will highlight some research projects in which we have been involved that illustrate the research initiatives and perspectives from the last two decades and that are relevant to these issues and to the unresolved tensions. In the concluding section of the chapter, we will address the need to be aware of these unresolved tensions and the interrelationship between research and curriculum development for children, school, and technology. Our key messages in this chapter are, first, that the field of digital technology in education has been defined by unresolved tensions that create polarisation rather than coherence in how we achieve progress and, second, that the potential for involving students and their agency in approaches to using digital technologies within schools is characterised by ambivalence.

Curriculum frameworks and student agency during the last two decades

An important antecedent for how technologies are implemented and used in school settings is the curricula and policy frameworks that define the direction of educational development and transformation (Williamson, 2013). In a Nordic context, curricula are important on a national level; they present political priorities, objectives, and general strategies for the coming years as well as more subject-specific guidelines and aims. Over the last 20 years, 'digital technology' as an area has become increasingly apparent in Nordic curricula.

Most importantly in the Norwegian context is the transition in 2003 from an action plan for school development towards a new national curriculum, which was implemented in 2006. This curriculum was called the 'Knowledge Promotion Reform', and it established 'to be able to use digital tools' as one of the five basic skills running through all subjects and levels of schooling (in addition to reading, writing, numeracy, and oral skills); the term 'digital competence' has also been used to describe this basic skill. As a national curriculum, it created a totally new commitment within the education system to using digital technologies in all subjects and on all levels. Norway was thus among the first countries in the world in which digital competence/skills was defined as a core element in a national curriculum (Erstad, 2010). During the last few years, the most important development has been a general revision of the national curriculum, called 'Fagfornyelsen' ('Renewal of Subjects'), which was implemented in 2020 and coincided with a national strategy for the digitalisation of Norwegian society (Ministry of Education, 2016). What is interesting in this revision of the national curriculum is that some topics from the 1980s and 1990s have been redefined. First, an emphasis on programming and computational thinking, especially in mathematics, refers back to ideas from Seymour Papert and others in the 1980s, and second, there is a general emphasis on critical media awareness in times of disinformation as part of social studies, referring back to media education and the media literacies of the 1980s and 1990s (Buckingham, 2003).

Looking back on these developments, there is an underlying ambivalence in how the importance of students' agency is expressed when using digital technologies as part of learning activities in different subject domains. On one hand, digital technologies are mainly described as resources for teaching and learning in particular subjects, with teachers treated as the main agents determining how technologies should be used within classroom settings. On the other hand, the emphasis on digital competence in 2006 indicated a shift in focus in which students' use of digital technologies and their levels of competence are more in line with their engagement as learners. As such, students' agency, in the sense of understanding children and youth as media users, became more apparent in school curricula at the same time as the formal aspect of teachers fostering skills and competencies as part of teaching practice was described. Of further importance is that the Norwegian and Nordic curricula provide a lot of freedom for teachers to engage students in using different tools for learning.

Unresolved tensions of children, school, and technology

Looking back on key public debates during the last two decades, there is a continuous ambivalence from policy-makers and educational practitioners towards the educational potential of new technological developments, such as computers, video games, and social media. Often, such developments are defined as challenges to the core characteristics of formal education, with the book considered the main resource for learning and teaching (Blikstad-Balas et al., 2020; Erstad & Hauge, 2011). Some topics and issues surface in public discourse regularly, while others – often linked to specific software, tools, or apps – are debated for a while and then disappear. People contributing to these unresolved tensions include politicians, policy-makers, researchers, parents, teachers, and students themselves.

The main criteria for our selection of unresolved tensions are that they remain consistent over time; that they define key challenges in practice and research concerning children, school, and technology; and that they inform us about how students' agency is conceptualised. In summarising the themes and debates that are described in the literature mentioned above and taken from our own experiences of participating in public debates in Norway over the last two decades, we have identified five unresolved tensions that surface regularly in research initiatives, in policy statements from international, national, and regional authorities and in practice, as described by teachers, principals, and parents. These unresolved tensions are not mutually exclusive and sometimes overlap in complex ways. However, in contrast to other tensions, these are neither solved nor settled, and they take on new forms and expressions over time.

The allocation of time using technology

The first unresolved tension is regarding the allocation of time using technology. There are two aspects to this tension; first, it is about the time spent with technologies in school versus at home (Cuban, 2003; Voogt et al., 2018). Over the last two

decades, several surveys have documented the differences between how young people use technologies at home and at school and how much time they spend doing so (Fraillon et al., 2018); an example in Norway is the national Monitor on ICT in Education, which was started in 2003, with follow-up studies almost every two years until 2018 (Egeberg et al., 2017; Kristiansen & Kløvstad, 2003). Second, it is about time spent with technologies in classroom activities per se. Over the last two decades, some teachers and parents have argued for reducing the time spent with computers at school; for example, a journalist and parent have recently written a series of newspaper articles and a book (Brochmann, 2020) arguing that digital technologies should be removed from classrooms, especially in the lower grades, and criticising the lack of research supporting technology use in schools (see also the chapter by Drotner in this book).

Inequalities and matters of access/use

This unresolved tension is about the constant issue of inequalities and gaps in the Norwegian student population's use of digital technologies and the implications thereof. The tension is between those who argue for making hardware and software accessible to all students and those who argue for reducing the availability of digital technologies in schools. Research has shown that the socio-economic background of parents is the strongest predictor of school success, which is why public schools in Nordic countries are politically defined as a social mechanism for giving all students equal opportunities. This has partly been about national policies to provide equal access to computers and broadband Internet connection to all students in order to counteract digital divides caused by a lack of access, but access remains an issue of tension in many countries and between regions in Norway (Davies & Eynon, 2015; Fraillon et al., 2018). Yet this has also been partly about how to use available digital technologies in classroom settings; research shows that there are large differences in how much and in what ways teachers use such technologies (Cuban, 2003; Egeberg et al., 2017), which is often explained as a deficiency in teachers' professional competencies or differences in teachers' beliefs about how to use digital technologies in instructional work. The implication is that there remain unresolved tensions between those students who have access – for whom digital technologies are used as part of learning activities in schools – and those who do not.

Defining the boundaries of technology use at school

This unresolved tension is about how teachers relate to the everyday use of digital technologies among students as part of activities at school. Public discourse and research has highlighted the tension between the risks and opportunities of young people using digital technologies in their everyday lives. The implication is that schools and teachers are hesitant to open up to the broader media culture outside of school, such as social media or online gaming. Some schools and teachers see possibilities for using different technologies in schools and emphasise teaching

students to self-regulate their technology use, while others rely on rules, regulations, or banning such technologies and parts of broader media culture. One example is regulations against using smartphones in schools in order to counteract online bullying or restrict access to social media. In Norway – and in other countries in Europe, such as France – there have been many debates about the need for a mobile phone ban in schools (Voogt et al., 2018). This tension takes new and different shapes as smartphones and iPads are being introduced to children at an early age (Staksrud & Olafsson, 2019), and there is a worry that families and schools do not have enough control over how children use media platforms and their content. This is a challenging task for parents and teachers because they encourage the use of technologies but are also worried about how to regulate their use.

Reading and writing on screen versus paper

This tension is about different conceptions of literacy, with some teachers and researchers arguing that digital technologies suppress traditional reading and writing skills and others believing they open up new ways of reading and writing. Both researchers and teachers have engaged in debates regarding what literacy is today (Coiro et al., 2008; Gilje & Silseth, 2019). Some are concerned that young people today do not read enough printed books or that children do not develop the neurological connections for hand–brain coordination when holding a pencil and writing on paper (Mangen, 2021). Others argue that reading and writing is constantly developing, that it is situated in social practices and that young people today are both consumers and producers of a variety of different texts that are meaningful to them in different ways (Hull & Schultz, 2002). The stance that one assumes towards this unresolved tension has implications for how teachers and parents interact with children and youth when reading and writing using diverse technologies.

Different conceptions of learning using digital technologies

The final unresolved tension is between learning that is conceptualised as what can be objectively measured as a learning outcome and broader conceptions of learning as embedded in diverse social practices (Davies & Eynon, 2015; Selwyn, 2011). Digital technologies are accordingly interpreted either as tools for more effective learning outcomes or as cultural resources that interact with people in meaning-making and in diverse ways of learning. This tension is, both for research and policy, about conceptions of learning and how we study learning and teaching with technology (Preiss & Sternberg, 2005; Säljö, 2010). More recently, because of learning analytics in educational institutions, adaptive learning, in which software and user interact in a learning progression, has become popular among technology developers and teachers, which also raises concerns that teachers will be replaced by computers in children's learning processes.

From a research perspective, these unresolved tensions concern the agency of students within formal school contexts in terms of children's wellbeing and the affordances for learning provided by digital technologies. We will now turn to some of the research initiatives in which we have participated during the last two decades and discuss how these unresolved tensions have emerged in different and relevant research orientations.

Research initiatives over time

The projects that we will describe and discuss below are relevant because they exemplify developments over 20 years. They reflect the evolution over time of research into technology in education and how students are positioned relative to the impact of technologies for learning. We will present key characteristics of these time periods and diverse projects as illustrations of how students' agency and involvement have been addressed in research.

Implementation and school development

During the first few years of the 2000s, several initiatives were taken by the Ministry of Education to focus more on school development and on infrastructure to support the use of digital technologies, not only in classroom settings, but also as administrative tools. The main issue was regarding system change and how schools dealt with change and transformation. The first three tensions mentioned above were all part of the public discourse at that time, in newspaper articles and among politicians and policy-makers. One important issue was complaints from teachers and policy-makers at the local level regarding huge differences between different municipalities in Norway in access to technologies and to broadband Internet connections (tension 2). This was also related to the allocation of time using computers and the Internet at school versus home and between different schools (tension 1), as documented in several surveys (Kristiansen & Kløvstad, 2003). Time spent using technologies was also part of concerns over risks and opportunities for students' learning (tension 3), as expressed in stories about young boys spending too much time playing computer games and the presumed negative influence on their school performance.

In Norway during this period, there was an important project called 'PILOT' (Project – Innovation in Learning, Organization and Technology; Erstad, 2004), which lasted from 2000 to 2004 and involved 120 schools in all regions of Norway and at different levels together with research communities from around the country. The project showed how some schools that were considered to be developmentally oriented had succeeded better than others with the integration and use of digital technologies at all levels of the organisation and how leadership and strategies for the role of technologies in learning activities were important (Erstad, 2004). One conclusion was that it was not technology itself that was the main mechanism for change, but rather how it formed a part of the change processes at schools. The students themselves were explicitly

addressed as part of this research, and in several of the sub-projects, the main focus was on students' participation ('elevmedvirkning') and ways in which technology could support such processes, although this was usually defined by teachers and the school rather than the students themselves. Such projects and initiatives laid the foundation for the new national curriculum in Norway in 2006, in which digital competence and 'using digital tools' became a core element across all subjects. The curriculum marked a change from holistic school development towards a greater focus on students' competencies and on ways of using technology in classroom activities, implying an increased focus on the students themselves.

New tools for communication and creation

Towards 2008–2009, social media began to arrive in Norway and other Nordic countries, rapidly becoming popular among young people and establishing online places for socialisation and friendship. These social arenas afforded new ways of being together but also created new risks (tension 3) (Boyd & Ellison, 2008).

Several research initiatives explored the educational potential of using social media as part of learning activities in schools. One such initiative was an international project initiated by UC Berkeley, called 'Space2cre8' (2009–2011), in which we participated with a Norwegian case. This was both a collaborative intervention project that brought together researchers, teacher,s and students from different countries around the world and a social media platform where students could meet, share, and create experiences and products together (Stornaiuolo & LeBlanc, 2014; Vasbø et al., 2014). Students from the United States, United Kingdom, India, South Africa, Norway, and Australia came together and participated in activities that enabled them to share and co-create content and learn about each other's cultures and communities. There was also a focus on students with fewer socio-economic resources, who received new tools that gave them the opportunity to create on their own terms. Through chatting with each other, sharing movies and photos and discussing topics related to being young across countries and communities, the students created a lot of content that became part of the learning ecology generated by the project.

The arrival of social media implied new practices of content creation that challenged traditional conceptions of reading and writing in schools (tension 4); some saw this as a new opportunity to engage students in practices with which they were familiar from outside school, while others saw it as a threat to basic reading and writing skills among children and youth. Allocation of time to social media became an issue (tension 1) as teachers and parents became more aware of the risks of its use (tension 3). During this period, with a conservative government in Norway, more policy-makers also started to ask questions about the subject-domain learning outcomes of using digital technologies because research was not clear on this issue; this created tensions between narrower and broader conceptions of learning (tension 5).

Boundary crossings and personal technology

During the 2010s, access to smartphones among young people became more ubiquitous in Norway and other Nordic countries. People were no longer place-bound with their technologies but could engage in online communities while moving between different activities and practices (Sahlström et al., 2019). As part of this development, worries about the role of mobile phones in school began to emerge, and possible bans and restrictions on mobile phones were debated and introduced in several Norwegian schools (tensions 1, 3 and 5). A common argument was – and remains – that smartphones cause disturbance and interrupt concentration among students and that banning the phones would solve these challenges.

In this context, the research project 'Knowledge in Motion Across Contexts of Learning' (KnowMo, 2013–2016) is relevant. Building on insights from studies within the socio-cultural tradition, the purpose of this project was to examine how and to what extent teachers could relate to students' everyday experiences and knowledge in schools (Silseth, 2018; Silseth & Erstad, 2018; Erstad & Smette, 2017). The project documented some intriguing episodes in which the students used their phones to seek information that was relevant to ongoing conversations during class (for more details, see Gilje & Silseth, 2017). Thus, students used sources other than the textbook and the teacher and exercised agency in the ongoing construction of knowledge in the classroom. However, during our fieldwork, the school introduced a mobile phone ban following a discussion at the school among both the teachers and student council about what mobile phones did to the social and academic environment. However, this ban unavoidably made it difficult for students to spontaneously use their phones for information-seeking and knowledge work in the classroom.

In the context of discussing agency and digital technology in school, this was an interesting project because students were able to work on topics with which they were familiar from their media practices using personally meaningful digital tools, such as their mobile phones (Silseth & Gilje, 2019). In this way, they were positioned as experts, creating products at school that they wanted to share with others outside school. However, as mentioned, the school implemented a ban on using such phones, which were then collected into a box when the students entered the school each morning. This change was also supported by local and national policy-makers and shows the tensions regarding the boundaries of technology use at school (tension 3), the time spent on using mobile phones in schools and classrooms (tension 1), and the ways of understanding literacy and learning (tensions 4 and 5).

Children's agency and the school of the future

In this chapter, we have presented both curriculum developments and research initiatives over the last two decades and how particular tensions have defined the field of 'children, school and technology' in certain ways. The period from around

2000 until today is interesting because of the major developments in the role of digital technologies in society and how digital technologies have become a core topic within our education systems. Experiences from Norway are both similar and different to other Nordic countries, which have similar education systems and broad access to technologies both inside and outside of schools. There is also a conception of childhood that is different from many other countries in the way in which independence is a core virtue in both families and education, although there are variations in how this is realised.

Even though students' agency in learning is appreciated historically in the Nordic countries, the ways in which Nordic education systems have developed over the last two decades imply a stronger focus on the content, teacher and learning outcomes. Thus, even though the technologies used in schools have provided more potential for students' agency in schools, there remain tensions and ambivalence within schools regarding its realisation. As shown in this chapter, there are examples of resistance to certain technologies in schools, in the service of regulating the teaching and learning process, which has also had consequences for students' agency. At the same time, new curriculum developments in all Nordic countries have emphasised more 'deep learning', 'multiliteracies', 'exploratory methods', 'programming and coding' and 'digital competence', indicating a stronger focus on students' future participation and agency in schools and creating further ambivalence towards how the transformation of education will be defined in the years to come.

Awareness of the five unresolved tensions we have identified is important because they determine whether and how technologies are perceived as important for learning within twenty-first century education. The research referred to in this article shows examples of teachers trying to engage students in new ways using digital technologies, but such practices often create tensions within schools and are often not sustainable over time. Many schools still struggle to find a place for digital technologies in formal education that enhances students' learning and engagement. The unresolved tensions might both hinder progress in this field and maintain a polarisation between policy, practice, and research.

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Chapter 5

Bridging dichotomies between children, nature, and digital technologies

Kristiina Kumpulainen

Introduction

Educating children to appreciate and care for the environment has been a long-standing cultural value and priority in the Nordic countries. This priority is reflected in the richness of outdoor education programs, such as Forest Schools (Williams-Siegfredsen, 2017), and efforts to promote environmental education in schools as a cross-cutting curriculum theme (Wong & Kumpulainen, 2019). In Finland, the national curriculum emphasises the need to develop children's knowledge, critical skills, and identities in line with their interest and participation in environmental advocacy (Furu, 2019; Tolppanen, et al., 2017). In parallel, the everyday lives of many children in the Nordic countries have been characterised by opportunities to roam 'freely' in nature contributing to its enhanced appreciation and care (Mjaavatn, 2016).

At the same time, the rapid pace of digitalisation together with urbanisation and changing lifestyles are leading some people to argue that our relationship with nature is fundamentally changing, and that digital technologies are distancing children from experiencing nature itself, the Nordic countries being no exception (Clayton et al., 2017; Edwards & Larson, 2020; Mjaavatn, 2016). Of course, there is a nuanced feel to these claims – from concerns about 'indoor children' or 'couch potatoes' whose lived experiences are becoming more distant from nature due to the pervasiveness of digital technologies in their lives (Soga & Gaston, 2016), the increasing 'nature deficit disorder' in children (Louv, 2005, 2012), and overall environmental 'illiteracy' (Payne, 2006). But fundamentally they highlight deeply rooted imaginaries about childhood in which children play and roam outdoors, relating to plants, animals, and the wildness, which puts it at odds with their digital engagement. These imaginaries are also reflected in environmental education approaches that challenge the value of digital technologies in contributing to children's environmental appreciation and care (Payne, 2010).

In this chapter I argue that these imaginaries about childhood and their relationship to nature and digital technologies are both outdated and unhelpful. In particular, I suggest that in the age of rapid technological and environmental change, there is a need to challenge unnecessary binaries that limit the pedagogical renewal of environmental education responsive to our current troubled times. These

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binaries apply to discussions about nature and culture, traditional and digital literacies, outdoors and indoors, science and art, realism and fantasy, cognition and affect, and mind and body. Moreover, I posit that environmental education in the Nordic countries and beyond must recognise children's rights to multimodal communication, participation, and meaning making in the digital age and, importantly, ensure that children can develop a critical and transformative stance towards the relationship between people, technologies, and nature (Greenwood & Hougham, 2015). Here it is important to ensure that environmental education 'stays with the trouble' in the contact zones of human and nonhuman relations, and where digital technologies may play a part in bringing these relations closer to human attention (Facer, 2019).

In my chapter, I use relational ontology and Donna Haraway's (2008, 2016) worldling concept to revisit some of the imaginaries about childhood and their relationship to nature and digital technologies. I use them to understand and promote environmental education with digital technologies that have the potential to immerse children in nature. From the relational perspective (Barad, 2003, 2007), digital technologies are not just tools or objects that are used for predefined ends but agentive participants in the unfolding of activities that together with other actors including children, other humans, and nonhuman entities (i.e. animals, trees, waterways, rocks, materials, and tools) create a 'space' for worldling. Worldling accounts here for children's immersive engagement and relating in nature, including their attentiveness to complex relations between human and more-than-human worlds.

I start by identifying and assessing the persistent strands, binaries, and limitations of research on the integration of digital technologies in environmental education, with a specific interest on the uptake and use of augmented reality technology. Building on this review, I introduce a novel pedagogical approach to environmental education that moves beyond seemingly dichotomous thinking about children, nature, and digital technologies. To explain this approach, I draw on some empirical findings of the studies in the Enriching Children's Ecological Imagination (ECHOING) research group in which primary school children in Finland engaged in storying activities with augmented reality technology during their outdoor exploration and crafting and communicating of their stories (Kumpulainen, et al., 2020; Kumpulainen, et al., 2021). Using the notion of worldling, I illustrate the serendipitous unfolding of opportunities (worldling pathways) that children's storying activities with augmented reality technology generated. I end by considering the value of relational ontology to generate novel understandings of the co-emergent role of digital technologies in environmental education that can enhance our understanding and pedagogic practice of the relationships between children, nature, and digital technologies.

Digital technologies in environmental education

Digital technologies are becoming increasingly mobile, small sized, geo-locative, powerful, and low cost, contributing to modes of communication, engagement,

and representations of the natural world, holding novel, yet largely unexplored opportunities for environmental education and learning. To date, digital technologies have been used to connect learners to various local and distant environments that may otherwise be difficult or even dangerous to visit (Jacobson, Militello, & Baveye, 2009; Wrzesien & Alcañiz Raya, 2010). Similarly, technologies have been employed to provide learners with information about the environment and to contribute to environmental monitoring projects and data generation, sharing observations and findings with different communities (Fauville, et al., 2016; Fauville, 2017), as well as for taking civic action (see Mäkitalo in this volume). Digital games and play have also been integrated into environmental education to enhance motivation and nature exploration (Fjællingsdal & Klöckner, 2019; Schneider & Schaal, 2018). In the research literature (for reviews see Buchanan, Pressivk-Kilborn, & Maher, 2018; Fauville, Lantz-Andersson, & Säljö, 2014), the integration of digital technologies in environmental education has ranged from the use of digital cameras (Änggård, 2015), all the way to tracking digital trails and engaging in augmented reality that entails visualisation of virtual objects or multimodal information in a real world (Buchanan, Pressivk-Kilborn, & Maher, 2018; Schneider & Schaal, 2018).

Despite the paucity of research, there is some evidence to suggest that augmented reality technology can support environmental education and learning, enhancing students' interest in learning about the environment and developing positive relations with nature (Huang, Chen, & Chou, 2016). Importantly, augmented reality can provide access to nature, but also to render a perception that we are within nature. In this case, the educational potential of augmented reality is based on its ability to create learning experiences that combine digital and physical objects and spaces supporting students' critical thinking, problem-solving and communicating, and enhanced motivation and knowledge building (Chang, Hou, Pan, Sung, & Chang, 2015; Lu & Liu, 2015). For instance, in their study with sixth graders Kämäräinen, et al. (2013) investigated how augmented reality technology, paired with handheld environmental probes during a field trip to a local pond, was able to address ecosystem science learning goals and enhance students' sense making of water quality measurements. The study showed how augmented technology supported students' interactions with the pond and engagement in scientific practices with gains in attitudes and learning. The study by Lu and Liu (2015) investigated how augmented reality technology embedded in a digital game-based interactive learning environment supported elementary school students' learning about marine ecology and water resources. The technology was incorporated in the learning activity through digital storytelling with 3D visual images and game-based tests. Usefully, the study reported positive gains in the students' learning, confidence, and satisfaction. In their study, Enedy et al. (2012) used augmented reality to help children aged 6 to 8 years old learn the concept of Newtonian force and motion, concluding that using augmented reality embodied play enhanced children's learning in physics.

The promising pedagogical applications of augmented reality technologies in environmental education described above are not without their critics and are not

unchallenged. In parallel, there are discussions about how nature is represented in and through digital technologies, and whether this representation entangles children in nature (Kahn et al., 2009; Scott-Stevenson, 2020; Greenwood & Hougham, 2015). Some people also argue that digital technologies in general are related to neoliberal globalisation and a culture of fast speed that has little to do with the values and goals of environmental education that stress slow and deep immersive nature experiences in local natural environments and humans' relations and connectedness to nature (Payne, 2006). At its most extreme, instead of children touching nature, they touch screens that displace their immersive experiences with actual environments (Louv, 2012). It has been argued that the social and environmental costs of technological production have gone largely unexamined and taken for granted (Greenwood & Hougham, 2015). At the level of educational practice, the integration of digital technologies requires professional competence and creativity from teachers, and often they feel ill-equipped to deliver multidimensional and transdisciplinary goals (Wong & Kumpulainen, 2019). In addition, teachers find it difficult to employ digital technologies in environmental education as there are less available applications or pedagogical models on how digital technologies can be used outdoors during children's mobile and embodied learning activities in nature.

At the same time, systematic research knowledge about the possibilities of digital technologies in environmental education is limited, particularly as it relates to pedagogical efforts to immerse children in nature. It appears that research efforts around digital technologies in environmental education have focused on conceptual learning and motivation with predetermined plans, whereas holistic and open-ended approaches that acknowledge the affective, ethical, imaginative, and even mystical side of humans' engagement in and relations with nature are rare. This is a serious limitation as we know from research that increasing environmental knowledge is not the sole factor that connects people with nature or advances their valuing and caring for nature (Renshaw, et al., 2021). Instead, an affective connection is needed. It is holistic and immersive encounters with nature that support children developing appreciation, care, and advocacy for nature (Giusti, 2019). Therefore, there is a need to generate more research knowledge on how digital technologies enter into the relationship with human and nonhuman entities and how this potentially produces a space for children's immersive engagement in nature.

A relational approach to environmental education with digital technologies

In response to the need to develop environmental education relevant today, one of the studies in our ECHOING research group has investigated how cultural nature stories based on Finnish mythology, with augmented reality technology and children's own mobile storying activities, create potential animated spaces for children to be immersed in nature (Kumpulainen, et al., 2020; Kumpulainen, et al., 2021, see also Renlund, et al., in this volume). Our pedagogical approach – based on

relational ontology that views human, nonhuman and other matter as 'one plane of being', as entangled reality – recognises the mutually supportive narratives of literacy, art, science, and technology that can potentiate spaces for children's storying, and support children's immersive intra-actions in nature. Importantly, our pedagogical motivation aims to foster children's relational attentiveness to the complexities of the human and more-than-human worlds. In this case, Haraway (2016) helps us support children's understanding of humans as part of the web of life that transcends disciplinary boundaries and disrupts binaries between human and nonhuman, the natural and cultural, and the material and the discursive. Put differently, the opportunity to immerse in nature and to consider, form, and maintain a relationship with the natural world should be at the heart of environmental education.

Our interdisciplinary team has used Finnish mythology that invites children to address situations from several angles, offering alternative visions of the world and provoking fundamental questions that can in turn prompt change. An augmented reality application, MyAR Julle (www.myar.community/julle/index-en.htm) was created, framed by a short orienting story about a forest elf (Julle). Julle features elves, known as modest drillers, as caring supernatural characters who respect nature and its habitats but who also expected reciprocity from humans (Saure, 2019). The app allows children to project an immersive rendering of the Julle character in the physical environment and invites them to 'capture' it by taking a photo of it in nature and creating a short narrative around the character. Afterwards, teachers allocate time for children to communicate and reflect on their stories, and to share what they have experienced and/or learnt. Children's storying creates a space for collective discussions and reflections, and potential mobilisation of the children's stories (Kumpulainen et al., 2020).

Children 'worldling' with augmented reality technology

Building on relational ontology and using the lens of Haraway (2016) our research findings revealed 'worldling pathways', namely, playing and imagining, feeling and sensing, being and becoming, and critical thinking and future making that illuminate the ways in which the children immersed in nature and attended to complex relations between the human and more-than-human worlds. Following relational ontology, I understand worldling as a creative and performative practice that emerges in the entangled practices of the liminal in between (Irwin, 2013).

Playing and imagining

The augmented fictitious character Julle created a playful and imaginative layer to the children's storying in nature, enriching and expanding their worldling. The fictitious mode also brought forward incompleteness and open-endedness in the activity that further immersed children in nature. Many of the children imagined and played with the augmented reality character situating Julle in, on, or beside different plants and built constructions or abandoned objects, such as a

bicycle. The Julle character was placed peeking behind the trees, sometimes hiding from adults or children or secretly observing them. Some of the children also pictured themselves, their peers, or the researchers in their stories, illustrating how they or other humans were interacting with Julle and nature. The children also played with the technology, making the Julle character larger or smaller or turning the character upside down. This technological feature invited the children to experiment with proportions and composition. The different versions of the Julle character that the children could choose from in the app similarly invited playful experimentation and the making of stories. Altogether, the children's storying in nature with the augmented reality technology demonstrated their playful and imaginative immersion into the human and more-than-human worlds.

Feeling and sensing

Children's storying in nature with our augmented reality technology was rich in affect and senses. The children enjoyed creating augmented stories that reflected their sensed reality and fantasy in various ways (see also Wohlwend, Buchholz, & Medina, 2018). The children's stories were typically connected to specific places or things in nature, for instance, rocks or trees the children felt attached to. Some of the children emphasised the beauty of nature in their stories as they imagined the positive sensations these aroused in the Julle character and the children themselves. Meanwhile, some children imagined Julle to feel uncomfortable or unhappy in nature. For example, in some of the children's augmented stories, Julle was depicted as feeling scared of falling from a high place or being afraid of humans and hiding from them. Some seasonal changes were also in the children's storying – for example, in some Julle was feeling cold due to the snow. In summary, the children's storying with augmented reality technology evidenced the children's attentiveness to nature, as they lived through their emotions and senses with and through the augmented character Julle and nature.

Being and becoming

The open-endedness of the storying activity in our work allowed children to immerse themselves in nature, bringing to the fore different ways of being and becoming in nature. Moreover, storying with Julle brought forward the children's diverse experiences, identities, and cultural knowledge in relation to nature, evidencing how every place is about multiple stories that are also interconnected to other places and time (Massey, 2005). The children's storying communicated their experiences and understandings of local environments and places as well as people and other objects, both imagined and real. The children's storying with the augmented character Julle appeared to act as an encounter through which they could find and re-define themselves, their knowledge, and experiences as well as other people and nature, opening up opportunities for personal and collective dialogue and reflection.

Critical thinking and future making

Children's critical considerations of human and nonhuman relations were clearly shown in our research, addressing issues of power and ethics. This often happened when the children positioned themselves into the role of the augmented character Julle or they viewed the world in the role of animals, insects, or plants and made observations about humans' carelessness behaviour in nature. For example, the children storied how humans are destroying nature by littering and proposed that nature would be better off without humans. The children's storying also immersed children into considering their own values and pro-environmental actions to protect nature, such as picking up rubbish to protect nature when storying about collective efforts with other children. These findings are evidence of the children attending to the rich complexities of the present and imagining and acting on towards alternative futures. At a broader sense, the children's storying can be interpreted as a utopian practice that uncovers the richness and tensions of the meanwhile, and explores avenues for hopeful futures (Facer, 2019).

Discussion

In this chapter I have called for the need to challenge unnecessary binaries that limit and narrow research and pedagogical renewal of environmental education in the Nordic countries and beyond. Here I have discussed how relational ontology can offer a means to bridge these binaries between children, nature, and digital technologies. From the relational perspective, the meaning of digital technologies is not predetermined but instead it is emergent, temporally contingent, and socio-materially entangled (Barad, 2003, 2007).

Drawing on our research on children's storying in nature with augmented reality technology, I have shown how technologies can be conceptualised as agentive participants in the unfolding of activities that together with other actors including children, other humans, and nonhuman entities create an improvisational space for worldling – that entails attending to the complex relations of the human and more-than-human worlds (Haraway, 2016). It is these shifting relational entanglements that researchers and educators need to sensitise to understand the potentialities and challenges that emerge (Burnett, et al., 2020).

Furthermore, the worldling pathways illuminated by our research demonstrate how the children immersed in living and imaginative inquiries about the relation between themselves and other human beings, materials, technology, and nature. Storying with augmented technology invited the children to explore nature and its various elements – immaterial and material – from a range of perspectives and positions. Here, nature became alive and entangled with the children's engagement in nature as they explored and attended to environmental details, such as place, seasonal changes, temperature, and aesthetic details. The children's immersive investigation appeared to awaken their awareness of nature, themselves, and other humans. The children's living inquiry, playfulness, and imagination not only retold

a story and document sensed reality, but also invited the children to engage in imagining the future and how they can contribute to it.

The importance of critical thought in relation to integrating digital technologies in environmental education needs to be highlighted. In particular, pedagogical approaches covering the integration of digital technologies in environmental education draw largely on human-centric values with a focus on increasing children's environmental knowledge. Holistic and open-ended approaches that take account of the affective, ethical, imaginative, and even mystical side of humans' engagement in and relations with nature are rare. This is a serious limitation. Increasing environmental knowledge is not the sole factor that connects people with nature or advances their valuing, caring and advocacy for nature (Giusti, 2019). And, therefore, it is important to further understand how digital technologies can enter children's immersive and enchanted engagement in nature, recognising the affective, embodied, sensuous and moral dimensions of our being, learning and becoming in nature, in addition to knowledge enhancement. Similarly, we need to direct attention to the curriculum frameworks, and how they afford room for teachers to implement creative and holistic approaches in environmental education with digital technologies.

Above all, it is clear that more research and development work is needed to guide environmental education policy and practice towards a relational approach with (or without) digital technologies. Attention needs to be directed to the educational programs and approaches and the moment-to-moment emergence of sociomaterial entanglements that give rise to opportunities, tensions, and limitations. There is also a clear need to revisit the Nordic imaginary of an autonomous and independent child and to consider whether this imaginary ought to be revised into the notion of a relational child that positions the child as part of a network of social, cultural, technological, and environmental relations.

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Part II

Forms of communication, literacy, and learning

Chapter 6

Young children initiating and negotiating their digital literacy practices in their homes

Heidi Sairanen, Kristiina Kumpulainen, Alexandra Nordström and Anu Kajamaa

Introduction

Digital devices permeate many children's everyday lives in the Global North from birth, the Nordic countries being no exception (Chaudron, 2015; Letnes & Sando, 2016; Statens medieråd, 2017; Størup et al., 2020). The digital age is shaping children's early experiences of literacy, as well as interactions and relationships with others and the social and material world in general (Flewitt et al., 2015; Livingstone & Blum-Ross, 2020). Digital technologies and media are important mediating devices for children's thinking, learning, and identity development (Danby et al., 2018; Erstad et al., 2020; Marsh et al., 2017). For instance, research has shown how digital engagement can enhance children's authorship (Aliagas & Margallo, 2017) and transformative agency (Kajamaa & Kumpulainen, 2019) as well as narrative thinking (Skantz-Åberg, & Lantz-Andersson, 2020). Existing research also suggests that digital technologies and media can enlarge and support children's 'offline' life interests including playful, agentive, and creative engagement (Arnott, 2016; Given et al., 2016; Marsh et al., 2016).

In addition to the opportunities of the digital age for children's literacies, relations and learning, threats, and risks have been identified in the international research literature that permeate the everyday lives of children from a very early age (Livingstone et al., 2017; Danby, et al., 2018; Erstad et al., 2020). These include 'content' risks, such as exposure to harmful or age-inappropriate material; 'contact' risks, including exposure to unsolicited contact from adults; 'conduct' risks, such as cyberbullying; and 'contract' risks that are to do with data harvesting, commercial pressure, and exhortations to gamble (Livingstone et al., 2017). It is with respect to these risks and threats that many parents in Finland (and elsewhere) must negotiate as they navigate the balance between opportunities and risks that the digital world has to offer their children (Kumpulainen et al., 2020).

Lately, increased research attention has been directed to understanding how and why young children use digital technologies and media in their homes, and what roles parents and other relevant adults and peers play in children's digital literacy practices (Marsh et al., 2017; Kumpulainen & Gillen, 2020; Dardanou et al., 2020). Although there has been an increase in the availability of digital devices at home, it does not automatically mean that children are using digital technologies

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and media in meaningful, productive, or empowering ways. It has been shown that depending on the material and social contexts of homes, young children have varying degrees of opportunity to engage and learn with digital technologies and media in their everyday lives (Livingstone et al., 2017). Consequently, there is a need for more research on how the sociocultural contexts of the children's homes, and relationships between children and their parents, siblings, and other family members, support and/or hinder children's digital literacy practices, learning opportunities, and healthy development in general.

In this chapter, our aim is to contribute to current research knowledge on young children's digital literacy practices in the home. To do so, we have drawn on a video-ethnographic case study of two children (both aged two years old) and their digital literacy practices in their homes in Finland. Drawing on a sociоculturally framed understanding of digital literacy as embedded in tool-mediated social practices, we investigated how these children negotiated their digital literacy practices with their parents, and the agency of parents and children in these practices. In doing so, our research sheds light on the organisational dynamics of children's and their parent's agency in their digital literacy practices.

Children's digital literacy practices in the home: insights from Finland

In Finland, early childhood education policies and curriculum frameworks have a long tradition of emphasising children's initiatives and agency (Sairanen, 2020). Listening and responding to children's interests, initiatives and experiences are underscored in Finnish national core curriculum (EDUFI, 2018). Finnish society and its policies also value parents' agency and decision-making in managing and regulating their children's use of digital technologies and media. Although no strict recommendations for children's screen-time exist, several public guidelines and models are available to guide parenting practices in relation to children's use of digital technologies and media. These guidelines ask parents to control and observe their children's digital engagement, and at the same time to pay attention to their own screen time in the home. The recommendations also encourage parents to participate in their children's digital lives and in general to spend time with their children (MLL, 2017).

In Finland, there is a need for more contextually nuanced research about young children's digital literacy practices at home that acknowledges children's and parents' perspectives. The present study contributes to this lack of research knowledge with an interest in the sociocultural organisation of children's digital literacy practices in their homes in Finland.

Researching the negotiation of children's digital literacy practices at home

In our study, we viewed children's digital literacy practices as social practices with digital technologies and media involving tool-mediated reading, writing, and

multimodal communication (Marsh et al., 2016; Street, 1984). Digital literacy practices can include children's engagement with various texts, images, audio, video, and playing games while playing, reading, writing, analysing, and carrying out other activities relevant to their everyday lives (Marsh et al., 2017). Our understanding also holds that digital literacy practices can cross online/offline and material/immaterial boundaries resulting in hybrid social practices that challenge categorical notions of children's digital and non-digital literacy practices (Kumpulainen & Gillen, 2020).

Taking a sociocultural approach (Vygotsky, 1978), we regard children's digital literacy practices as relational and as culturally and socially framed (Kumpulainen & Lipponen, 2010). Furthermore, we hold that children's and their parents' funds of knowledge (Kajamaa et al., 2018), agency (Kumpulainen, Sairanen, & Nordström, 2019a; Sairanen, 2020) and historically developed norms and rules of their communities, including the home, organise and give meaning to their digital literacy practices including their agency in these practices (Kumpulainen et al., 2020). To us, children's digital literacy practices are closely related to the notions of agency and power relations, that is, who can make choices, add content, adopt active and interactive roles and identities with digital technologies and media (Kucirkova & Flewitt, 2018).

Our study regards initiations as important components of agency that manifest in multimodal ways in ongoing interactions between children, adults, and tools (Sairanen et al., 2020). Agency is constantly evolving and developing as we make initiations and respond to and negotiate them. However, agency may not manifest itself if an initiative is rejected or ignored. Following Linell (2009), we define an initiative as a related or unrelated attempt to influence the ongoing activity or interaction. Initiatives may be either verbal expressions or they can be expressed through non-verbal means such as by babbling, gestures, and sound. An initiative is typically culturally connected to the situation and to the response it receives. It can determine the direction and the flow of the activity or it can be an effort to introduce a new topic or perspective to the ongoing activity.

Study

Participants

Our study was conducted with two Finnish-speaking families in suburban areas in southern Finland in 2017. Two children, Laura (2 years, 11 months) and Maria (2 years, 9 months), and their families took part in this study.

Laura lives with her mother and father in a semi-detached house. Their home is situated next to a forest in which they often spend time. Laura's parents both have university-level education. Laura spends her days at home with her mother who is on parental leave and takes part in early childhood education activities at a kindergarten nearby a few times per week. At home, Laura has her own room. Laura keeps her toys, books, and other things in her room where she spends time alone and with her parents and friends. During the day she also spends time in the

family's living room, particularly on the couch. Sometimes she spreads her toys and things out in the house's corridor and plays on the floor or reads books there. At home, Laura uses her parents' tablet with her parents and by herself. During the week Laura uses digital devices occasionally but not every day. When she uses the tablet by herself, she asks her mother's or father's permission to use it or her mother suggests when to use the device. Also, Laura's parents prevent Laura from using the device by encouraging her to commit time to another activity. Sometimes the whole family sits together on the couch and watches TV or a laptop, especially if they are ill and at home on sick leave. There are days when Laura does not use digital devices at all. Laura spends time outdoors every day, in their yard or in the woods next to their home with her parents, and/or friends and their parents in the neighbourhood.

Maria lives in a terraced house with her parents and her little sister. Their neighbourhood is a park-like area. They have their own yard and a shared yard with their next door neighbours. Maria's parents both have university-level education. Her mother is on parental leave and her father works full time. Maria's mother has a full-time job to which she will return after Maria's little sister is a bit older. Maria spends her days at home with her mother and sister and, in addition, they spend time most days in the parks and nearby woods with other children and parents, and at home. Sometimes they visit their friends' homes. Maria's daily habit is to play in the park with her friends and family and she also has permission to play alone in their yard and the nearest housing cooperative's backyard. Maria uses her mother's smartphone, her parent's tablets, and watches their family's television. She prefers to use a tablet or a smartphone instead of a TV, although her parents occasionally put the TV on. Maria uses the devices by herself and with her parent(s). From time to time, she is asked if she would like to use the devices and, occasionally, she asks for the device. Although Maria's parents are positive about Maria's use of digital devices and see this as being significant in this digital era, they do restrict the use as well. Her parents have quite a good knowledge of the applications and the content that they consider to be suitable for Maria, and they encourage Maria to use the devices following her interests and then they negotiate the appropriateness of the content with Maria. The parents also recognise digital media to be a good source for learning English and a useful way for Maria to communicate with her friends and family.

Data collection and analysis

Our video-ethnographic case study followed the Day In the Life (DITL) methodology (Gillen et al., 2007). Following DITL, the empirical data collection included three visits to the children's homes. During the first visit, two authors of this chapter made acquaintance with the child and the family and explained the aim and purpose of the study. The whole family had the opportunity to get familiar with the methods of the data collection, that is, videoing, observing, and interviewing. During the second visit, two researchers spent a whole day with the case study family, following their daily lives in and outside the home.

Researchers videoed, observed, and wrote field notes of the child and her interaction with the people and the environment around her. Before the third visit, the researchers edited a 30-minute compiled video of the child's day by concentrating on those moments in which digital devices were being used by the child. During the third visit, one of the researchers showed the video of the child's day and discussed it with the parents. The discussion with the child's parents was videoed. Later, the whole video data corpus collected in the study were transcribed.

The study followed the ethical guidelines set forth by the Finnish National Board of Research Integrity. The parents were carefully introduced to the study and its goals before being asked for their written consent. During the data collection, the researchers were sensitive to the children's and their parents' wishes. All transcribed video data have been anonymised.

Our primary data corpus consisted of observational field notes and video data covering each child's full day. Parental interview data worked as a secondary data source to support our analysis and interpretation. Our analysis of the video and observational data followed the Interaction Analysis method instigated by Jordan and Henderson (1995), acknowledging the multimodality of evolving interaction. Our analytic focus was on the initiations and their negotiation between children and their parents during the children's digital literacy practices at home.

Findings

Next, we discuss our key findings with empirical examples that make visible the relational dynamics of the children's digital literacy practices realised through a reciprocal interplay of child and parent initiations.

Example 1: 'Do you need help?'

In this first example, Laura's mother initiates Laura's use of the tablet while she is preparing a meal in the kitchen with Laura's father. Laura begins to play a game of her choosing on a sofa in their living room. Laura plays quietly with a soft game sound in the background. The game appears to be quite difficult for Laura to play but determinedly she continues trying. Laura starts to wonder aloud how to drag a bird forward in the game, away from the water, and continues playing.

LAURA: How can you get it …?
Mother and father discuss in the kitchen.
LAURA: [unclear, talking about the game]
MOTHER: What you don't have there? What is that darling? Do you need help?
LAURA: Yes. [unclear]
MOTHER: What did you say? Do you need [help]? [comes next to Laura]
LAURA: Yes. This should get into the boat.
MOTHER: It should get into the boat?
LAURA: Again. It falls.

Figure 6.1 Laura is trying to drag the bird in the computer game.

MOTHER: But you are doing it very well. You should play it with one finger, then it is easier. There you go.
LAURA: But it doesn't … [unclear]. Hard.
MOTHER: Is it hard?
LAURA: Yes.

Together they continue playing and practising how to use one finger on the screen to move the bird and finally they finish the game together (Figure 6.1).

This example shows how Laura's mother takes the initiative by reacting to Laura's interaction. Laura is playing with a tablet by herself and, while playing, she faces a problem, and the game cannot continue. Her mother noticed that she needed help, replied to her, stopped her chores in the kitchen, and moved next to Laura to the living room. The mother's reply shows her active negotiation and involvement in Laura's problem verbally and non-verbally. In addition, the negotiation between Laura and her mother leads to a shared playing session.

Example 2: '… and then to the music program'

The second example shows how Maria and her mother together negotiate Maria's digital literacy practices both in terms of the device and content. Maria tells her mother that she wants to watch a children's program from her mother's smartphone.

MARIA: I want to, mother, watch the children's program.
MOTHER: You want to watch it? Mother opens it [the smartphone], there you go.

Maria's mother gives the phone to Maria and she climbs onto the sofa to choose the content. When the sound of the cartoon begins, Maria's mother advises her that she is allowed to watch only one cartoon and then she should change to a music program. Maria agrees and continues to watch the cartoon she has chosen. In the middle of the cartoon, Maria quits the program and begins to navigate and search for other content. First, she opens another cartoon but, in a few seconds, ends the cartoon and continues navigating. Finally, she finds a music programme and begins to watch it (Figure 6.2).

Our second example illuminates how Maria takes the first initiative by asking to watch a children's program (with a large amount of various content) from her mother's smartphone. The mother agrees with Maria's initiation but at the same time the mother regulates Maria's digital literacy practice by asking her to watch only one cartoon and then she should choose a music program. The example shows a reciprocal interplay of a child-initiated and adult-initiated digital literacy practices that were strongly mediated by the parents' rules and reveals how Maria's

Figure 6.2 Maria is changing the cartoon to the music program.

digital literacy practice in watching a cartoon was shaped by parental rules for her media use that she was willing and able to follow.

Example 3: 'Five minutes and then we will quit the game'

In our third example, Laura' mother initiates Laura's use of the digital device. Laura has just woken up from her nap and she is sitting on a sofa in the living room. Her mother asks if Laura would like to use the tablet. Laura responds positively with her mother's initiation and smiles when she is receiving the tablet from her mother.

MOTHER: Laura, five minutes and then we will quit the game.
Laura takes the tablet and starts to choose the content.
MOTHER: What are you going to play?

This third example provides an insight into parent-initiated activity with a digital device whilst Laura's mother suggests that Laura can have the tablet after her nap. The mother explained that the reason for her initiation was that she wanted to give credit to Laura as she had behaved well earlier and fallen asleep quickly for her daily nap. The mother also explained that this was a good situation to encourage Laura to play with the tablet. Here, the mother controlled the use and timing of the device whereas Laura could make decisions about the content, that is, what she wanted to play with the tablet. The parental initiation and mediation of the child's digital literacy practice is shown across time, device, and content. Interestingly, in this example, the child's playing a digital game is framed by the mother's interest to thank the child for her obedient behaviour. At the same time, the initiation served the child's interest to play a game and the parent's interest to encourage the child's engagement in digital literacies.

Example 4: 'Maria, Max is trying to call you'

In our fourth example, Maria's mother initiates Maria's use of a smartphone as an opportunity to connect outside home. Maria, her mother, and her little sister are returning from their daily visit to the playground and woods nearby home. Maria wants to stay in their yard alone for a while before going inside. Her mother and little sister go in. After a while Maria's mother comes out and tells her that Max, Maria's friend, is trying to call her.

MOTHER: Max, Max is trying to call you, Maria.
MARIA: Aha.
MOTHER: Do you want to talk with him?
MARIA: Yes.

Maria quits playing outdoors and goes inside. Maria takes her shoes off with her mother's help and her mother gives the phone to her. She makes the call and Max

Figure 6.3 Maria is having a video call with Max.

answers. The conversation between the children begins by asking multiple times what they have been doing during the morning. The children also watch each other from the screen. Max's mother joins in the conversation and comments on Maria's response. Max asks why Maria did not call her earlier and Maria responds that she does not know. Maria's mother tells them they were in the park and Maria repeats this to Max. After a while Maria and Max decide to end the call (Figure 6.3).

Our fourth example shows how Maria's mother initiates Maria's use of her smartphone. The example illustrates how Maria's mother acted as a broker to facilitate Maria's communication with her friend Max ensuring that Maria is able to communicate and connect with Max. Usually, Maria meets her same-aged friend Max at the playground but today the routine was different and instead they met through a video call. The intention of the activity initiated by Maria's mother was to enable Maria to be virtually connected with her friend.

Discussion and conclusions

Homes form an important and intriguing research context to generate research knowledge about the ways in which the digital age and its literacies are shaping children's lives, communication, and learning (Kervin et al., 2018; Kumpulainen & Gillen, 2020). Our findings make visible the relational dynamics of the children's digital literacy practices in their homes realised through a reciprocal interplay of child- and parent-initiations. Interestingly, not only did the children initiate their

digital literacy practices but the parents actively initiated their children's digital literacy practices as well. Our study shows how both children and their parents initiated the duration, content, and the purpose of their use of digital technologies and media, and how these initiations at times led to joint engagement in digital literacy practices between children and their parents.

At the same time, the findings demonstrate how the children's agentic actions and initiations of their digital literacy practices were firmly grounded on parental mediation, reflecting the parents' values and conceptions of what it means to be a parent and a child in the digital age. The parental mediation of their children's digital literacy practices was built around active negotiation, guidance, control, and involvement in the child's lives, and they echoed policy recommendations and guidelines inherent in Finnish society. These values and conceptions of parenting and children were hybridised in the daily rhythms and lives of the families serving both the parents' and children's needs and motivations.

The children's digital literacy practices evidenced multimodal literacies. The children engaged in playing games, watching cartoons and videos, listening to music and sounds, texting with emojis and communicating with friends and family members, taking photos and videos, searching for information, and learning to use the digital devices. Our findings resonate with a recent large-scale survey study of parents in Finland, indicating how digital devices are only one part of children's everyday lives (Kumpulainen, Vartiainen et al., 2019b). The children's lives in the home were filled with many other activities and literacies including indoor and outdoor play with traditional toys and tools, crafts, sports, and printed literacies. The parents in this study considered digital literacies to be an important part of their children's lives, and rather than avoiding the digital media, they embraced it. However, in the interviews the parents expressed their struggles and concerns about finding the 'right' balance between their children's digital lives and other lives. The parents found it valuable to have the opportunity to discuss these issues with the researchers during the study.

How the digital age is impacting children and childhoods including their literacies and learning in the long run requires more systematic and longitudinal research. We also need more research on children's digital literacy practices among diverse families and children, acknowledging how differences between social, cultural, and material resources in families interact with children's digital literacy practices and learning opportunities. This research knowledge is valuable for ensuring all children's equitable, safe, and productive engagement with digital technologies and media. We hope our research with its culturally nuanced methodology will inspire more research in children's digital literacy practices at home.

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Chapter 7

Digital storymaking

A powerful pedagogic approach in the Swedish preschool class

Ewa Skantz-Åberg and Annika Lantz-Andersson

Introduction

Children in Western society are frequent users of digital devices and Web resources and thereby encounter a textual landscape where symbolic systems, sounds, and images are woven together in new dynamic ways, which offer interactive possibilities for meaning-making (Burnett & Daniels, 2016; Chaudron et al., 2018; Neumann et al., 2017). Experiences with such texts contribute to position children as capable users and producers of new modal combinations (Erstad et al., 2019). Nordic research shows, however, when children enter formal education, they commonly meet a pedagogy that does not regularly build on these experiences but emphasises academic content and methods (for discussion about the Swedish preschool class[1] see Ackesjö & Persson, 2019). Especially in literacy practices, conventional skills-oriented reading and writing instruction dominates (Hagtvet, 2017), regardless of the use of print or screen-based technology (Andersson & Sofkova Hashemi, 2016). Such teaching, which tends to reduce children's opportunities to learn through experience-based interaction (Botö et al., 2018), is likely maintained by the political discourse that values measurable learning outcomes (Sefton-Green et al., 2016). The question is whether skills-oriented approaches are sustainable given the digitalisation of society, which places increasing demands on citizens' literacy competences. Research indicates that teachers face challenges in meeting the curriculum standardisation and simultaneously providing children with opportunities to develop so-called twenty-first-century skills (Neumann et al., 2017; Oakley et al., 2018) suitable for participation in modern society, such as communicating, problem-solving, creativity, critical thinking, and digital literacies (Sefton-Green et al., 2016). A balanced pedagogy is needed, which in parallel to conventional literacy cultivates such skills. However, to date, there is limited research on how such pedagogy can be designed. In this chapter, we present a detailed analysis of storymaking activities embedded in a Swedish preschool class, where the teacher's balanced approach enables the children to involve multiple uses of semiotic means and thereby displaying how digital storymaking can be powerful for supporting emergent literacy and twenty-first-century skills.

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A Nordic perspective on early literacy education – the case of digital storymaking

Nordic countries' households, including children,[2] have high access to digital technologies and are among the leading countries having the highest Internet penetration rate (Statista, 2021). To take advantage of the potentials of the digital revolution, Hagtvet (2017) proposes that Nordic early literacy education should be seen as a 'project of democratization, where access to digital literacy is a tool to participation in the Nordic societies' (p. 107). She thus emphasises the importance of education to support children in becoming digitally competent and active participants in order to prepare them for critical citizenship. Studies from Finland, Norway, and Sweden indicate that socially organised storymaking activities are one possibility to enable children's growing participation and agency because they constitute links to children's popular media culture (Leinonen & Sintonen, 2014: Merjovaara et al., 2020).

Traditionally in school, the narrative genre is used as means to engage children to learn to read and write, often involving print-based material. With the increased access to digital tools, other opportunities are offered for narration and literacy learning (Andersson & Sofkova Hashemi, 2016). Storymaking with 'open-ended' technology that enables the use of multiple symbolic systems, sound, and colour can contribute to aesthetic and emotional experiences (Skantz-Åberg, 2017). Moreover, it can benefit the exploration of symbolic language and the learning of a certain vocabulary depending on content (Letnes, 2014; Skantz-Åberg & Lantz-Andersson, 2020). By being producers themselves, 5–6-year-olds receive possibilities to explore and understand how to draw on different mediational means to communicate a story (Letnes, 2014). Merjovaara et al. (2020) explicitly relate digital storymaking to children's learning and development of collaboration, creativity, and problem-solving competences. In contrast to conventional literacy activities, engaging digital storymaking may appear unstructured, 'crowded, noisy and chaotic' as children negotiate in a playful manner (Wohlwend, 2015, p. 155). Such literacy events might pose challenges for teachers, who have to deviate from regular routines and act as 'innovators' (Pöntinen & Räty-Záborszky, 2020) embracing a pedagogy involving digital technologies as a resource complementary to others (Sefton-Green et al., 2016). Recent studies show that beneficial storymaking activities are characterised by teachers that encourage and invite the children to dialogue and function as co-explorer (Skantz-Åberg & Lantz-Andersson, 2020; Undheim & Jernes, 2020). In sum, studies on digital storymaking display promising potentials for developing children's multimodal literacies and twenty-first-century skills but are conditioned by appropriate tools and supportive teachers.

Most studies accounted for above are conducted in preschool involving the younger children. Research in early literacy classrooms governed by other curriculum demands is scarce. Against this backdrop, the study aims to provide insights into the nature of a pedagogical approach that makes space for six-year-olds to explore their repertoire of semiotic means. This is done by an in-depth analysis of their storymaking activities with and around an interactive whiteboard.

A sociocultural framing of the digital storymaking activities

In the study, the observed storymaking activities are part of the ongoing literacy practice in a preschool class. From a sociocultural perspective, these activities are understood as social sensemaking practices contingent on the involved tools and the situated context (Vygotsky, 1978). A theoretical premise is that the use of cultural tools (intellectual tools, such as language, mathematical signs, symbols, letters, and artifacts) contributes to transforming how people think, communicate, and act (Wertsch, 2007). The main tool in interaction, verbal language, is commonly used adaptively depending on needs and situation, which is possible due to its semiotic nature. In addition to speech, sensemaking processes typically involve the juxtaposition of different bodily resources, such as gestures and gazes (Goodwin, 2000; Vygotsky, 1978). This view implies that to understand, for example, children's and teachers' negotiation of narrative ideas, a unit of analysis is required that encompasses all the multiple means used to make sense. Attention must also be given to the artifacts that interplay with the participants' actions in the activity (Wertsch, 2007). The main artifact in the study is the interactive whiteboard, an example of a digital tool that transforms the conditions for gaining experiences. Drawing on Vygotsky's thoughts, digital technology consists of both physical materials that offer users to influence the 'activity object', and embedded conceptual knowledge that serves as a tool for mastering mental activity. These characteristics make the technology powerful and motivating and with which one can perform symbolic actions, for example, it enables the combination of means of expression, such as sounds, symbols, colours, and images in new ways (Oakley et al., 2018).

For children's literacy learning, understanding symbolic representation was emphasised as one of the most important aspects by Vygotsky (Kozulin, 2003). The concept of representation refers here to a direct image of an object, and symbolic representation refers to symbols carrying a message beyond the physical and visual sign. Examples from the study of symbolic representation are the drawn red lines behind a car symbolising fire and speed. The meanings of symbols are culturally conditioned and must be deliberately mediated by others more knowledgeable so as not to remain useless to children (Kozulin, 2003). It is the relationship between a symbol and what it refers to, children need to master to develop an understanding of different symbolic systems such as the written language.

To understand the interplay between the participants in the study, the applied cultural tools, and the symbolic representations, we use the concept of semiotic mediation (Wertsch, 2007). It refers to how the participants understand and negotiate the symbolic meanings in the specific situation. Their set of means of expression is termed a repertoire of semiotic means. These premises suggest that children's interactive storymaking should be studied in situ to understand the repertoire they use, rather than focusing on individual children's achievements.

The empirical study

This chapter draws on empirical data from a project conducted in two Swedish primary schools including three preschool class classrooms between 2013 and 2015. Here we provide insights from observations in one of the classrooms where six- and seven-years olds in small groups created six stories with the support of a preschool teacher. An interactive whiteboard (IWB) with the software Notebook[3] was used. The digital tools enabled possibilities for joint creation through the large touch-sensitive screen on which the children could work simultaneously. Furthermore, a toolbar with several applications such as pencils, a colour palette, and an eraser was offered.

For the study, the empirical data consists of 270 minutes of video recordings from six storymaking activities. Two cameras recorded what was played in front of the screen; one aimed at the participants' faces and one aimed at the screen from behind. The recordings were manually transcribed in full following the principles of Interaction analysis, implying that linguistic actions, such as words and phrases, as well as bodily movements, such as gestures and gazes, are carefully included (Keyton, 2018). In line with the sociocultural perspective, these actions are in the analyses considered contingent on the interplay between the digital tools and the social interaction in which the children bring in their previous experiences and knowledge. How actions are accomplished, responded to, and subsequently leading to other actions is key to understanding human interaction (Heath, 2011) and sensemaking. Thus, the method allows for systematic 'unitizing, coding and interpretation of naturally occurring conversations' (Keyton, 2018, p. 7). Based on this, the present data was analysed iteratively by reviewing the recordings and the transcripts and by including a minimum of three 'action-turns'(Heath, 2011) to distinguish the interactive nature of the technology-mediated activities.

All ethical guidelines formulated by the Swedish Research Council (2017) are followed to protect the rights of the participants. Before the study, all caregivers were informed in writing about the research aim, and the caregivers of the five participating children signed consent. One of the researchers met and informed the children in an age-relevant way about voluntary participation and the right to leave at any time during the recordings. The children's names are all pseudonyms.

Findings from digital storymaking activities

In the following, we will show a pedagogical approach in the form of storymaking and its implication for the children's participation, by carefully selected and analysed excerpts,[4] which display how the teacher supports the children and their exploration of different semiotic means during the negotiation of the story content.

Before introducing the children to the task, the teacher prepares the activity by creating a grid with four boxes on the IWB screen, numbered 1–4, within which

the children are expected to narrate. Thus, the teacher structures the activity by using the grid as a mediating tool to limit the physical surface to work on and to cognitively support making a coherent story. The first excerpt presents a sequence where Elias and Leon during the creation of Silvermario negotiate the number of cars to be included and how the teacher suggests alternative ways to represent these objects.

Excerpt 7.1. Suggesting alternative symbolic representation

249. Elias:	how many cars are there
250. Leon:	one thousand billion
251. Elias:	exactly it is one thousand billion cars here in Mario Cart
252. Teacher:	how could you show so many cars or maybe you could write just that
253. Elias:	shall we ah
254. Leon:	mm
255. Teacher:	some things can be easier to write than to draw maybe but you decide
256. Leon:	we draw no we write I mean

So far, the boys have drawn their story, but are now facing a problem as they want to include an enormous number of cars into the story (turn 250, 251). The teacher realises that drawing all these cars is a demanding task and therefore offers a solution to the problem. At first, she challenges the boys by asking how they could 'show' the cars (turn 252), thus leaving room for them to choose means of expression. Without waiting for an answer though, she then suggests writing and justifies this by saying in turn 255 that it is easier (in terms of more economical) to write than to draw. The suggestion, however, implies a difficult transformation of means involving abstract symbolic thinking. That is, instead of drawing direct representations of the cars as objects, the children have to produce a symbolic representation of speech sounds: 'one thousand billion cars' in the form of letters, which presupposes an understanding of the principles of written language.

Innovative problem-solving with multiple means

The two following excerpts display the participants' engaged collaboration during the creation of a story named *The three policemen*. Kalle has proposed a setting and a character, uttering with an intense tone of voice: 'I know something super scary, we are in a in a haunted hotel[5] and then comes this scary monkey who scares people.' The sequences that follow show how multiple semiotic means, such as spoken and written language, imagery, and gestures are explored, negotiated, and used by the children to represent Kalle's narrative idea on the IWB screen. Excerpt 7.2 illustrates the written representation of the word scary (in Swedish: *läskig*), which wrongly spelled becomes playful (in Swedish: *lekig*).

Excerpt 7.2. The transformation from verbal to written means

	Speech	*Body movement*
372. Kalle:	what should I write hm *E N L E K I G* a scary monkey	sounds and writes the letters in box three (see Fig. 7.1)
/…/	*the participants talk about the computer*	
380. Teacher:	a playful monkey [*lekig*]	reads the text on the screen
381. Kalle:	scary	
382. Teacher:	scary aha	
383. Kalle:	not playful	
/…/	*Viktor is occupied adjusting the screen height*	
385. Teacher:	then you got to have then you need one more letter Kalle	
386. Elias:	*S*	points at the screen
387. Teacher:	what is missing	
388. Kalle:	dot [*in Swedish diminutive: punktis*]	marks a dot after the word monkey
389. Teacher:	but a letter is missing in play [*lek*]	
/…/		
392. Elias:	playful	
393. Kalle:	pl *E* ah	
394. Teacher:	you need to get push in a small	
395. Elias:	*S* (.) playful	smiles, has a happy tone
/…/		
397. Teacher:	yeah	Kalle writes s

Kalle's proposal is to be transformed from verbal to written language, which is laborious and requires a lot of support from both the teacher and peers. To perform this transformation of means, Kalle needs to distinguish and identify all the speech sounds in the words, and then correspond them with alphabetic symbols. Simultaneously, in this act, he must remember the complete sound image of the word to avoid omitting any letters. In turn 372, Kalle accidentally uses the wrong vowel, which is understandable since e and ä sound similar in Swedish. Additionally, he omits the consonant s. The misspelling is discovered when the teacher reads aloud (turn 380), which leads to Kalle's correction (turn 381, 383). The teacher's awareness of Kalle as a novice writer and that the omission of s results in a difference in meaning, makes her turn the attention to the missing letter (turn 385). Elias also engages with what is happening on the screen and acts as a supporting peer by pronouncing the letter (turn 386, 395). However, the teacher does not pick up on Elias' utterances, instead, she continues to narrow down the problem by asking a question (turn 387) and then further by pointing out in which word

the letter is missing (turn 389). The sequence contains an element of amusement as the spelling mistake alters the character of the monkey.

Excerpt 7.3 shows how Kalles' idea of a haunted hotel, which was written down in the second box, now is to be represented figuratively in box 4 (see Figure 7.1).

Excerpt 7.3. Aesthetic creation of a new word as a symbolic representation

	Speech	*Body movement*
634. Kalle	do like scrapers on the house as well [*in Swedish: skrapor*]	raises the hand slightly
635. Viktor	yeah I will do that later lots of scrapers	
636. Kalle	but I do the scrapers	
637. Teacher	what are scrapers	
638. Kalle	the house is old and stuff	
639. Teacher	aha I understand it should look a little scratchy [*in Swedish: skrapigt*]	
640. Kalle	what is that	watches Viktor making marks on the screen
641. Viktor	scrapers	
642. Kalle	but this is how you make scrapers	takes the pen from Viktor, presses the eraser tool and deletes the marks
In turn 643–648 follows a discussion about what to delete or not		
649. Kalle	(inaudible) like kind of stripes	draws several short stripes on the house
650. Teacher	yeah now you can see that it is haunted	

Kalle introduces an invented word, scrapers,[6] which he encourages Viktor, who is holding the pen, to draw on the hotel building (turn 634). Viktor states that he will make scrapers without questioning their appearance (turn 635). The teacher does not share their understanding and asks what scrapers are (turn 637). Her question provokes Kalle to reflect on the word meaning and verbalise his thoughts 'the house is old and stuff' (turn 638). Recognising his innovation, the teacher then reformulates the noun into the adjective scratchy to denote the appearance of the house (turn 639). Kalle rejects Viktor's attempt to draw his version of scrapers, which is established as he approaches the screen and deletes the marks (turn 642). Kalle seems to have an aesthetic idea of how scrapers should be represented, which he makes visible by uttering stripes and by drawing short marks (turn 649). Thus, before Kalle could visualise his original idea of a haunted hotel on the screen, he needed to take a detour through the verbal language (scrapers) as an intermediate resource to articulate his thinking. Importantly, the teacher confirms Kalle's symbolic representation by referring back to the initial word that gave rise to the negotiation (turn 650). Analytically, this sensemaking is made possible by the semiotic nature of language and the situated social interaction. The two excerpts

illustrate how this pedagogical approach encourages the children to use the symbols at their disposal (Figure 7.1).

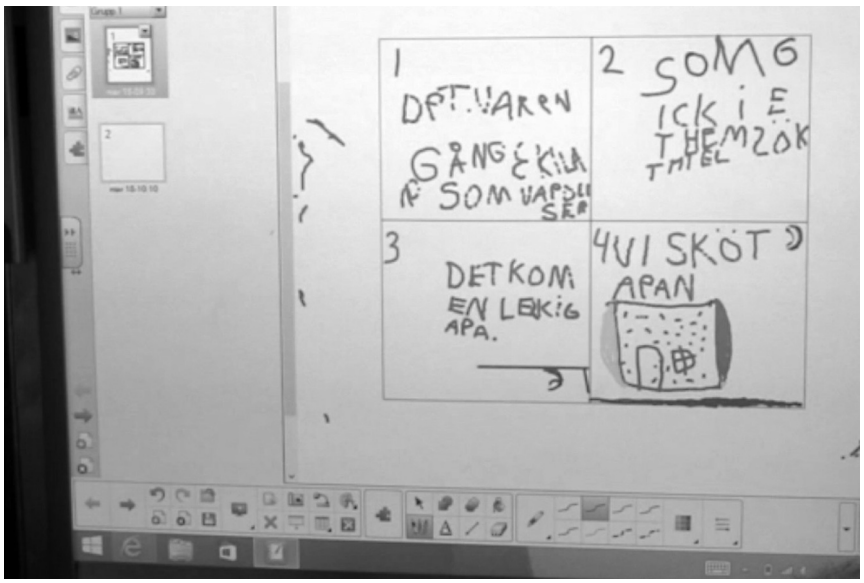

Figure 7.1 The three policemen – a story created on the interactive whiteboard.

Exploration of the digital tool and movement

The next excerpt shows how Leon moves from depicting *Batman*'s car on the screen to symbolically represent its movement by multiple means of expression.

Excerpt 7.4. Symbolic representation of movement with multiple means

	Speech	*Body movement*
35. Elias:	this one has really many different colours right	
36. Leon:	I play [this is fire	draws an orange vertical line next to a red behind the car
37. Elias:	[black orange (.) is that fire	
38. Leon:	yeah cause there is a fire here behind [so he goes faster	turns his gaze at Elias, puts his hands behind the back and shapes them as a circle (see Figure 7.2)
39. Elias:	[ah but in which direction does it go	orients towards the screen
40. Leon:	in that direction	orients towards the screen, moves the hand from left to right (see Figure 7.2)

Just before the sequence, Leon tries out different colours provided by the Notebook colour palette and then draws a red vertical line behind the car. In turn 35 it appears that Elias does not yet understand that the line represents a speed line. This is not strange since the line is vertical, which is at odds with the figurative design language typically used in comics where horizontal lines carry symbolic meaning for movement. Leon explains, while drawing the orange line, that he pretends that the lines are a fire (turn 36). The conscious choice of red and orange colours indicates his awareness that they symbolise fast speed. Elias seems surprised, which is expressed with a somewhat critical tone and his reformulation of Leon's explanation into a question (turn 37). To clarify his narrative idea and create a common understanding of the symbolic representation, Leon uses two semiotic means with tightly overlapping. He turns to Elias and uses speech, 'yeah cause there is a fire here behind so he goes faster', and a circular hand gesture behind his back (turn 38). The boys orient towards the screen. Elias seems unsure about the direction of the car, probably due to the vertical lines, and poses a question (turn 39). Leon responds 'in that direction' again reinforcing his utterance with a hand gesture moving from left to right (turn 40). In the negotiation, the gestures have a communicative function but they are also important for Leon's sensemaking in the narrative enactment. The hand movement can further be interpreted as a way of bridging what the Notebook does not offer, that is, moving images (Figure 7.2).

Figure 7.2 Two boys in front of the screen negotiate story content. Left image – see conversational turn 38 (in Excerpt 7.4); right image – see conversational turn 40 (in Excerpt 7.4).

Discussion

One of the key questions for literacy theory and practice today is 'how to define and delineate literacy in the digital era' (Sefton-Green et al., 2016, p. 14). This chapter contributes to some insights into emergent literacy through a detailed analysis of storymaking activities where the participants interact with and around an interactive whiteboard. The teacher's design of the activity, her choice of genre and tools, turns out to be a powerful pedagogical approach where the children are given space to participate with their experiences and knowing. In line with previous research (e.g., Skantz-Åberg, 2017; Skantz-Åberg & Lantz-Andersson, 2020), the study shows how the children could invoke shared popular media experiences as a resource. For example, during the *Batman* and *The three policemen* productions, we find elements adopted from the superhero, comics, and horror genres, such as characters and setting. In this imaginative world, the children both reproduce and give new symbolic meanings to those in the media. Wohlwend (2015) considers such actions similar to those of readers and writers who 'link printed words to symbolized ideas' (p. 159). Based on this, children's experiences of non-digital and digital texts outside formal education cannot be isolated from what 'happens on-screen' in the classroom (Burnett & Daniels, 2016; Erstad, et al., 2019; Neumann et al., 2017) but should be considered as gateways into several literacy paths (Wohlwend, 2015).

Further, our findings resonate with Oakley et al. (2018) and Letnes (2014), which show that the children use a repertoire of semiotic means, such as speech and gestures, to communicate and negotiate narrative ideas. From a sociocultural understanding of multimodality, they are seen as interdependent in the children's actions and thus equally important (Wertsch, 2007). However, our analysis reveals that they function differently depending on the purpose. Goodwin (2000) shows that gestures often constitute visual versions of speech but can also, as in the case with Leon in this study, add to the meaning of their own. For example, the circular hand gesture in Excerpt 7.4, which probably represents a fuel rocket, symbolises velocity by Leon's utterance. The placement of the hand gesture behind the back adds a spatial dimension to the representation of movement. What evoked these semiotic actions is, as seen above, the car with the speed lines on the screen that was created with the Notebook colour palette. It is important to understand the symbolic act similarly and thus the narrative idea; the boys have to ascribe the lines, the utterances, and the gestures the same meaning. The storymaking activity offers a context for them to develop an understanding of culturally agreed symbolic conventions where they can learn from each other (Kozulin, 2003). Based on our findings, we agree with Letnes' (2014) view of the importance of meta-discussions about symbolic systems and linguistic expressions and their different semiotic relations in the early literacy classrooms. As shown in Excerpt 7.1, the participating teacher takes such initiative to discuss alternative ways of expressing a narrative idea on the screen, and by that, she enables new ways of thinking (Wertsch, 2007). Moreover, the teacher demonstrates other pedagogical strategies, such as instruction, asking questions, explaining,

pointing at critical aspects to support the children when facing problems, which is a finding following Undheim and Jernes (2020).

Thus, consistent with previous literature (e.g., Leinonen & Sintonen, 2014; Merjovaara et al., 2020; Oakely et al., 2018; Pöntinen & Räty-Záborszky, 2020), this study displays that socially arranged literacy activities with digital technology motivate young children to engage in the task as active and reflective co-producers of stories. We argue that the pedagogical approach answers to what Erstad et al. (2019, p. 1) term 'the multimodal nature of contemporary literacy practice' since it entails opportunities to use previous experiences; learn conventional literacy, such as decoding/encoding letters and words; symbolic and critical thinking; use of semiotic means; practise communicative skills; negotiate; collaborate; make choices to solve problems, and to operate digital technologies. Although this is just a small case study, it shows that all these abilities come into play during digital storymaking activities. It shows a pedagogical practice that echoes what Hagtvet (2017) calls the democratisation project in Nordic early literacy education.

Concluding remarks

In the introduction, we stated that the study should be understood in the light of a strong trend towards an autonomous view of literacy in education that privileges phonics and technical decoding/encoding skills, reaching even the earliest school years. Critical voices warn that such a narrow notion of literacy risks entailing instruction that overlooks competences required in the twenty-first-century digital landscape (Ackesjö & Persson, 2019; Andersson & Sofkova Hashemi, 2016; Sefton-Green et al., 2016). Our study has shown that a balanced pedagogy can tap into early literacy classrooms, making space for children to learn and develop competences that are stressed as important in a digitalised society. In that way, the study contributes to the field of knowledge by showing how technology-mediated storymaking activities can enhance children's discovery of the potential of semiotic means by involving resources they already master and encourage them to explore others.

Notes

1 The Swedish preschool class is a one-year compulsory schooling for six-year-olds with a special curriculum.
2 Norwegian *Medietilsynet* reports that in 2018 91–93 per cent of the 5–12-years-olds had access to the Internet at home (www.medietilsynet.no). Chaudron, Di Gioia, and Gemo (2018) report that in 2015 90 per cent of the Danish children under 7 had access to tablets and 98 per cent of the school children used the Internet; in 2016 88 per cent of the Finnish people used digital devices and the internet. In total, 84 per cent of the Icelandic 6–7-year-olds have access to digital devices (see Gudmunsdottir et. al., this volume). The Swedish Internet Foundation reports that in 2019 97 per cent of the 6–10-year-olds used the internet occasionally and 79 per cent were daily online (https://internetstiftelsen.se/kunskap/rapporter-och-guider/barnen-och-internet-2019).
3 Notebook is the standard software for the tool SMART Board, an interactive whiteboard.

4 The transcription key is as follows: [= point of overlap speech; (.) = a micro pause; the sounding of letters is indicated in capital letters and italics.
5 *Haunted* is an abstract word, not usually included in young children's vocabulary. The source of Kalle's idea can probably be found in popular media where the ghost story genre is a trend.
6 The word could be a homonym for a tool scraper that causes marks on walls or be connoted to marks done by animal claws.

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Chapter 8

Digital language contact between Icelandic and English

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Introduction

The digital age has transformed modern societies. Although increased access to technology brings countless opportunities for citizens of the modern world, it also raises questions about the effects of digital devices on children's development, including their language acquisition (e.g. Madigan et al., 2019). Due to the spread of English as a worldwide language (Crystal, 2003) and its use in digital media and technology, many language communities today are in Digital Language Contact with English. This term refers to the situation in which speakers come in contact with another language in the digital domain as opposed to eye-to-eye contact in more traditional domains. Although conventional language contact is well studied (e.g. Thomason & Kaufman, 1988), this new type of language contact is an understudied phenomenon.

The population of Iceland was 368,590 on 31 December 2020 (Statistics Iceland, 2021), which makes Icelandic one of the smallest independent languages in the Western world. It is the only official language of Iceland (apart from Icelandic sign language), has a long literary tradition, and is almost the sole language in government, public administration, workplaces, education at lower levels, and most other domains of society. Although the country has long been largely monolingual (Hilmarsson-Dunn & Kristinsson, 2010), immigration has increased in recent years and immigrants are now 15.2% of the population, with people born in Poland being the largest group (37% of all immigrants) (Statistics Iceland, 2020). Additionally, there is increased contact with English through digital devices in Iceland today with English digital input being an important part of the daily life of many Icelanders. Popular streaming providers, like Netflix, almost only contain material in English and a limited amount of it is dubbed or subtitled in Icelandic. The same applies to the Internet, e.g. for YouTube, which is popular with young Icelanders.

The possible negative effects of increased digital contact with English on children's language acquisition have been a growing public concern in Iceland in recent years. Thus, today, it is often claimed that Icelandic is losing ground to the globally dominant English (Rögnvaldsson, 2016). This public concern was one of the motivations for the research project *Modeling the Linguistic*

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Consequences of Digital Language Contact (MoLiCoDiLaCo, https://molicodilaco.hi.is), which was awarded a three-year grant of excellence from the Icelandic Research Fund in 2016–2019 (PIs Sigríður Sigurjónsdóttir and Eiríkur Rögnvaldsson). The main goal of the project was to construct a nationwide profile of the Icelandic and English input that Icelandic speakers of different ages receive, their attitudes towards the two languages, and their language use and skills, testing both vocabulary and grammar. In the project, we took advantage of the homogeneity and the small size of the Icelandic population to get an overview of the nationwide effects of digital language contact. Thus, although the focus here is on Icelandic, we believe that our results are generalisable to other languages, e.g. the Scandinavian languages, which mostly face the same contact and input scenarios as Icelandic currently does (e.g. Sylvén & Sundqvist, 2012; Hannibal Jensen 2017).

In this chapter, we focus on some of the results from our 3–15-year-old participants. First, we review some relevant previous research before we turn to the MoLiCoDiLaCo-project and describe the methods used for data collection. Then, we outline some of the results of the project, focusing on the children's digital usage, their input and language use, video game input and language attitudes. Finally, we conclude with a summary of the findings outlined in the chapter.

Background

Language acquisition is the process by which children acquire a language in their first years of life. Both first and second/foreign language acquisition depend on language input, which includes all the language stimuli in children's environment, e.g. what they hear, read, watch on television, etc. This input is a fundamental aspect of children's language acquisition – they process it and use their innate abilities to build their own linguistic system (Sigurjónsdóttir, 2019). Both input quantity (Hurtado et al., 2008) and quality (Unsworth, 2015) affect language acquisition. Research shows that these two input factors are even more important when acquiring a second/foreign language than a first language (Paradis & Grüter, 2014; Pearson, 2007). Specifically, the quantity of the input predicts bilingual children's vocabulary size (Pearson et al., 1997; Oller et al., 2007), although the amount of exposure necessary for bilingual children to score within monolingual standards varies between receptive and productive vocabulary, with the latter requiring greater input amounts (Thordardottir, 2011). The quality of the input also matters, for example, the source of the input, such as parents, other family members, playmates, and their socioeconomic status (Hoff et al., 2014), how interesting and relevant the input is for the child (Krashen, 1985), and whether the input is interactive or not. Thus, interactive input involving productive language (speaking and writing) is more efficient than receptive input (listening and reading) and results in more language gains (Hoff et al., 2014). For example, recent studies show that the number of conversational turns between children and adults have a greater impact on children's language acquisition than the sheer number of adult words in the input (Romeo et al., 2018).

Due to the use of English in digital media and technology, many language communities today are in digital language contact with English. Recently, a number of studies have addressed the effects of this new type of language input on children's language acquisition. Most of them focus on the English proficiency non-English-speaking children can obtain through contextual out-of-school exposure to English and on which types of digital language input are most beneficial for such second/foreign language English acquisition (Lindgren & Muñoz, 2012; Sylvén & Sundqvist, 2012; Sundqvist & Wikström, 2015; De Wilde, et al., 2020). The results of these studies indicate that despite considerable levels of individual variation, a substantial number of children show large English language gains. These were for example, the results of De Wilde et al. (2020), who studied the English proficiency of 10–12-year-old Dutch-speaking children by measuring their receptive vocabulary, listening, speaking, reading, and writing skills. The digital input types with the most explanatory power were video gaming, use of social media and speaking, showing the value of interactive digital language input and its association with increased English language skills (see also Sundqvist, 2009). Interestingly, the children's language attitudes also play a role, since the children who showed the best English skills were the ones who had the most positive attitudes towards English (Sylvén & Sundqvist, 2012). One aim of the MoLiCoDiLaCo-project was to provide relevant research, targeting possible digital English effects on the English and Icelandic proficiency of Icelandic children, and documenting their attitudes towards both languages.

Methods

An extensive amount of data was collected within the MoLiCoDiLaCo-project. The two main methods for data collection were extensive online surveys and subsequent in-depth testing sessions. The online surveys were conducted in 2017–2018 among a stratified random sample of 5,418 Icelandic citizens aged 3–98 obtained from the National Registry of Iceland. Of those targeted, 1,500 were 3–12-year-old children and 3,918 children and adults aged 13–98. Five versions of the online survey were administered, one tailored to each age group within the sample: 3–5, 6–7, 8–9, 10–12, and 13–98-year-olds. The response rate for the 3–12-year-olds was 50%, yielding 724 participants, and the response rate for the 13–98-year-olds was 41%, yielding 1,615 participants. Each survey included 198–265 questions. The surveys were parent-administered for the 3–9-year-olds but partly independently completed by the 10–12-year-olds. For the 3–12-year-old children, the focus of the present chapter along with 13–15-year-old adolescents, parents listed Icelandic as the child's native language in 99% of the cases. This does not exclude other languages having this status, which was the case for 8% of our participants.

The in-depth testing sessions took place in 2018–2019. A stratified random sample was drawn from the participants of the online surveys, based on input data results: small, average, and large amounts of English input within each age group. A total number of 240 participants participated in these further testing sessions:

Table 8.1 Number of 3–15-year-old participants in the online surveys and the in-depth testing sessions.

	Online surveys N=989	*In-depth sessions N=137*
3–5	228	34
6–7	122	18
8–9	144	24
10–12	230	30
13–15	265	31

106 children aged 3–12 and 134 children and adults aged 13–83. The participants were called in for interviews and further testing sessions, where the 3–9-year-old came in for three 1-hour sessions whereas the 10–83-year-olds came in for two 1.5-hour sessions. In the in-depth testing session, standardised language tests were administered, e.g. an English version of the PPVT-4 (Dunn & Dunn, 2007) for vocabulary assessment, more thorough language experiments conducted, and highly detailed input information gathered.

In the next section, we discuss some of the results from our 3–15-year-old participants. The number of participants in each of these age groups, who responded to our call in the online surveys and the in-depth testing sessions, is outlined in Table 8.1.

Results

Digital usage

The results of the online surveys show that 80% of children in our 3–5-year-old age group have access to smartphones and smart tablets, 84% of the 6–7-year-olds and 98–99% of the 8–15-year-olds. It is clear that many of the youngest children were very young when they first came in contact with these devices. Thus, 58% of the 3–5-year-old participants, who use smart devices, began using them at the age of two or younger and of those, 8% were younger than one-year-old. The children in the older age groups were older when they started using these devices, which is understandable since the first smartphone was marketed in 2007 (Sigurjónsdóttir & Rögnvaldsson, 2018). These results show a dramatic increase in the use of smartphones and tablets among young children from the so-called SAFT project (2013), which showed that only 2% of Icelandic children started using the Internet before the age of three that year (Sigurjónsdóttir, 2016).

Table 8.2 shows the amount of computer and smart device usage in the five age groups reported on here. When asked how much time the participants on average spend using computers and smart devices daily, we see that the amount of time increases as the children grow older. It is interesting to see that although the majority, or 80%, of the 3–5-year-olds use these devices less than daily or less than one hour a day, 21% of them spend 1–4 hours a day using computers and smart devices. At the age of 6–7, 38% use these devices 1–4 hours a day, and 1–4 hour usage is

Table 8.2 How much time does the child on average spend using computers and smart devices?

	Less than daily	*Less than 1 hour*	*1–4 hours*	*More than 4 hours*
3–5	50%	30%	21%	0%
6–7	38%	22%	38%	1%
8–9	12%	25%	61%	2%
10–12	5%	12%	67%	17%
13–15	1%	1%	57%	41%

up to 61% for the 8–9-year-olds and 67% for the 10–12-year-olds. Moreover, 17% of the 10–12-year-olds use computers and smart devices for more than 4 hours a day and this is true for 41% of the 13–15-year-olds. The results for the use of the Internet show the same pattern (see Sigurjónsdóttir & Rögnvaldsson, 2018; Guðmundsdóttir, 2018).

These results indicate that many 3–15-year-old children use computers and smart devices from an early age and that their usage increases as they grow older.

Input and language use

As already mentioned, English digital input is a big part of the daily life of many Icelanders. According to Guðmundsdóttir et al. (2019–2020), the 13–15-year-olds spend a lot of their spare time watching material online and on streaming providers, such as YouTube and Netflix, using social media apps, such as Snapchat and Instagram, and playing video games, with or without communicating with other players. Most of this material is in English and only a limited amount of it is dubbed or subtitled in Icelandic. For the 3–12-year-olds, we find an age difference, where the younger children are more likely to watch Icelandic material when it is available than the older children (Nowenstein et al., 2018). Still, the results show that 90% of the 3–12-year-olds watch videos online in English, e.g. on YouTube, whereas only 62% watch such material online in Icelandic. It is also more common for the 3–12-year-olds to listen to music in English than in Icelandic.

Moreover, we asked the 6–12-year-olds about the frequency of their receptive (listening and reading) English input and their productive (speaking and writing) English use. The 3–5-year-olds were excluded from these measurements since we did not expect them to read and write yet. Figures 8.1 and 8.2 show density curves for measurements of the 6–12-year-olds receptive and productive English use (Nowenstein et al., 2018). The graphs show where the concentration (density) of the data lies, with the total space of the curve reaching 1.

The x-axis on the two density graphs shows the score that the 6–12-year-old children got for English receptive/productive use, where 10 is the maximum score, and the y-axis shows the density. The peaks in density are different for years of different age and show that as the children grow older, there is more density at the

far right corner, i.e. at the end of the x-axes, where the maximum score for receptive/productive English use lies. The figures show that the children clearly pattern by age, where the older ones use receptive and productive English more than the younger ones. Also, by comparing the far-right corner in the two figures (note that the values on the y-axis in the two figures are not the same), we see that the children's receptive English use (Figure 8.1) is more than their productive English use (Figure 8.2). Thus, Figures 8.1 and 8.2 show that the children's English use is

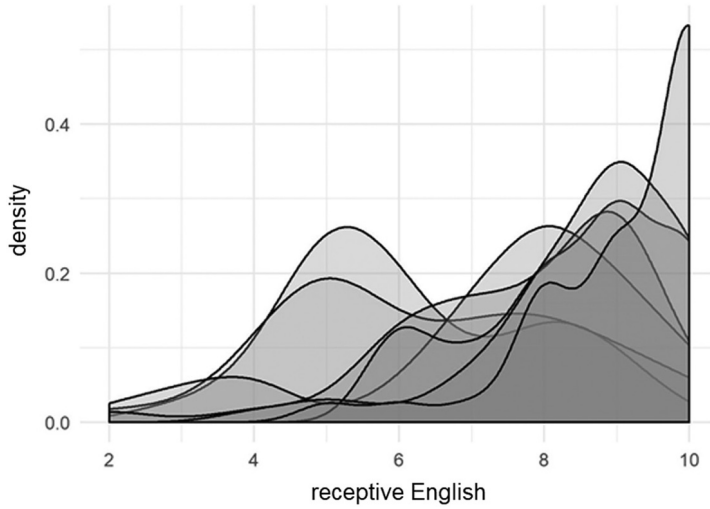

Figure 8.1 Frequency of receptive English use (6–12-year-olds).

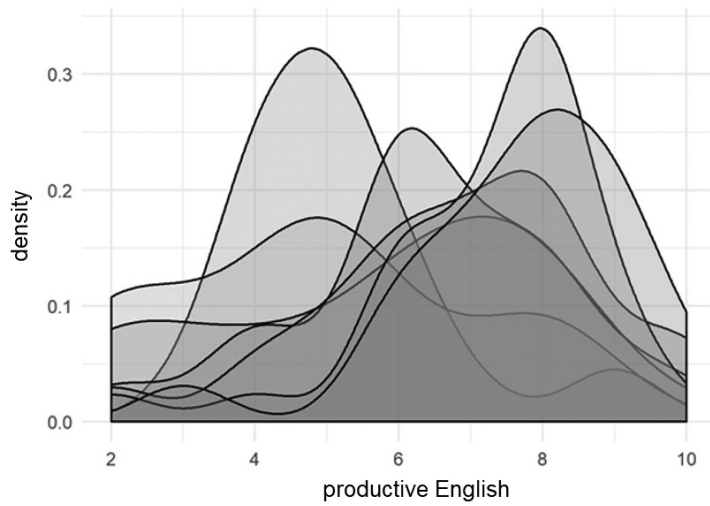

Figure 8.2 Frequency of productive English use (6–12-year-olds).

more receptive than productive, and as the children grow older their overall English use increases (Nowenstein et al., 2018).

In the in-depth testing sessions, we conducted more thorough measurements of the English input in the participants' language environment, asking about a wide array of activities such as video gaming, watching television and chatting online. The results from these measurements show that the average proportion of English input in a typical day for the 3–12-year-olds is 14% and the average amount of English use per day is 90 minutes, or one-and-a-half hour (median value: 63 minutes). Regarding the age trend, discussed above, where English input increases as the children grow older, it is interesting to note that we do not get comparable results regarding the 3–12-year-old children's Icelandic use. Those results show that the children across age use similar amounts of Icelandic in minutes daily, with a mean of 519 minutes or 8 hours and 39 minutes (median value: 525 minutes) (Sigurjónsdóttir et al., 2020).

Children's video game input

In the online surveys, the children were asked specifically about their video game input. These results are interesting since very few video games are available in Icelandic which target young children. Hence, most games played by Icelanders have an English interface. Also, the digital language input received through gaming is by nature more interactive than, for example, the input received when watching videos and shows online or on streaming providers. This is both due to the role-playing nature of games as well as to the online communication with other players included in some games. Thus, gaming provides ideal input for children's language acquisition.

Figures 8.3 and 8.4 show the results of the 3–12-year-old children's video game input in Icelandic and English by age (Nowenstein et al., 2018). Note that the age index is on the right of each graph.

Figure 8.3 shows the percentage of 3–12-year-old participants in our online surveys who play video games with interfaces in Icelandic, and Figure 8.4 shows the same results for video games in English. The broken line in the figures indicates the mean video game input that the children receive, a little less than 50% in Figure 8.3 for Icelandic and almost 75% in Figure 8.4 for English. Comparing the two figures, we see that the youngest children, 3- and 4-year-olds, are the only ones who receive more input from games in Icelandic. This changes in the 5-year-old age group where the 5–12-year-old children receive much more input from games in English than from games in Icelandic.

Interestingly, we find gender differences in video game playing where boys play more games than girls and this gender difference increases as the children grow older, see Figure 8.5 for results from our 3–12-year-old participants.

The results show that boys in most age groups play more video games in English than in Icelandic and that there is an increase in the children's video game playing in English as they grow older. In the 8–12-year-old age groups, we not only asked about video game playing in Icelandic and English, but also whether or not the

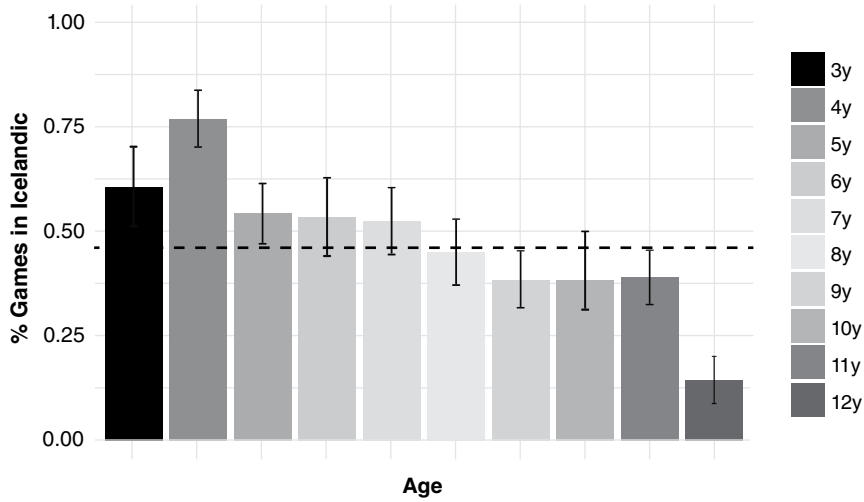

Figure 8.3 Video game input in Icelandic by age (3–12-year-olds).

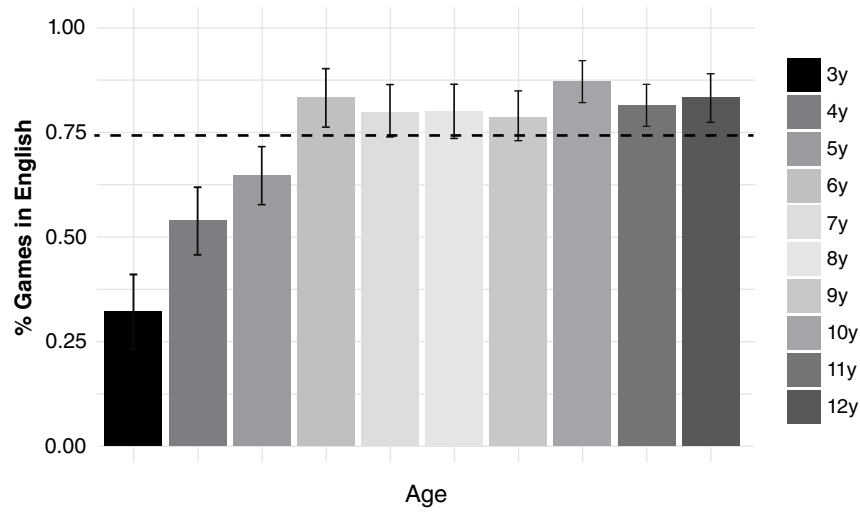

Figure 8.4 Video game input in English by age (3–12-year-olds).

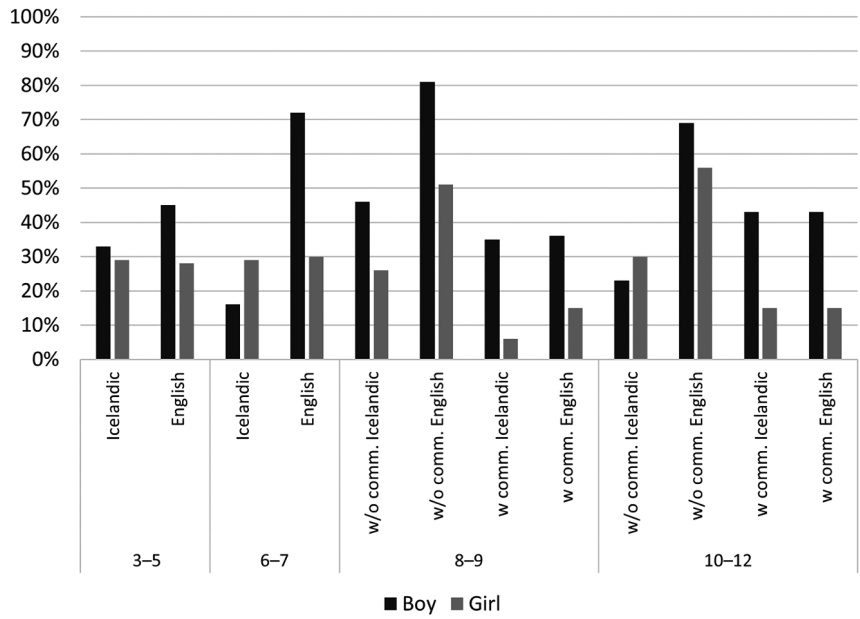

Figure 8.5 3–12-year-old boys and girls who play video games in Icelandic and English.

games allowed the players to communicate with other players during the game (by speaking through headsets or writing). Figure 8.5 shows that a much higher percentage of 8–12-year-old boys than girls play video games that allow communication between players and hence productive English output. Thus, 36–43% of the 8–12-year-old boys play such interactive games in English, whereas only 15% of the girls do. Also, a higher percentage of boys than girls on average play games that do not offer this possibility.

Thus, our results regarding the children's video gaming in the online surveys not only show an age difference but also interesting gender differences where boys play more (interactive) games in English than girls and this gender difference increases as the children grow older. In this respect it is worth mentioning that in our modelling results from the children's online surveys, we find a gender effect, with boys having more English vocabulary than girls (Sigurjónsdóttir et al., 2020). Although these results do not allow us to state that there is a relationship between boys playing more video games and having more English vocabulary than girls, it is interesting that as discussed in Sylvén & Sundqvist (2012), studies have shown that boys outperform girls regarding English vocabulary (e.g. Herriman, 1997; Sundqvist, 2009). They mention that one possible explanation for this particular gender-related difference may be the learners' involvement in digital gaming. Furthermore, Hannibal Jensen's (2017) results from Denmark are in line with these results, as she found that boys played significantly more video games than

girls and there was a statistically significant relationship between boys' gaming and higher English vocabulary scores.

Attitudes

Research indicates that in language contact situations, speakers' attitudes towards the languages are a key factor in determining their vitality (Hakuta & D'Andrea, 1992). The language that enjoys more prestige within the language community, especially among the younger generations, usually has a brighter future within the community (Pearson, 2007). Thus, if young speakers foster negative attitudes towards their mother tongue, for example, because they cannot use it in entertainment, technology, and international communication, it can affect their language use.

The results of the online survey within the MoLiCoDiLaCo-project indicate that although most Icelanders have positive attitudes towards both Icelandic and English, an age trend appears where adolescents and people younger than 30-years-old are more negative towards their mother tongue than older people (Sigurjónsdóttir, 2020). This age trend is not reflected in responses to questions regarding English in the online surveys and our results indicate that many of the children find English interesting and proudly display their knowledge of it (Sigurjónsdóttir & Rögnvaldsson, 2018).

However, the results of the in-depth-testing sessions show that according to the 3–15-year-olds, domains of use of these two languages are different. Thus, they associate Icelandic with prescriptive grammar, linguistic purism, compulsory school assignments, and good grades, whereas they associate English with entertainment in the digital world, new technological advances and travel abroad (Sigurðardóttir, 2020; Einarsdóttir, 2019). Furthermore, Guðmundsdóttir's (2018) results indicate that the 13–20-year-old participants in our online surveys are more positive towards the use of English than older generations, and that the 13–15-year-olds are most likely of all the age groups (3–98-year-olds) to use productive English, i.e., speak and write in English. She also finds that the 13–15-year-olds' attitudes towards English partly predict their productive English usage, where those 13–15-year-olds, who have the most positive attitudes towards English, speak and write English more than those who are not as positive towards English.

Conclusion

To sum up, the results of the MoLiCoDiLaCo-project indicate that English digital input is a considerable part of the daily life of many young Icelanders today. Although there are important individual differences in English usage, many 3–15-year-old children use computers and smart devices from an early age and their usage increases as they grow older. For example, there is an age trend in the 3–12-year-old children's video game input, where the 3- and 4-year-olds receive more input from games in Icelandic, whereas the 5–12-year-olds receive much more input from games in English. Also, we find gender differences in video

game playing, where boys play more (interactive) games than girls and this gender difference increases as the children grow older. Interestingly, in our modelling results from the children's online surveys, we find a gender effect, with boys having more English vocabulary than girls. These results are reminiscent of Sylvén and Sundqvist's (2012) and Hannibal Jensen's (2017) results, where boys play more video games and outperform girls in English vocabulary.

Regarding English input, our measurements indicate that English still is a relatively small part of Icelandic children's language environment. The average proportion of English input in a typical day for our 3–12-year-old participants is 14% and the children in general, across age, receive a lot more input in Icelandic than in English (Sigurjónsdóttir & Nowenstein, 2021). The children use more receptive English (listening and reading) than productive English (speaking and writing), which is in line with the results of Arnbjörnsdóttir (2018) and her colleagues from studies conducted in Iceland in 2005–2011. Even though the input is still mostly receptive, it predicts some of the Icelandic children's English skills, e.g. vocabulary. Therefore, the English input that children in Iceland are exposed to does result in increased English proficiency.

The largest positive effect found in our modelling results of the children's parts of the online survey for the English vocabulary measure was the measure of the children's interest in English. Thus, attitudes play a role in Icelandic children's proficiency of English vocabulary, as also found by Sylvén and Sundqvist (2012) for Swedish children. Furthermore, Guðmundsdóttir (2018) finds that the 13–15-year-olds' attitudes towards English in the MoLiCoDiLaCo-project partly predict their productive English usage, where those who have the most positive attitudes towards English, speak and write English more than those who are not as positive towards English. However, when it comes to attitudes towards Icelandic, we find an age trend where adolescents and people younger than 30 years old are more negative towards their mother tongue than older people.

To conclude, the public concern regarding the negative effects of digital English input on Icelandic children's language development seems to be unwarranted (Sigurjónsdóttir & Nowenstein, 2021). Such results should prove useful in shaping informed language policies in education and society more broadly – pointing towards the importance of cultivating positive attitudes towards Icelandic and other languages and emphasising the potential of digital language use. Still, it is important to keep in mind that the results presented in this chapter are general results and further research within the MoLiCoDiLaCo-project should look into individual profiles and smaller groups of children, which might show different effect patterns.

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Chapter 9

Ideation, playful learning, and making in a Minecraft Virtual Learning Makerspace

Skúlína Hlíf Kjartansdóttir and Gisli Thorsteinsson

Introduction

The Icelandic educational context of craft extends back to the early days of compulsory education. Art and craft education has an unbroken tradition in Iceland dating back to 1889, when it was introduced under the influence of the Scandinavian Sloyd (Craft) movement (Thorsteinsson & Olafsson, 2009). Sloyd was established as a pedagogical system of manual training that seeks to aid the general development of students through learning craft. Craft became a subject within the curriculum in 1936 until Design and Technology was introduced in 1999. Innovation Education (a new subject area) and Entrepreneurship was also introduced into the national core curriculum as an optional subject for schools (Thorsteinsson & Olafsson, 2009). In 2011, the current national core curriculum was published with a subject division, based on six fundamental pillars: literacy, sustainability, democracy and human rights, equality, health and welfare, and creativity. This curriculum marks a change in the teaching of literacy, as digital literacy and media literacy became a part of the learning process. It spurred new developments, such as makerspaces, that had the potential to link with ICT, design, and craft. The main goal of literacy learning is to invite creative approaches:

> for pupils to become active participants in transforming and rewriting the world by creating their own meaning and responding in a personal and creative manner to what they read with the aid of the media and technology that is available.
>
> (Ministry of Education Science and Culture, 2012)

This open invitation from the curriculum to introduce technology and digital literacy has since been taken up by teachers interested in technology, media, design, and craft. Other factors have been influential, such as the introduction of Fab Labs in Iceland in 2008, now found in eight locations around the country, and the Nordic model of pedagogy prevailing at the preschool level that emphasises the value of play and tends to look at mind and body as a whole (Dýrfjörð et al., 2019). The Fab Labs offered courses to teachers and students in digital making that established a knowledge base and skills that the schools could enhance further.

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The implementation of tablet computers (iPads) in schools was another influential factor that paved the way for 1:1 pedagogy, connected learning, gaming in schools, and digital literacy projects that invited new educational opportunities (Kjartansdóttir & Jakobsdóttir, 2016). These developments encouraged grass root initiatives, such as an all-women tech pioneer team that set about creating a learning community for teachers on making in schools (Kjartansdóttir, Hjartarson & Pétursdóttir, 2020) as well as the formation of teacher community groups (Stefánsson, 2020) and teacher initiatives, exploring making in Minecraft Edu.

Our research project started as a part of the European project 'Makerspaces in the Early Years' (MakEY, 2018). MakEY was an inspiration for researchers and teachers alike, and since its completion several schools in Iceland started installing makerspaces and to develop maker pedagogies, most often with the emphasis on interdisciplinary learning. In our research, we have been interested in exploring children's collaborative making and learning practices in a Minecraft Virtual Learning Makerspace (MVLM) in school education. Minecraft is a popular computer game among young children in Iceland that gives them opportunities to ideate and find solutions through virtual design and crafting, via playful learning. Our leading research question was: How do the affordances of MVLM support students' collaborative making and learning?

Minecraft as a virtual learning makerspace and related research

Makerspace in education, according to Marsh et al. (2017), suggests a model of learning-by-doing in which students can ideate and make artefacts that are of personal and/or collective meaning. It supports social relations and learning practices, often across divisions such as age, gender, or level of conventional education and/or expertise (e.g., Halverson & Sheridan, 2014).

At a general level, a VLE is a computer program that enables online education and that can be utilised both in open and distance learning and in conventional education (Paulsen, 2003). Minecraft can be used for virtual learning as a makerspace. It was designed based on the iconic Lego game idea but located within a virtual world. It is a sandbox game, which allows the gamer to move freely within an endless virtual space (Bebbington & Vellino, 2015) and gain different affective experiences (Abrams, 2017). Minecraft digital making involves both social and digital practices (Dezuanni, 2018), where digital materials, *Minecraft blocks*, are employed. The player can gather, craft, and redeploy these blocks in their making. These digital materials have affordances that provide the player with sensory feedback.

Minecraft has been an object of educational research in Scandinavia and elsewhere (Mørch, Mifsud, & Eie, 2019). It has been utilised by teachers, as a Minecraft Virtual Learning Makerspace (MVLM), in after-school classes and in conventional classes (Dýrfjörð et al., 2019).

Some studies suggest that video games can help develop cognitive skills, such as visual and selective awareness and concentration (Rosas, et al., 2003). Green and

Bavelier's (2003) research showed that students increased their capability to pay attention to a larger quantity of objects and improved their response times, hand–eye coordination, and manual skills while playing. Video games, furthermore, improve spatial skills, and gamers frequently do better on mental rotation tests.

Current research on makerspaces, according to Marsh et al. (2017), indicates that hands-on checking and making across multiple media and digital contents strengthens students' ideation and idea generation as well as critical engagement in disciplinary and transversal learning with numerous digital technologies and media (Hughes, 2017). Furthermore, research indicates that making can assist young students' innovative activities and improvisational problem-solving, inspire students' agency, persistence and self-efficacy, and enhance their ideas and understanding in STEM and elsewhere (Bevan et al., 2014). Marsh et al. (2017) also suggest that making events can establish peer collaboration and transform traditional roles of teachers and students, enabling partakers to develop and draw on each other's relative expertise (Vossoughi & Bevan, 2014).

Affordances in terms of interaction and control

Students used iPads during the research to enter and work inside the MVLM with all its affordances. Gibson (1977) defined affordances as the totality of all perceived action possibilities that are latent in an environment. The iPad has technical affordances, such as a camera and technology to work with multimodal content and in addition a plethora of software applications. These affordances make the tablet an interesting tool for virtual making activities with young students to support the relationship between the students' cognitive and emotional engagement and their learning (Price, Jewitt, & Lanna, 2015; Golland, 2011; Gonyea & Kuh, 2009). The affordances of the technology and software combined influence the ways in which the students interact with the device and the content, offering affordances to communicate and create. The touch screen capabilities enable students to control applications. The affordance of using fingers to control objects on the screen makes the iPad user friendly (Golland, 2011).

Zeltzer (1992) has suggested a framework for the characteristics of a VLE, along with three dimensions that he refers to as autonomy, presence, and interaction. The environment offers the user different interaction techniques, including navigation, selection, manipulation, and system control, to interact with and manipulate the environment. These techniques play a significant role in the users' making. In a VLE, such as Minecraft Edu, the user enters the game via an avatar that has access to tools and a material chest for building. The user's control over their avatar, their personal representation within the VLE, is limited but nonetheless important. The concept of a VLE is linked to the feeling of being in a location and a social setting other than your physical location, and this means that you can control an avatar or another device at a distance. The player's projective identity, embodied in the avatar, becomes noticeable when a player communicates to others on his achievements in the VLE, and this testifies to his emotional involvement (Abrams, 2017).

Digital literacies as a social practice

Rowsell and Pahl, in a recent multimodal literacies research (2020), introduce the concept of living literacies and a living literacies approach to learning. They present the idea of literacies as lived and active, the ideas of 'seeing', 'knowing', and 'making' as offering new theoretical positions on literacy, that encompass both the visual and the oral. According to them the literacy event is

> a living production of meaning that can be written and read, inscribed and interpreted; creativity allows for it to be remade in the moment. Creativity can refer to new meanings or new modes of communication to produce new definitions of what literacy can be.
>
> (p. 118)

Wohlwend (2021) introduces the concept of the literacy playshop to describe a curricular approach through exploratory play and making. It emerged from studies with teachers and describes playshop explorations that are 'learner-led, untidy explorations in play, making, and remaking in makerspaces. Explorations (that) provide creative energy and engaged learning, while mediation comes from responsive provision of materials, tools and technologies in makerspaces with just-in-time-and-just-enough teacher assistance' (p. 242). Wohlwend suggests that a flattening of teacher–student power relations occurring in the playshops enables teachers to reposition themselves, learn from their students and reflect on their pedagogy. In her account she describes four domains in literacy learning: play, storying, collaboration, and production (Figure 9.1). In play, the storylines proliferate, and collaboration brings together players' multiple ideas.

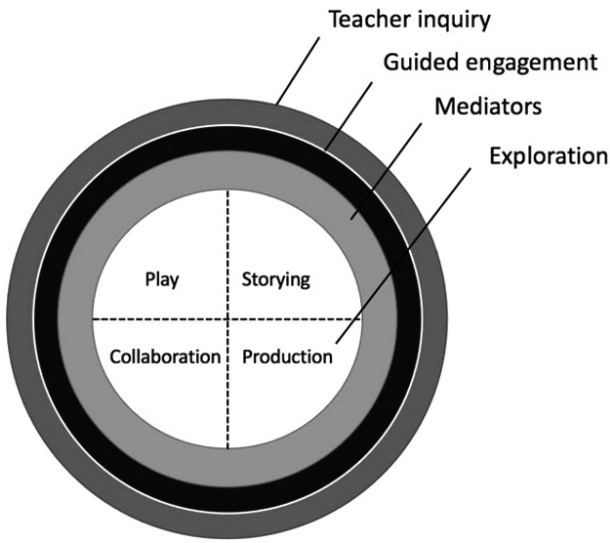

Figure 9.1 Literacy playshop activities.
(adapted from Wohlwend, 2021, p. 249).

Ideation and idea generation

The term ideation originated from Guilford (1950). Thompson (2008) used it to explain the pattern of interactions that arise when an individual generates an idea. Ideation is closely related to idea generation, which is the generation of opportunities, performed in problem-solving and innovation (Smith, 2003).

Minecraft is a societal and experimental learning tool that can easily trigger ideation and idea generation in students as their activities in designing and building are based on their ideation and idea generation abilities. Fullan (2013), argues that we can recognise critical and logical thinking as the ability to solve problems and design, control projects, and make useful decisions utilising a range of tools and resources. Papert (1980) stated that this kind of knowledge and thinking process can support intellectual openings.

Playful learning and making

Kangas (2010) defines creative and playful learning in the context of digital playful learning environments (PLE) as: (1) learning that allows and stimulates learner creativity and knowledge co-creation, (2) learning through designing content in the PLE by using recent technology, and (3) learning through a variety of playful and physical activities in the PLE. She further describes learning as not only related to academic achievements, but also to all actions of learning that consider the whole person as well as the role of cultural tools (Säljö, 2004). Playful learning, according to the social constructivist theories, is also a part of the cultural, social environment, or as Vygotsky would recognise it, a part of a dialogical environment. Kangas (2010) refers to earlier PLE-related studies and summons the following features as being central for creative and playful learning: playfulness, creativity, narration, collaboration, insight, emotions, embodiment, and activity.

Researchers of virtual reality for learning claim that playful learning activities are 'most powerful when they are personally meaningful, experimental, social, and epistemological all at the same time' (Shaffer, Squire, Halverson, & Gee, 2005, p. 105). Ramsden (1992, p. 110) suggests that learning is a 'conception of reality' or how students translate learning for themselves and make their own understanding of knowledge. Playful learning activities in education lie inside a constructivist theory of education. Constructivism is focused on the idea that individuals create their own view of the world based on their understanding of their personal experiences (Gagnon & Dan Collay, 2001). The metaphor Stornaiuolo (2015) employs of culture being a process of hammering a world, where people hammer each other into shape with the cultural tools available to them, creating symbolic meaning together, seems apt when discussing literacy as worldmaking in Minecraft.

Methodology

The research was undertaken in an Icelandic primary school's classroom, in the context of using a MVLM. The participants in the research were ten seven-year-old

students, equally gendered, that volunteered, with their teacher. Two of the students were not able to read and had some learning problems. All the students had used Minecraft before at home and in the teacher's class. The design challenge brief involved a suggestion to ideate and make. The teacher was attracted to the idea of setting up a lesson plan with the researchers using Minecraft as a makerspace platform:

Case study 1: focused on mathematics, based on the national curricula.
Case study 2 and 3: students worked out solutions from a design brief, in Minecraft.

The research study consisted of six 180-minute case study lessons. The lesson sequence was:

1. Introduction and description of design tasks: (1) to design and make a pathway from a mainland to an island and (2) to make a transport vehicle.
2. Homework – sketching an idea of means of transport for travelling in the game world.
3. Individual learners work out solutions in the MVLM and build it.
4. Learners resolve a challenge of moving within the world.
5. Playful learning session, developing further some aspects of design and making.

Various data was collected, and the analysis based on grounded theory, using open coding (Creswell, 1998). Grounded theory consists of a systematic, inductive strategy for collecting and analysing data to construct theoretical frameworks that describe the collected data. This enables the researcher to identify emerging categories in a set of data and to develop initial hypotheses which can be tested iteratively. It focuses on obtaining an abstract analytical schema of a phenomenon related to a particular situation (Creswell, 1998).

The data was treated as follows:

1. Data from diverse sources (Table 9.1) was collected and summarised, and then used to generate categories.
2. Key points in the data were coded with keywords, which were then grouped into emerging conceptual categories. These categories were then discussed, and conclusions drawn.
3. The process was repeated for other data sources.
4. Finally, categories from all data sources were brought together under overall categories.
5. The categories were then used to triangulate the findings and analysed in relation to each other and the literature, and conclusions were drawn.

To fulfil the ethical requirements, the parents, principal, and teacher signed an informed consent form regarding the use of personal information and images in the data. A disclosure detail was sent to the Icelandic data protection authority.

Table 9.1 Data collection methods

Data sources
1. Screen captured videos in the VRM
2. Interviews with the teacher
3. Interviews with individual students
4. Interviews with the students' group about the course and their work
5. Overall videos of the conventional classroom activities
6. Go-Pro videos showing individual students' circumstances and his screen
7. Observations.

Discussing the main research outcomes

The following categories emerged during the analysis as the central themes in response to its aim and the research question:

1. Motivation and playful learning
2. Communication and learning
3. Ideation and idea generation
4. Worldmaking and living literacies.

Motivation and playful learning

According to the interviews with the students and the teacher, the students enjoyed learning, but some had difficulties at school because they were already short of motivation for studying. Playing Minecraft enabled the students to reveal their identity and express their opinions and emotions (Golland, 2011; Abrams, 2017). While working in Minecraft, students experienced their activities as play, not traditional schoolwork – and this motivated them. One of the students expressed: 'I wish we could always play Minecraft at school.' The teacher also argued that the students saw the activities as a game. 'They don't realise that they are learning … where they may have been bored working through a textbook … now they just get into the task instantly and quickly finish the work.' Learning through making seemed to become less of a memorising act and more of an interpretive and creative activity. Many studies indicate that playing is meaningful in the learning environment and that students need to find themselves having fun while learning (Kangas, 2010; Bevan, Petrich, & Wilkinson, 2014). Of course, the novelty factor of a research situation and a design challenge could have impacted (Creswell, 1998).

Communication and learning

Students were given both individual and collaborative tasks and were most often thinking cooperatively when solving learning tasks (Vygotsky, 1978), sharing knowledge during cooperation and collaboration. Their multimodal communication inside the classroom and the MVLM was supporting their individual, cooperative, and collaborative learning (Figure 9.2). The students, according to the teacher, did not talk much while working through their workbooks.

Figure 9.2 Students giving advice, sharing ideas, and reading for illiterate peers in the Minecraft Virtual Learning Makerspace (MVLM).

Our observations showed that inside Minecraft students shared their experiences frequently while working (Wohlwend, 2021). Students who were skilled in Minecraft often took on a specialist role, even if they were not academically strong, enabling their peers to develop and draw on their relative expertise (Vossoughi & Bevan, 2014).

According to the teacher and our observations, the students improved their understanding and recollection of concepts: 'Collaboration affected their work … They take care of each other. They observe each other's work and help each other.' Students with learning problems gained help from more capable peers, e.g. reading in-game signs for peers if they were not capable of reading. This enhanced the students' social relations and learning practices (Halverson & Sheridan, 2014), connecting students with different abilities in negotiations and triggering developments and literacy events in the game (Dezuanni, 2018). Students often offered other students with less abilities compliments when they were getting on with their maker activities. Most likely, this encouraged collaborative action. This discussion between students also seemed important for improving their learning skills and for their social development (Marsh et al., 2017).

Ideation and idea generation

Playfulness was apparent when the students were working informally inside the MVLM in a humorous and teasing manner, it appeared to trigger students' ideation skills and idea generation via synergy. It probably made them confident in using the MVLM and increased their familiarity with each other's intentions. Being physically together and being able to communicate inside the classroom and online at the same time also seemed to assist the students' idea generation and making (Wohlwend, 2021).

Often, student's ideation and making were influenced by their daily lives, mirroring their close environments and cultural contexts. The design challenge anticipated a journey from a mainland to an island and involved the design of measures to achieve it (Figure 9.3). Obviously, their insights from their past experiences and prior knowledge of local topography helped them to make sense of

Figure 9.3 Student designing a vehicle to use in the Minecraft Virtual Learning Makerspace (MVLM).

their new knowledge established via ideation and making (Vygotsky, 1978). While playing, students developed their storying and enhanced their digital literacy in explorations, and relations of everyday life animated literacy events (Rowsell & Pahl, 2020). In accordance with Street's observation (2003), meaning making depends partly on relevant concepts and models that make up their own cultural contexts.

Students' ideation and idea generation were also supported by the MVLM affordances and their media literacy. Students' understanding and use of various tools and digital building materials in the form of building blocks (Figure 9.4) introduced various possibilities. Navigating together around an object, gaining feedback from each other as avatars was also useful. Textures, colours, and animals to spawn also appeared to support the student's ideation (Figure 9.4).

Some of the materials, which were vibrant or interactive, such as fire, streaming water, and lights, encouraged the design of extraordinary objects and buildings and enhanced playful activities. Some students already knew how these affordances were used and could, therefore, focus on their playful learning activities via their ideation and idea generation.

Figure 9.4 Students expressing their emotions in the Minecraft Virtual Learning Makerspace (MVLM).

Figure 9.5 Spawning and playing with animals, polar bears, and horses, triggered the students' emotions and enhanced their idea generation.

Worldmaking and living literacies

In executing the design and problem-solving challenge and the consequential making activities, the embodiment was observed in the relationship between hand and mind coordination and the handling of tools and materials, as well as dexterity in worldmaking activities. This equally depended on their skills in using Minecraft on the iPad and their negotiations during their design and making. In these activities, the sense of touch and its importance in mark making and literacy development was noted (Price, Jewitt, & Lanna, 2015). This was noticeable, when the students started collaborating and storying during their making effort, spinning stories and creating sporadic literacy events at distinct locations within the game world, such as the creation of an animal hospital (Figure 9.5). The storytelling evolved into what we perceive as living literacy events and practices (Rowsell & Pahl, 2020; Street, 2003).

Conclusions

This research examined the use of a MVLM to support students learning in MinecraftEdu. The teacher must employ a variety of instructional methods to facilitate students' playful learning, both in the MVLM and the classroom. Altering the teacher–student power relations enabled the teacher involved in this research to reposition himself and encourage open communication and making, with the aim that students could become active agents and gain power over their learning and creation. The use of MVLM at schools could be considered as a potential bridge between traditional design and craft subjects and creation with digital tools.

Students experienced the lessons as play, but the teacher considered them to be learning situations. The fact that the students were already familiar with the game and skilled in using the iPad made it possible to make full use of its affordances for running lessons, focusing on learning through making. Hands-on activities deepened their understanding and remembering of concepts. It also decreased the novelty factor of running the research in the school context. The learning was characterised by both individual and collaborative tasks, as well as interpretive and

creative activities. It involved much social interaction and negotiations, in open multimodal communication. The negotiations and sharing of knowledge and expertise enabled peer learning, improved social development, and supported students with less abilities.

The research exposed an association in playful learning between the game affordances, ideation, and making. The humorous interaction and synergy in the gameplay were one factor triggering students' ideation and idea generation, that became a driving force of students' learning. Affordances of the game and iPad were another contributing factor and source of inspiration. Digital materials, and tools that were sensed and reacted on, appeared to support students' ideation, and encourage negotiation, design, and making. Students' past experiences and insights from their cultural contexts also played a role and contributed to the making of objects and spatial creations.

The execution of the design and problem-solving challenge depended on the avatar's affordances. This revealed the relationship between hand and mind coordination in the students' handling of tools and digital materials. The reading of affordances and negotiations in collaborative building effort often resulted in storying and creation of literacy events, where students combined their knowledge and skills in making. The results revealed benefits of active, self-directed learning and living literacies in action in the virtual world of Minecraft.

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Chapter 10

Guns and dolls

Preschool children's (im)material Christmas list activities

Malin Nilsen and Mona Lundin

Introduction

During the past decade digital technologies have become an integral part of many children's lives (Kumpulainen & Gillen, 2019). Children engage with technologies in their homes as well as in educational settings and children in the Nordic countries are no exception. The Swedish preschool provides an example of an educational setting that is going through comprehensive efforts of further digitalisation mandated in the Curriculum for the Preschool (2018) stating that all children have the right to use, as well as to develop a critical and responsible approach to digital technologies. It also states that children should be supported in developing their interest in using, interpreting, questioning, and discussing digital and non-digital images and texts. This is a major change for an educational system with roots in long-established views on play and learning as being traditionally non-digital processes and experiences.

In this chapter, we aim to shed light on preschool children's digital literacy events in order to discuss digital literacies in the context of early childhood education. Our empirical data in this chapter are two video observations of children who engage in digital Christmas list making activities in a preschool setting. As theoretical perspective we turn to the (im)materiality of literacy framework, which was brought forward by Burnett et al. (2014), challenging the traditional binaries between material and immaterial aspects of digitalisation by emphasising the relationships between space, mediation, stuff, and embodiment in children's digital activities. Until now, the (im)materiality of literacy framework has mainly been applied in analysis of digital literacy events in school settings. Nevertheless, we argue that this framework is just as relevant to use in the analysis of digital literacy events in preschool settings since even very young children's digital activities span both material and immaterial contexts. We ask the following research question: What kind of (im)material literacies do the children engage in when creating digital Christmas lists?

Children's digital literacies

In the chapter, we examine digital literacy events that can be defined as meaning-making, multimodal activities that revolve around digital text (Lankshear &

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Knobel, 2008). In the events that are analysed children create digital text and conduct online searches for digital images. There has been a growing recognition of spatial dimensions of literacy as well as movements within these dimensions, which call for further research on connections between social spaces. While there are many studies on teachers' pedagogical use of digital tools and on how parents manage their children's interactions with digital technologies, there are few studies on how young children connect their digital literacies and learning across domestic, informal, and formal settings (Livingstone et al., 2019). Children under the age of six are frequently excluded from studies of Internet use and there is therefore very little known about their use of, for example, search engines. However, the few existing empirical studies have suggested that children's digital literacies need strengthening. For example, in a study of young children's use of digital technologies in preschool and in the home by Danby and Davidson (2019) it was established that many of the children found it challenging to seek information on the Internet. This was typically connected to difficulties in formulating useful search terms and in selecting appropriate search results. In this chapter we do not wish to focus on children's digital literacies solely from an educational perspective. We see children's digital literacy events as subjective meaning-making processes connected to children's rights to cultural participation, agency, and freedom of expression. Therefore, we are interested in movements and leakages between boundaries of different domains – which comprise domestic, educational, and digital domains as well as consumer cultures (Edwards, 2014).

The (im)materiality of literacy framework

The theoretical point of departure is the (im)materiality of literacy framework proposed by Burnett et al. (2014), developed to conceptualise aspects of meaning-making in digital and non-digital contexts. The framework is grounded in sociocultural perspectives on literacy and further influenced by New Literacy Studies and builds on the notion of literacy as a social practice rather than a competence or skill set of an individual child (Barton & Hamilton, 2000). The (im)materiality framework is also strongly influenced by socio-spatial literacy research, which acknowledges that literacy practices emerge in certain social spaces, but have connections to practices in other spaces. Burnett et al. (2014) suggest four dimensions that can be used to conceptualise how the material and immaterial intersect in digital literacy events. These interconnected and interacting dimensions (space, mediation, stuff, and embodiment) highlight different aspects of (im)materiality.

Space

In the first dimension of the framework, the authors challenge the idea of digital space as a separate place and highlight that people actually move around within and between digital and non-digital worlds. They discuss this process as *siting*, which is described as the ongoing negotiation of shifting social spaces. This notion builds

on spatial theories on literacy (Soja, 1996) where space is considered more than a mere background variable in people's lives. When children engage in digital literacy events, they encompass digital and non-digital spaces and there is a confluence of the material and the immaterial. For us, it becomes important to investigate children's siting and the relationships between the material and immaterial since they are relevant to widen our understanding of how literacy is spatialised in digital literacy events.

Mediation

The second dimension is strongly influenced by multimodality research (Kress, 2010) but also research from other fields such as media studies and sociocultural theorising. The process of mediation is significant to the shifting relationship between the material and the immaterial and this relationship can become even more complex when technology becomes more advanced. Therefore, the focus within this dimension lies on the *interface* between the material and the immaterial. In our analysis, we also make use of Bolter and Grusin's (2000) concept of *logic of transparent immediacy*, when the borders between digital and non-digital semiotic means blend together and the technological medium and its purpose no longer is visible to the user. However, sometimes technologies break down or, as in our chapter, do unexpected things causing the borders between the material and immaterial become visible to the users.

Stuff

The third dimension deals with how literacies are materialised in things. Burnett et al. (2014) explain that this standpoint on literacy highlights how all texts (material stuff) carry traces of social activity and therefore are imbued with experiences, memories, and feelings (immaterial practices). This implies that all literacies are materially situated in the sense that they are created within the material world and shaped by the material contexts they are part of. In this chapter, the dimension of stuff becomes relevant in connection to how the digital texts are created in material processes with the use of material technologies, such as tablets and printers. We also use it to analyse the imaginative digital collage-making processes undertaken by the children where their immaterial wishes are materialised in stuff, such as text and images.

Embodiment

In the fourth dimension, the focus is on the relationship between subjectivity and the felt, embodied experiences in connection to literacies. Here Burnett et al. (2014) rely on the ideas brought forward by Merleau-Ponty who claimed that we cannot cease to exist in the perceived world – we always have to relate to the lived world around us and do so in subjective and idiosyncratic ways. In line with this thinking, the authors state that subjective experiences are highly important and

that for example colour, smell and texture call forth perceptions of ourselves in the world. We argue that this is a useful concept when it comes to analysing digital literacy events in preschool settings because it emphasises the, often overlooked, corporeal aspects of children's activities with tablets and apps.

In this chapter, we demonstrate the interaction between these four dimensions in preschool children's digital literacy events in order to contribute to the field of (im)materiality of literacy.

Empirical study

The empirical data analysed in this chapter is from a larger study on children's activities with tablets and apps which was carried out in a Swedish preschool in 2012–2013 (Nilsen, 2018). The data for this chapter consist of two video observations (17 and 22 minutes respectively) of one boy (age three) and one girl (age five). Regarding ethical considerations all teachers and children's parents were informed about the study in writing and signed informed consent forms. The participating children and the researcher who conducted the video observations (Nilsen) regularly discussed their participation during the process and all participating children gave voluntary, informed consent before filming. The researcher recognised that the children were highly competent communicators and the ethical process can be described as 'situated, dialogic and relational' in the words of Flewitt (2019, p. 66). In line with prevailing Swedish ethical guidelines (Swedish Research Council, 2017), the names of the children and teachers are pseudonyms in order to protect children's identities.

Setting

In the preschool where the study was conducted, every morning in December started in the same way. The children participated in different activities in preparation for Christmas. The activity of this particular day was the making of Christmas wish lists, a traditional activity in Swedish preschools. This particular activity was based on a previous activity that was usually carried out at the preschool before they had tablets. As described by the teachers, the children used to sit together in large groups and cut out images of toys from catalogues and magazines and then glue the clippings onto large, coloured sheets of paper. This resulted in paper collages, which they would bring home to their parents. This year the teachers had decided to use tablets and the app PicCollage in order to make digital wish list collages – in the words of one of the teachers: 'in a digital activity'. The collages were made with the help of PicCollage, which is now a commonly used app in Swedish preschool settings but was relatively new at the time of the study. PicCollage is a photo collage maker in which one can arrange and edit photographs from the tablet photo library or from searches via the search engine Bing. There are also a selection of backgrounds, templates, and stickers for decorating the collages and it is possible to include text. At the time of the study, the teachers had recently downloaded this app and had started to use it in different kinds of activities with

the children at the preschool. The children took turns sitting individually with a teacher making their digital Christmas wish list collage. The teachers told the children that the collages would be printed for them to take home later the same day.

The making of Christmas list collages

In this section we present the two video observations in the form of vignettes. This is a practice that corresponds with previously published empirical studies using the (im)materiality of literacy framework (Burnett et al. 2014; Colton, 2016), where single vignettes were analysed. We, on the other hand, will analyse vignettes of two literacy events in order to have a more extended base for exploring how the material and the (im)material play out in different events. The analysis of the two vignettes will be intertwined as to provide a single point of reference for a complex set of ideas, as pointed out by Burnett et al. (2014). These two vignettes of two preschool children and their teachers provide a glimpse into the nuanced relationship between the material and immaterial in the context of early childhood. However, we recognise that more ethnographic work is needed to explore this further.

The two vignettes presented in this chapter portray two very different digital literacy events. The first vignette illustrates how three-year-old John makes his Christmas wish list. John is not experienced in using a tablet keyboard or in conducting digital searches. He has not used the app before and does not know the names of the letters in the alphabet and therefore needs close guidance from the teacher. In the second vignette, we focus on the five-year-old Sophie. Sophie already knows most of the letters of the alphabet; she is well-versed in using the tablet and has used the app once before. John and Sophie are attentively assisted by their teachers, Frida and Ingrid. The digital literacy events are carried out in a slow, almost contemplative pace. The writing of words and search phrases, one letter at a time, turns out to be a time-consuming activity.

Vignette 10.1

John sits down next to Frida at the table. There is a tablet in front of them and Frida starts the PicCollage app and turns over the tablet to John. She asks: 'do you know what you want for Christmas?' and after a few seconds John answers: 'a gun' (in Swedish: pistol). Frida writes down the word 'GUN' in black letters on a notepad. She points at one letter at a time, says the name of the letter and tells John to type in the corresponding letters in the search box. It takes John a long time to find the letters on the keyboard. He also types in the wrong letter several times and Frida than helps him delete them and points to the correct letter. When John has finished writing the word, she tells him to press the search button. John scrolls through the images and chooses one photograph of a handgun and adds it to his collage. The teacher asks if there is something else that he wants for Christmas and John answers: 'a stuffed

animal.' The teacher writes down 'stuffed animal' on the notepad and assists John in conducting the search. John chooses a picture of a green cartoon monster. Frida asks: 'do you want to make another wish?' and John answers: 'a cannon' (in Swedish: kanon). Frida writes KANON on the notepad and John types in the word in the search box. There are no images of cannons in the search results; there are mostly images from a Japanese Manga novel called *Kanon*. John starts scrolling through the images and finally chooses a photo of Kanon – a musician from a Japanese pop band. Friday asks him: 'do you want anything else?' and John answers: 'a gun' and makes another search for an image of a gun. A four-year-old girl called Alice walks up to the table, looks at the images in the collage and asks which gun makes the loudest sound. John points at one of the gun images in the search results. Alice asks: 'does it smell disgusting and is really loud?' John replies that it is so loud that one has to cover one's ears and presses both of his palms against his ears. The teachers suggests that he might want to make a wish for ear protectors. John nods, but then adds that he wants another gun. He types the word GUN in the search box and adds a third image of a gun in his collage. He then makes yet another search for a gun and pastes a fourth image of a gun in his collage. Frida asks: 'do you want to write your name on the collage?' and John nods. She helps him to find the letters in his name. The teacher then suggests that he can make his name smaller or bigger if he wants and John exclaims: 'bigger!' Frida shows him how to change the size of his name by pinching it with his thumb and index fingers. John enlarges his name so much that it covers the whole screen, looks at the finished collage, and smiles.

Vignette 10.2

Sophie sits next to a teacher, Ingrid, at a table. There is a tablet in front of them and Ingrid shows Sophie where to find the PicCollage app. Ingrid asks: 'do you know what you want for Christmas?'. Sophie answers: 'a Barbie doll that can be showered'. Ingrid says: 'click the magnifying glass' and points at the search icon in the app. She then writes the word BARBIE on a notepad and tells Sophie to type in the same letters in the search box, which she does. The search generates a large quantity of selection of Barbie photos which Sophie slowly scrolls through. There are no images of showering Barbie dolls. Sophie chooses four photos of Barbie dolls and pastes them onto her collage. She meticulously adjusts the placement of the small photos in the collages and enlarges them slightly by pinching them out. Ingrid asks: 'do you want anything else for Christmas?' and Sophie answers: 'a doll that can be washed.' The teacher writes the word DOLL on the notepad, Sophie types in the word into the search box and chooses three images of dolls for her collage. Ingrid asks: 'do you want anything else?' and Sophie replies that she wants 'high heels'. The teacher answers: 'shoes with

high heels' and makes a pause. She takes a deep breath, gasps, and says: 'well let's see … should we write shoes and then we'll see if we get the kind with heels?' The search for 'shoes' (in Swedish: *skor*) generates a large selection of images of a candy bar called 'Skor'. Ingrid says: 'it seems like we got candies instead' and suggests that Sophie should add the word 'heel' to the search. This search results in a selection of photos of shoes for adults. Ingrid asks Sophie if she wants to make a search for 'princess shoes' instead and Sophie nods. She finds seven images of shoes which she pastes onto her collage. Sophie makes two additional searches, one for a stuffed toy rabbit and one for Barbie clothes, and adds a total of 16 new images to the collage. She adjusts the sizes of all images in the collage in order to make them fit. Thereafter, the teacher shows Sophie how to change the background colour of the collage. Sophie first chooses a green background but changes it to black. Ingrid tells her to save the collage in the table library. She points to the library icon (a yellow sunflower against a blue background) and tells Sophie to 'click the flower.'

Analysis of (im)materiality of literacy

In our analysis of the two vignettes, we will now discuss how the four dimensions of the (im)materiality framework can theoretically explain what kind of (im)material literacies John and Sophie engage in.

Space

In applying the (im)materiality framework to these digital literacy events we can see that there is a confluence of social spaces. John's and Sophie's siting (Burnett et al., 2014) – their ongoing shifting of social spaces – encompasses both material and immaterial spaces. The events take place in a material space, a preschool. However, a preschool can also be seen as an immaterial space, as part of an educational domain, where teachers scaffold the children in formulating search phrases, in spelling words correctly and in finding the letters on the keyboard. There are also observable connections to Sophie's and John's domestic settings. Both children knew beforehand that the printed collages would be forwarded to their respective parents later that day and this connection indicates that there is something at stake for the children, namely Christmas gifts. As the teacher presents the collages as something to be printed (materialising them) and handed to the caregivers (who are supposed to distribute these to Santa Claus), they provide the children with an incentive to include images of objects that they actually want. This can explain why John, in vignette 10.1, makes as many as four individual searches for guns. It could also explain why Sophie makes a wish for 'a doll that can be washed' after she does not find an image of a 'Barbie doll that can be showered' in her previous image search. The children's siting also spans a variety of digital sites. First of all,

the PicCollage app, the built-in search engine Bing and a myriad of digital images connected to numerous globally connected digital sites.

Mediation

Correspondingly, the mediation process shifts between material means (the teachers' lettering on the note pad, children's verbal articulations of wishes and physical manipulations of the tablet and the screen) and immaterial means (digital text in the search box, the icons in the app and the search results in the form of images mediated through the search engine's algorithms). The fact that the children use the keyboard and go online in order to find images, shapes the collage making as well as the interactions between the children and the teacher in a multitude of ways. For example, the teacher in the second vignette recurrently reformulates Sophie's wishes into, what we assume, concise, functional, and age-appropriate search keywords. This could, for example, explain why the teacher reformulates Sophie's wish for 'high heels', since such a search phrase could prospectively result in inappropriate or less child-friendly pictures. In fact, the teacher rephrases Sophie's wishes on several occasions. She does this through generalisations where she removes words from an original verbal search phrase ('a Barbie doll that can be showered' → 'BARBIE') and by substitutions where words are changed in search phrase ('high heels' → 'SHOES' → 'HEEL SHOES' → 'PRINCESS SHOES'). In the end, the formulation of the search keywords shapes what kind of images are shown in the search results, and when it comes to Sophie's very specific wishes for dolls that can be showered and washed, these are not visualised in the completed collage. The reason for why the teacher removes words from Sophie's verbal wishes is unknown to us. It could be explained by the fact that the teacher wants to simplify the process for Sophie by using shorter search phrases since it will be quicker for her to type, or that she thinks that Sophie's wishes are too specific and will not generate enough search results. However, it could also be that Sophie's and the teacher's engagement in consumer cultures differ. For example, Barbie shower sets are frequently presented in toy catalogues and commercials aimed at children and it is plausible that Sophie knows this, but that the teacher does not. Conversely, in the second vignette, the teacher Frida allows John to make four separate searches for guns and pasting four photographs of real handguns onto his collage. She neither questions, nor reformulates, his wishes even though they could be seen as highly provocative images for a three-year-old child's Christmas wish list. The image search process is also mediated by the built-in search engine, Bing, which is a smaller search engine compared to, for example, Google. Therefore, the selection of images is more limited. On these occasions the limits of the technologies become visible, causing breakdowns in the logic of transparent immediacy (Bolter & Grusin, 2000) for the children. It is also noteworthy that while texts offer the children a plethora of opportunities of multimodal expression, many are never acted upon. For instance, the app offers an abundance of affordances in the form of

design features, such as stickers and templates. Nevertheless, the children show little interest in these features. They do not use any stickers or templates in their collage making and keep their decorating to a minimal. This could perhaps be explained by what the children see as the overarching purpose of this collage-making activity: to communicate as effectively as possible with their parents in order to receive the desired Christmas gifts.

Stuff

In the meaning-making processes portrayed in the two vignettes, there are many examples of immaterial practices materialised into stuff. In response to the teachers' instructions, John and Sophie express their wishes and, in doing so, the children weave subjective immaterial practices – wishes, desires, memories and experiences – into material objects. Immaterial notions of toys first need to be verbalised in order to be materialised and materialisations consist of written words on the teachers' notepads, the collages visibly evolving and manifesting on the screens and ultimately the printed paper collages that they get to take home. This is handled differently by the two teachers. In vignette 10.2, the teacher's reformulations limit Sophie's possibilities to exert agency in the literacy event by reformulating her wish. The teacher in vignette 10.1, on the other hand, does not reformulate John's repeated wishes for a gun, which allows him to exercise agency all through the event. This is curious since this might not be appreciated by John's parents, which is something that the teacher probably is aware of.

Embodiment

In connection to these subjective processes, the digital literacy events also encompass embodiment and corporeal responses among the children. For instance, when John signs his collage at the end of the activity he shows a strong positive, emotional response to his own name materialised in digital text on the screen. He also takes enjoyment in physically increasing the size of his name until it covers the whole screen. Also, when Alice asks John if the loudest gun smells disgusting and is really loud, John confirms this and by pressing his palms tightly against his ears. The children discuss sensory, physical experiences such as sound and smell in connection to digital images. This shows that children's digital engagement is embodied and connected to the lived world and their wishes relate to corporeal and physical experiences, emotions, and understandings. It also shows that John acknowledges that the digital images in fact depict real handguns and not toy guns. Also, when Sophie visually engages with her digital collage, she does this according to her individual and subjective taste. She meticulously designs the collage by physically adjusting the sizes and placement of images with her fingers when she adds new images to the collage. This process evolves multimodally, at the interface between the material and the immaterial, and the boundaries thereby become intertwined.

Discussion and concluding remarks

In the introduction to this chapter, we posed a research question that guided us in the analysis of the digital literacy events: What kind of (im)material literacies do the children engage in when creating digital Christmas lists? We will now discuss this question, using the four dimensions of the (im)materiality of literacy framework: space, mediation, stuff, and embodiment.

As we put forward in the analysis, the collage-making processes span across several material and immaterial *spaces* which thereby become interconnected. Educational, domestic, digital and consumer literacies all become enmeshed and entangled in this course of events. The vignettes show how the boundaries between the digital/non-digital and the material/immaterial become fleeting. A minor tension can be detected between the activity of making a wish list and the formal activity prepared by the teacher. The teachers continually articulate the name of each letter for the children and this turns into an educational, common thread in both activities. Nevertheless, this theme does not seem to work as more than a background in their scaffolding, which mainly is focused on helping the children in finding fitting images.

When it comes to the *mediation* process the children used and created, both material and immaterial literacies but on several occasions there are breakdowns in the logic of transparent immediacy (Bolter & Grusin, 2000). However, apart from when the teacher comments on the fact that the search for shoes resulted in photos of candy bars, these scenarios are not directly dealt with by the teachers. John looks for images of a stuffed animal and a cannon and opts for images of a cartoon monster and a Japanese bass player – but this goes uncommented by the teacher. Thereby, the technologies become blackboxed, which could cause confusion among the children or lead to distrust in the semiotic representations offered by the technologies. We argue that this is not necessarily a bad thing. On the contrary, technology breakdowns in fact offer openings for digital literacy learning if they are detected and acted upon by the teachers as such. From an educational perspective, we argue that technology breakdowns in the logic of transparent immediacy and unexpected search results should be seen as potential learning opportunities for young children.

In the vignettes, we can see how material and immaterial literacies are materialised in *stuff*. The vignettes show how the children's actions oscillate between the material and immaterial in the collage making processes and there is little value in trying to analytically separate and disconnect them. The digital literacy events portrayed in this chapter comprise a series of (im)material actions which can be translated into a chain of (im)material transformations which shows how literacies were materialised in stuff: The children's wishes were transformed into utterances (i.e. children's verbalisations of their wishes), the utterances were transformed into material text (the teachers' letterings on the note pad), the material texts was transformed into digital text (the search phrases in the search box), the digital text was transformed into digital images (via the search engine), the digital images were

assembled into multimodal assemblages, (the digital collages in the app) and, finally, the digital collages were transformed into material artefacts (the printed collages). This chain of transformations clearly shows the difficulties of separating the digital from the non-digital in these digital literacy events. It also shows that even activities that are seen as 'digital activities' (in this case by the teachers) incorporate digital and non-digital aspects.

Finally, it can be seen in the vignettes how both children are engaged in subjective and *embodied* meaning-making activities. The two vignettes depict two very different digital literacy events. The main reason for this is that the two children bring such diverse (im)material experiences and understandings to the table. The wishes made by the children resulted in highly gendered collages where the girl chooses images of dolls, princess shoes, doll clothes and stuffed bunnies while the boy mainly selects images of weapons. Their texts thereby carry traces of diverse encounters with consumer culture, traditions, expectations, memories and also, in all likelihood, perceived social expectations about toys and gender.

In the beginning of this chapter, we discussed that the Curriculum for the Preschool (2018) states that all children have the right to develop a critical and responsible approach to digital technologies and should be supported in developing an interest in using, interpreting, questioning, and discussing digital and non-digital images and texts. This takes us to the matter of digital literacies in preschool. Compared to the previous (non-digital) activity, where the children used to cut out pictures from magazines, the individual collage-making activities engage the children in other kinds of literacies. In order to create collages in the app, the children need to type in correctly spelled, functional search phrases into the search box in the app. This process evidently demands the assistance of a teacher to a much higher degree than the original, non-digital activity would. The children need to make up, articulate, and specify the objects they want to include in the collages, compared to the original activity where the visualisations by means of pictures in the magazines would work as suggestions for wishes, as described by the teachers. This implies that children, to a higher degree, will need to draw on previous experiences of consumer culture in order to know what to wish for in the digital collage-making activities. It also shows that digital literacy events, such as these, offer ample possibilities for engaging children in discussions about web searching. This would, in turn, support their critical and responsible attitudes towards digital technologies by using, interpreting, questioning, and discussing digital and non-digital images and texts. We argue that there is no fundamental disagreement on the advantages of using digital technologies in a play-based preschool. In fact, we suggest that all activities where children use digital technologies encompass both digital and non-digital aspects and can never be considered purely digital. Rather, they are (im)material activities since they always evolve in material and immaterial domains.

However, one final question remains: what did John and Sophie actually get for Christmas? Unfortunately, this final question of materialisation of the immaterial remains unanswered and is left to the imagination of the reader.

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Chapter 11

Finnish teachers' leadership narratives in a school's makerspace

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Introduction

The Finnish core curriculum for K-12 education calls for learning environments that recognise students' personal interests, knowledge and skills, and that enhance students' active participation in self-driven learning across disciplines (FNAE, 2014). During recent years, makerspaces and maker education have attracted educational attention in Finland as a means of responding to the learning requirements of the latest curriculum, including the promotion of students' engagement in science, technology, engineering, arts, and mathematics (STEAM), and learning with various technologies and media (Kumpulainen et al., 2020; Juurola & Wirman, 2019). Makerspaces give students the freedom to make choices in their learning activities (Martin, 2015), including where, how, and with whom to work with, seeking support from the teacher and each other as needed (Kariippanon et al., 2018). Makerspaces can also foster students' collaborative knowledge creation and learning (Kajamaa & Kumpulainen, 2020), agency (Kumpulainen et al., 2019), and transformative agency, which accounts for students' initiative and commitment to transform their activity and its context(s) for personal and/or academic ends (Kajamaa & Kumpulainen, 2019).

Although the Finnish education system has a long tradition in handcrafts and design (Autio et al., 2019), makerspaces and maker education bring new opportunities and tensions to existing school practices, challenging the more established roles of the teacher and students in classroom activities (Martin, 2015). At the same time, research in makerspaces has shown that students need their teachers' support to pursue maker activities and engage in learning (Kajamaa et al., 2019), suggesting that students and teachers need to have the opportunity to take part in decision making, ideate together, and share their expertise (Gumus et al., 2016). Such distributed leadership between students and teachers allows for students to take authority and control over their work (Hairon & Goh, 2015; Leskinen et al., 2021).

Despite these emerging findings, current research falls short in knowledge about the conditions, opportunities, and tensions of leadership in makerspaces. Our chapter responds to this research gap by investigating how Finnish primary school teachers narrated leadership as it related to their own and their students' interactions in a makerspace called the FUSE Studio. We were particularly interested in

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understanding how the teachers' narratives resonated with the notion of distributed leadership, involving collaboration between individuals to coordinate their work and decision-making (Gumus et al., 2016; Ho & Ng, 2017). A narrative approach (e.g., Czarniawska, 2004, 2007) was applied in analysing the interviews with eight Finnish primary school teachers working in the school-based makerspace. This approach was deemed fruitful for generating contextually nuanced research knowledge on how the teachers frame their experiences of leadership, and to depict the relationships between different experiences and their relation to broader social context (Wiles et al., 2005).

Distributed leadership in education

Distributed leadership is a widely-used concept in the educational literature (Harris & DeFlaminis, 2016; Spillane & Orlina, 2005). It has been primarily used to examine teachers' decision-making in schools (Gumus et al., 2016). Although the discussion revolving around the concept involves controversy and debate, it continues to be an influential idea within educational practice and new interpretations of distributed leadership continue to enrich theoretical understanding of leadership as a collective phenomenon and the processes of its distribution (Harris & DeFlaminis, 2016). Distributed leadership is commonly defined as being shared, delegated, and dispersed among individuals (Gumus et al., 2016). The concept presupposes that leadership is not simply restricted to individuals in formal leadership roles, but that influence and agency can be widely shared (Harris & DeFlaminis, 2016). Fundamentally, distributed leadership is a social practice constituted in the collective interactions of individuals and their social situation (Ho & Ng, 2017). Central to this conceptualisation of leadership is that it involves collaboration between multiple agents, a particular group, or community to coordinate work and decision-making (Gumus et al., 2016). Distributed leadership is thus an emergent (Gronn, 2000) and a dynamic process (Ho & Ng, 2017).

Although giving responsibility to all actors is central to distributed leadership, distributed leadership does not imply that teachers relinquish all control over decisions to the students (Hairon & Goh, 2015). In this context, Hairon and Goh (2015) refer to bounded empowerment, which fits well with a school context in which teachers have formal authority over the students but in which attempts are made to untangle power relations between students and teachers so that students can take more responsibility for their learning. Trust is also central to distributed leadership – trusting the students with responsibility over their personal work and learning (Hairon & Goh, 2015).

Some previous studies on distributed leadership have focused on agency-structure interplay to investigate the dynamics between the activity of the individuals and the social and material context out of which the leadership practice arises (Gronn, 2000; Spillane & Orlina, 2005). The activities within any structure are viewed as either reproducing or transforming the existing relations between different actors within a particular social setting (Gronn, 2000; see also Harris & DeFlaminis, 2016). Although it has been suggested that makerspaces allow for

leadership to be distributed between teachers and students (Leskinen et al., 2021; Martin, 2015), it is acknowledged that makerspaces do not automatically lead to changed practices in leadership distribution (Mulcahy et al., 2015), and that the teacher's role is still central in this process (Rajala & Kumpulainen, 2017). Furthermore, some research conducted in student-centred learning environments suggests that teachers can find it difficult to promote students taking responsibility and control over their work (Liu et al., 2021). Based on this finding, some central questions seem to arise: What does 'facilitation' and 'relinquishing control' mean for teachers? How do they enact facilitation and relinquish control to students in their daily teaching practices? (Liu et al., 2021).

Departing from earlier studies on distributed leadership, we have strived to enhance the current understanding of the dynamics of distributed leadership, with a special focus on the interactive relationship between the teacher, the students, and the learning environment. We posit that in a makerspace, leadership can be distributed through mutual decision-making, contributing to learning within the community, sharing expertise, and generating new ideas (Gumus et al., 2016). We view the learning environment as something teachers and students do (or encounter), rather than something that is given to them (Mulcahy et al., 2015). We thus posit that the makerspace context does not automatically foster distributed leadership, but its emergence is dependent on the efforts of teachers and students. Overall, this chapter contributes to the existing body of research on distributed leadership as well as research on school-based makerspaces by investigating the dynamics of leadership distribution in a school's makerspace from the teachers' perspective. We applied a narrative approach to carry out this investigation. On this basis, we ask:

How do teachers narrate the dynamics of leadership in a school's makerspace, the FUSE Studio?

Methods

Research setting

Our study is situated in a Finnish primary school in the capital area. At the time of the data collection, the school had undergone a curriculum reform, and thus the school's formal classroom learning environments were extended by introducing a new school-based makerspace, the FUSE Studio (Stevens et al., 2016). The school offers FUSE Studio as an elective subject to students in grades four to six (age 10–12). The FUSE Studio provides students with 30 STEAM projects, called 'challenges'. The challenges range from designing a 'dream home' with 3D modelling software to making windmills and solar-powered cars. Some of the challenges are fully digital and in some, students use hands-on materials that are provided to them in separate kits. The students can access the challenges and their instructions through a website.[1] On this website the students find trailer videos of each FUSE challenge and choose the challenge most appealing to them based on these trailers.

The FUSE Studio follows design principles, including student choice in selecting the challenges to work on as well as who to work with and minimal formal assessment (Stevens & Jona, 2017). The assessment of students' participation and learning does not include grading, but is carried out by using photos, video or other digital artifacts produced by the students. According to the developers (Stevens et al., 2016), the FUSE Studio strives for peer-based learning with an aim to develop the students' relative expertise – that is, expertise relative to each other developed through interest-driven work and peer collaboration. Further, the students do not have to rely on their teachers' interpretations of the challenge instructions – or interpretations of what the final product will look like – but can have an active role with opportunities and responsibilities to construct meaning and interact with peers to broaden interpretations and direction of their work. Thus, it proposes a new role for teachers as facilitators of students' work.

Data overview

The data comprised semi-structured interviews with eight teachers, conducted at the beginning of the 2017 spring semester. The teachers were individually interviewed at the school, and at the time of data collection, they had worked in the FUSE Studio for one academic semester. The interview questions addressed the following themes: the teachers' experiences of the FUSE Studio and its design principles; the students participating in the activities in the FUSE Studio; FUSE and pedagogy; school culture and leadership; and the curriculum reform. Although these themes did not specifically address leadership, the teachers reflected on the opportunities and challenges of leadership and its distribution in the makerspace environment. The interviews lasted for 30–45 minutes. Each interview was audio-recorded and transcribed verbatim.[2] The teachers represented diverse teaching backgrounds: four of them were class teachers in grades one to four, two were crafts teachers in grades seven to nine, one was an English language teacher in grades three to nine and one was a biology and geography teacher in grades seven to nine. The teachers' names (pseudonyms), the grade levels they teach in the FUSE Studio, as well as their primary teaching roles in the school are described in Table 11.1.

Table 11.1 Research participants

Name (Pseudonym)	Grade level in FUSE	Primary teaching role
Stiina (F)	4th grade	4th grade class teacher
Kari (M)	4th grade	3rd grade class teacher
Pauli (M)	4th grade	English language teacher, grades 3–9
Anniina (F)	5th grade	1st grade class teacher
Henri (M)	5th grade	Crafts teacher, grades 7–9
Anssi (M)	5th grade	1st grade class teacher
Tero (M)	6th grade	Crafts teacher, grades 7–9
Matias (M)	6th grade	Biology and Geology teacher, grades 7–9

Narrative analysis

Narrative thinking, applied in this study, allows for the interpretation and analysis of human experience, meaning, knowledge, social action, human agency, and the complexity of social elements of human life (Czarniawska, 2004). Narratives are important processual and temporal tools for interpreting and making sense of one's own and other peoples' experiences, actions, and intentions. They construct ways of action, reflect the context in which they are told, and the context itself can be seen as a socially constructed story (Clandinin & Connelly, 2000; Czarniawska, 2007). Different voices are present in narratives, and much knowledge is mediated through them (Czarniawska, 2007). For these reasons, we used a narrative approach, and it has proved to be an appropriate lens through which to analyse leadership (see e.g. Johnson, 2009).

We began the analysis by identifying the teachers' narrative accounts of leadership during the interviews. Central to identifying these accounts was their talk about how the teachers and students were described as taking responsibility and control over the activities in the FUSE Studio (Gumus et al., 2016; Hairon & Goh, 2015). We then categorised the accounts based on whether and how leadership was distributed between the individual actors. This phase of the analysis produced three categories: teacher-led, student-led, and distributed accounts of leadership. Taking a narrative stance, we then continued the analysis by organising the interviewees' accounts of leadership on a temporal trajectory (Czarniawska, 2004), analysing whether they concerned their past experiences, their current experiences, or the imagined future activities in the FUSE Studio (see Clandinin & Connelly, 2000). The placing of the accounts in a temporal structure allowed us to investigate the teachers' experiences as a sequence of connected events. In turn, this enabled us to analyse the relationships between the three narratives of leadership, and to analyse how they related to a broader social context (Wiles et al., 2005).

Results

The results of our study revealed three narrative accounts of leadership in the FUSE Studio, namely: teacher-led, student-led, and distributed accounts of leadership. In the teacher-led narratives of leadership, the teachers took control over structuring and organising the students' work. In the student-led narratives of leadership, participation was based on students pursuing their interests in personally relevant maker projects. In the narratives of distributed leadership, the teachers worked side by side with their students and shared responsibility over making and learning.

Teacher-led narratives of leadership: the teacher as a conductor

Narratives of teacher-led leadership reflected 'traditional' roles of teachers and students in schooling, in which the teacher is responsible for organising the students'

work. A 5th grade teacher, Anssi, had a teacher-led narrative, which included his thoughts about a cultural change happening in schools along with the implementation of new learning environments. He recognised a common goal for more student-led learning. However, he questioned whether that goal could ever be fully reached. This is evidenced by how he reflected on his past experiences as a teacher and how these are present in his daily work in the FUSE Studio:

ANSSI: In school, you will have daily situations in which the teacher has to work as a conductor if there is a new situation or one that has been new – or it can easily become chaotic. We have many devices here and a lot of things that can draw the students' attention in a somewhat wrong direction – you'll let them eat the marshmallows [intended for use in a challenge] and so on.

In his narrative, Anssi reasoned the need for teacher leadership so that the work does not become 'chaotic'. The goal of student leadership is challenged by a need for him to take control over managing the students' attention in a stimulating learning environment.

Like Anssi's narrative, 4th grade teacher Stiina's narrative included reflections about the change happening in schools. Stiina explained how the students bring former teacher-led ways of working into the FUSE Studio:

STIINA: Overall, the culture in teaching has been so that 'teacher, teacher, I don't understand' and then the teacher has always helped, but well – I just have to teach them out of that habit, at least here in the FUSE Studio, because I cannot always help or know how to help, you have to find out for yourself.

This narrative provides evidence of how the students can expect the teacher to take the lead and act as the conductor of their work. However, Stiina described how she saw opportunities to overcome such challenges by using the technological infrastructure of the FUSE Studio concept. She saw the infrastructure as a means to develop her own pedagogy to support students' taking more leadership in the future.

In sum, the narratives of teacher-led leadership highlight how working in a makerspace entails a constant negotiation among the teacher about how much, when, and how responsibility can be relinquished to the student. The narratives show that past experiences of schooling are visible in the FUSE Studio, and it thus takes time for the teachers and students to form new ways of working in a novel, more open environment, in the context of the school.

Student-led narratives of leadership: stepping back and relinquishing control

Narratives of student-led leadership were constructed from the teachers' accounts in which the teachers stepped back and made an effort to enhance their students' engagement in personal projects and granting the students responsibility for their own work. A 4th grade teacher Annika and a 5th grade teacher Henri both

reflected on their pasts as teachers in their narrative accounts of student leadership. They both explained how they had an orientation to facilitating students' projects in their own teaching outside the FUSE Studio. They saw the FUSE Studio as an environment which quite naturally allows them to implement this orientation. In particular, because the students could develop relative expertise, use it in their own projects and guide and teach each other in the FUSE Studio environment, it was seen as enhancing the students' opportunities to take leadership in their work. They both described this as being important for the students' learning.

Although student leadership was foundational, Henri's narrative particularly showed some challenges in the students' engagement in fully personal projects:

HENRI: Yes, well the instructions are very easy and it's easy to do only the different phases of the challenges, you don't have to apply the skills in any way at any stage and if you do as the instructions say … the students might jump over some of the videos and it's shown in the end that this is what it could be and they make exactly that. Or … someone printed that thing and I'm going to print the same. I want to challenge them to think that … you're supposed to learn the skill to be able to produce something of your own. It's so easy to take something that is ready … It takes effort to understand that in order to learn something yourself, you have to put yourself into it, plus you need to modify and apply the skills you develop.

In this passage, Henri recognised an issue in the current ready-made projects by the FUSE Studio developers. Constructing a student-led narrative, he reflects on a personal pedagogical goal (to urge the students to take leadership over their activity and to make decisions that promote their engagement in personally meaningful projects), and thus connects his current experiences of the FUSE Studio to a future that Henri imagines for him and his students. Annika expressed similar challenges: she was also concerned that the students would merely stick to a specific set of ready-made challenges. Her narrative included a future in which this challenge is overcome by expanding the current form of the FUSE Studio:

ANNIKA: The next step would be to get the students to make their own challenges. When they have a skill they've learned in a challenge, they could possibly combine aspects of different challenges and design a project that's completely of their own making, I'd still like to see that happen … like for example if they've learned – I'm thinking which challenges could be like that – well for example if you've designed a [virtual] game and then you'd want to develop it into a board game. You could use the vinyl cutter, sticker printing things or the 3D printer or something. You could use those skills to make that board game … so that it would start living something completely its own. You'd have the tools and the skills, and you could take it to a whole other level.

This passage highlights how the student-led narrative involves a future in the FUSE Studio in which the students would take even more leadership in creating

projects that are completely their own and using their personal skills and strengths in engaging in those projects.

> To summarize, the narratives of student-led leadership are evidence of the moments in which the teacher can step back, relinquish more control to the students, and facilitate their projects in the FUSE Studio. These narratives involve the teachers' current pedagogical actions, but further highlight their future objectives. Thus, the narratives illustrate how the distribution of leadership between the teacher and the students is something that happens over time – it happens to some extent in the FUSE Studio now, but particularly further in the imagined futures expressed in these narratives.

Distributed accounts of leadership: taking the journey together

The narratives of distributed leadership represent the way in which the gap between teacher leadership and student leadership is bridged. A 4th grade teacher, Kari, described how the FUSE Studio provides options for students to exercise leadership, but they – the teachers and the students – are not quite there yet. However, Kari expressed how distributed leadership could promote students' leadership in the future:

KARI: Yes, exactly. And I think that somehow the sharing of knowledge, taking on new roles, the students would take roles and realize that they can also guide others, an atmosphere of expertise or field of expertise in which you share that expertise among all actors, both teachers and students – that would be it.

A 4th grade teacher, Annika's, narrative included similar challenges. It reflected how the distribution of expertise evident in the passage above does not happen naturally in the FUSE Studio, but it is something that the students need to learn as they work:

ANNIKA: For some it's more natural than for others – you find out about things on your own. For many, it's about literacy, watching the videos; it's inevitable here and so many times I have to say 'have you read the instructions', 'have you watched the video? 'Well no', 'well read and watch first and then ask your friend', and so on. Maybe it's there too that if you go on YouTube there are tons of videos that you can watch and develop your skills but that also requires that you realize that okay, I really want to learn this, and I will go into it.

This passage exemplifies how the infrastructure in the FUSE Studio – the technology and the peer network – allows for the students to develop relative expertise and thus take leadership over their work. Yet, the students do not automatically take such leadership, but the teacher plays a pivotal role in overcoming this particular challenge. The infrastructure in the FUSE Studio allows the teacher to

relinquish leadership to the students by, for example, watching video tutorials and asking for peer help.

Overall, the narratives of distributed leadership were evidence of how the design principles of the FUSE Studio, particularly the technological infrastructure, encourage students to use peer resources, and further allow for and prompt shared distribution of leadership in the learning environment. As such, these narratives represent the dimensions of the FUSE Studio, which help overcome some of the challenges of 'past schooling' and move the activities towards the 'imagined future' of the FUSE Studio.

Discussion and conclusions

In our study, we investigated how teachers in a Finnish school described leadership in a school-based makerspace, the FUSE Studio. Makerspaces create teaching and learning arrangements as an alternative to more established educational practices in the school with consequences to the roles and power relationships between teachers and students. Yet, at present there has been little research about the nature of leadership in these novel learning environments. Our narrative analysis revealed how the teachers' narratives reflected teacher-led, student-led, and distributed accounts of leadership. Together the three narratives of leadership evidence how the makerspace context does not automatically foster distributed leadership, but its emergence demands collective efforts from both teachers and students to be willing to change their more established roles into collaborators and facilitators of learning.

Adding to previous research on distributed leadership, our study showed that the teachers considered it possible for everyone who took part in the school's makerspace to be able to exercise leadership (see Gumus et al., 2016). The teachers' narratives were also evidence of their efforts to increase the students' authority and control over their making and learning. Although the teachers' student-led narrative accounts of leadership reported students taking on new roles and acquiring expertise, this leadership potential was not always fully realised in the students' activities. For example, the teachers and students can bring a traditional culture of teacher-led leadership with them to the FUSE Studio. They can also copy and make pre-designed artefacts without hacking or customising them to make the projects personal, as is the aim in the FUSE Studio. However, the teachers' student-led narratives of leadership suggested an imagined future in which the core principles of maker education – student responsibility over personal projects – were met as advocated by maker education (e.g. Martin, 2015). In these narratives, the students were able to take leadership in designing and pursuing their maker projects based on their interests, skills, and passions. Our results also provided accounts of distributed leadership in which the teachers worked side by side with their students and shared responsibility for making and learning. In these narratives we could see a dialogue between the narrative accounts of teacher-led and student-led leadership, which in the teachers' reflections, created a space for the students in which they could take more authority and leadership over their personal work in the makerspace.

However, our study has limitations which require careful consideration. First, in narrative research, interpretations of events can always be otherwise (Clandinin & Connelly, 2000). It needs to be emphasised that our analysis of leadership relies on our own interpretations of the interviews and theoretical understanding of distributed leadership. We also acknowledge that our analysis was restricted to a specific makerspace, the FUSE Studio, within the context of one Finnish primary school. As makerspaces are now increasingly implemented in Finnish schools (Juurola & Wirman, 2019) as a means of promoting students' twenty-first-century knowledge and skills, agency, and collaborative knowledge creation (Kumpulainen et al., 2020), further research is needed to understand the dynamics of leadership in other types of makerspaces. We hence call for more research to understand which pedagogical solutions and practices can support and help sustain the efforts of different forms of leadership among the teachers and students in makerspaces.

Notes

1 The FUSE Studio website can be viewed at: www.fusestudio.net
2 Informed consent was obtained from all research participants. All names used in this chapter are pseudonyms.

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Part III

Conceptions of agency and engagement

Chapter 12

Young activists

Engaging with global climate change in a networked society

Anne Solli and Åsa Mäkitalo

Introduction

In this chapter we take an interest in how a youth climate movement leverage digital media to engage in new forms of politics that are profoundly participatory (Jenkins & Ito, 2015). Youth activism has a long history, with numerous cases of successful media resonance, but recently it has gained global reach due to the networked character of communication in contemporary society (Loader, Vromen, & Xenos, 2014; Olesen, 2020). Children,[1] who earlier had to rely on news media to take an interest in their perspective, now turn to their peers through social media and mobilise collective action in ways that raise public interest in their concerns. On 14 March 2018, students from several parts of the US walked out of school by the thousands, to protest against the threat of gun violence and demanded action for gun control. Later the same year, and inspired by this movement, a young climate activist in Sweden sat down outside the Swedish Parliament and eventually mobilised children on a global scale to strike from school on Fridays in protest to current climate policies. According to Huang and Cheah (2021), young people in the Nordic countries in particular, consider climate change as one of the biggest threats to the world's future. The media coverage and political attention to this young climate movement also testify to a new situation where children can position themselves in ways that echo globally. The response they receive from established institutional actors, we argue, calls for a conceptualisation and analytical approach that highlight children's political engagement with climate change in a networked society (Boulianne, Lalancette, & Ilkiw, 2020; Fløttum et al., 2016; Jenkins et al., 2018; O'Brien et al., 2018; Olesen, 2020).

Whether social media facilitates political participation is debated. Some scholars highlight their democratic potential, while others underscore their limitations in furthering participation (Bennett, 2007). Social media platforms provide options for youth who were previously excluded from formal channels of political participation, but they can also subject youth to surveillance, censorship, and other forms of repression (Lee, 2018). In the fields of Internet research and media and communication studies, the networked young citizen has, at times, surfaced as a self-actualising individual, primarily engaged in cause-oriented activism (Loader et al., 2014, p. 144). Large-scale survey research on young civic engagement in Europe,

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for example, reports that young people are reinventing political activism online (Sloam, 2016). Rather than engaging in political organisations, they have been claimed to engage in issue-based political activities, which has raised concerns about clicktivism or flash activism (Boulianne & Theocharis, 2020). On the other hand, there are reports of young people who participate in several collective activities online (i.e. connected civics). A recent meta-analysis from 106 survey-based studies about youth, digital media use and engagement in civic and political life, concluded that online and off-line forms of engagement are highly correlated (Boulianne, Koc-Michalska, & Bimber, 2020) suggesting that the distinction may have become obsolete. Ekström and Sveningsson (2019) found that the collective involvement during adolescence was tentative and explorative, understood as a social process of forming values, beliefs, and identities with peers. Expressing one's political opinion publicly, is a demanding form of democratic involvement. Young people's participation in public political talk is often highly valued, but when going public, individuals need to anticipate a range of responses and valued positions of others. Social media have transformed the conditions and created new interactional dynamics, opportunities, and risks (Loader, Vromen, & Xenos, 2014), where especially young girls seem to be negatively targeted (Ekström, 2016).

In this chapter we will exemplify how the youth climate movement mentioned earlier, is constituted through a local event in light of its global reach. Field observations from a particular event organised by the Fridaysforfuture (FFF) movement (@Fridaysforfuture @Fridays4future) will serve as our data. FFF raises concern about climate change through weekly school strikes on Fridays. A dialogical approach (Bakhtin, 1981, 1986; Vološinov 1973) serves as our theoretical point of departure since it is well suited to investigate the dynamics of young political engagement in contested issues. Analytically, such an approach highlights the saliency of dialogical tensions (Bakhtin, 1986) in young people's lives and as an inherent feature of such events.

Our purpose is to investigate how FFF as a youth movement establishes a voice in the public debate on climate change. We will address the following questions:

- How does the FFF movement leverage social media to mobilise students to join school strikes?
- How are voices of other parties invoked in the event to formulate climate change as an issue of public concern?

Conceptualising public climate protests as speech events in dialogical tension

Since climate change entered the public sphere of debate and deliberation (Dahl & Fløttum, 2014), the complexity it presents gives it the status of a social dilemma, where there are disagreements on the nature and the boundaries of the issue itself as well as the political measures to deal with it. This is why we find the notion of dialogical tensions to be of particular relevance to explore the dynamics in play where '[e]ach word tastes of the context and contexts in which it has lived its

socially charged life' (Bakhtin, 1981, p. 293). To address the issue in public implies to enter a situation of heteroglossia; where a range of different social languages – professional and institutional – are potentially in play. Those involved would typically raise the issue at stake, what measures should be taken to handle it and who are responsible. In other words, the speech event itself, as characterised by ideological tensions and moral overtones, will become constitutive of the issue for the young activists involved. Speakers will be heard as positioning themselves in alignment with, or against, the stakes of others and make salient the issue as a social dilemma by pre-empting (i.e. incorporating) the voices and stances of others (Vološinov 1973, p. 80). An utterance (Bakhtin, 1981, 1986) thus, applies to spoken as well as other forms of communication and is entangled with broader issues than the speaking subjects' own perspective, belief system, intention, or world view (Linell, 2009).

Debated issues, such as climate change, are generated through audiovisual-semiotic means and at public speech events they both echo and are charged by their earlier lives (Vološinov, 1973). They are sustained and distributed through social media and news sites, establishing further layers of display and circulation. In this context, even monologically organised utterances of one individual, delivering a public speech at a particular event, are understood as heterogeneous 'each utterance is filled with echoes and reverberations of other utterances to which it is related' (Bakhtin, 1986, p. 88). To establish a unique voice the speaker will draw on ideas and perspectives attributed to other people and use their voices, either as support, or as counter positions to resist and argue against (Linell, 2009). The speaker may also subject the other perspectives to various reservations as well as criticism and ridicule. In the following we will give an account of the FFF movement then we will exemplify how it mobilises children to the public speech event that we have chosen to exemplify our analytical approach.

Fridays for future: a new generation of climate activists leveraging social media

The FFF school strikes aim at global reach arguing that climate change threatens the future for all. A survey of the global FFF strike events on 15 March 2019, covering 13 cities in 9 European countries, reported that the school strikers were 14–19 years of age, 66 per cent were females, and they testified to a significant reliance on social media and peer networks (Wahlström et al., 2019). Earlier youth movements have been reported to leverage digital media in collaboration with adults to achieve a voice in public spheres (Ito et al., 2015). In the school strikes, however, online social media proved to be a potent information channel. As much as 34.4 per cent of school students indicate having learned about the protest through Facebook, Twitter, or Instagram. The FFF movement also showed a limited commitment to established environmental organisations, a significant investment in lifestyle politics but a varying interpretation of how important such politics are for achieving social change. There was also a hopeful attitude towards the future and a sense that the movement is strong. These elements point towards

the development of FFF into a new grassroots movement able to significantly broaden the composition of climate protest (Wahlström et al., 2019).

The global climate strike thus reflects a trend in international protest events, which are connected through social media and other digital media tools (Boulianne, Lalancette, & Ilkiw, 2020). The key challenge for environmental political change is that local action is required to address a global problem. Individual actions might be perceived as having little consequence, given the global, overwhelming nature of environmental problems. Social media platforms are in this context transforming political engagement by offering, especially the younger generation, agency through the ability to voice their concerns to a global audience. Participating in marches and demonstrations requires effort to mobilise people, and social media are believed to reduce the costs of participation, since information about the location and turnout are easier to acquire (Boulianne, Lalancette, & Ilkiw, 2020). Tweets that mention a location, or cities, such as London, New York City, and Stockholm were posted by the FFF movement and were then followed by tweets mentioning the protest at a global scale. Through social media the young may gain momentum to voice their concerns about climate change and the need for action, as well as document the discontent among citizens by posting pictures of the protest event (Boulianne, Lalancette, & Ilkiw, 2020). How the FFF movement leverage social media to mobilise students to join school strikes, to voice their concerns in public and to document their activities will be the entrance point to the next section as we introduce the specific event we will use as an example.

The global climate strike in Stockholm as co-constitutive of social media use

The FFF movement use social media to mobilise young activists worldwide to sign-up for a local strike as they decide to join an event. Their geographical locations are tagged through social media accounts through hashtags and hyperlinks. These are then re-purposed to display their joint engagement before the event. The specific speech event we will use to illustrate our analytical approach is a global climate strike arranged by FFF on 24 May 2019. This was a pivotal public event among 1263 others, taking place in 107 different countries. The Fridays for Future movement mobilised students for a global strike displaying the global reach of the event in social media. One of many examples is a Twitter post from 24 May Friday for Future Europe with the text 'Don't stay in school – Join us'. Similarly another activist on Twitter presents the world map pointing out all events and encourages 'Anyone of any age who can join should join'. We followed this particular event as it played out live and our observations of diverse audiovisual-semiotic means that are used during the event serve to illustrate how this school strike was dialogically framed, anticipated, performed, and reported as a unique event in light of its global reach.

In Stockholm, the young school strikers who participated in the public event gathered in Humlegården (a park area). They chanted as they moved through the streets of the city centre, led by the young activists speaking at the event,

before they reached Kungsträdgården, a space commonly used for public events (Figure 12.1).

As they arrive at Kungsträdgården they encounter a screen on stage with a live broadcast of the climate school strike in Copenhagen. Two young moderators, led chants about the climate on stage echoing the chants of the crowd in Copenhagen, and then introduced the speakers (Figure 12.2). While they addressed the young audience, Greta Thunberg, one of the organisers of this event and the main

Figure 12.1 Children have left their schools and meet up for the demonstration chanting together as they move through the streets of Stockholm.

Figure 12.2 School strike in Copenhagen on live display (left) and social media accounts displayed on screen (right) during the strike event in Stockholm.

attraction for many school strikers, waited in the backstage area, and used her Instagram account to report the events in Stockholm. The Instagram post shows a photo of the audience and the stage, accompanied with the text: Stockholm right now #FridaysForFuture, #Schoolstrike4Climate, #Climatestrike.

As Greta Thunberg entered the stage she addressed her peers by saying: 'Thank you for being here today, right now hundreds of thousands of children are striking all over the world', verbally situating their local presence as an important part of a youth movement currently engaged in one school strike event with global reach. The young famous climate activist also reminded her audience of the specific motifs of gathering this particular Friday; that this strike takes place during the 2019 European Parliament election – one that they have targeted and wants to affect politically.

After the public speech event Greta reports on the outreach of the event by tweeting about the massive number of participants, well over 1 million students in the global event. Her speech is also made available on YouTube for participants and more remote audiences from all over the world, as well as for the news media who cover the event as it unfolds locally and recurrently through social media.

In the following, we aim to exemplify how the young climate activists in organising this public speech event address not only those who are present (i.e. concrete others), but are also in dialogue with a range of remote or absent others to establish and maintain their unique voice in the public debate on climate change.

Establishing a unique voice in the debate on climate change

Identifiable addressees, apart from the present school strikers, green activists, and scientists, are politicians and adults who are either called upon to support them or targeted as those who compete with their shared social knowledge and scepticism to current action on climate change (Dryzek, 2013). We highlight the dialogical tensions involved by investigating the speakers' positioning in terms of alignment and opposition with respect to the voice of concrete as well as generalised others, anticipated and incorporated in the speaker's own utterances. The concrete others who are primarily addressed in this particular speech event have responded to the call of the movement, and consists of the young students on school strike. When addressing them, Greta who is treated as the main speaker of the event, orients their attention to their primary concern as young citizens and the impact they as Europeans have on climate change. She highlights the importance of their engagement, not only as climate activists here and now, but importantly also through time, thereby establishing the relevant theme of the dialogue (Vološinov, 1973) the human conditions for living on earth:

> What we do will have an enormous impact for the future living conditions on earth. We face an existential crisis and time is running out. If we have not decreased our emissions of carbon dioxide by half in 10 years, 221 days and 10 hours, we will most likely set off a chain reaction beyond human control /…/

> and these calculations do not include tipping points, feedback loops and issues of fairness in the Paris agreement or already built-in warming hidden by life threatening air pollutants /…/ the adjustment that is necessary will according to IPCC imply incomparable changes on all levels of society, starting today. If EU decided to seriously fight climate change, it would make a crucial difference, globally, and the EU election should reasonably be all about this but it's not, not at all.

As in earlier environmental discourse, time is invoked as a salient means to call on action and argue for its urgency (Van der Leeuw et al., 2012). In this context, the necessity of change becomes one of the survival of humans and other species on earth as the living conditions are claimed to be at stake. By referencing a prominent report written by an international expert panel (IPCC) in this context the notion of limited time gains scientific weight. This is achieved through reported speech (Vološinov, 1973) where the official voice of the experts is maintained intact (calculating the risks of 'tipping points', 'feedback loops', and 'hidden air pollutants') and only animated by the speaker. By mentioning the Paris agreement the joint obligations of taking political action are simultaneously made salient. However, in order not to distance the young audience from their own stake in the issue, the decision they have made to leave their schools and turn to the streets, is also acknowledged by an account that justifies their action as a necessary response against the background of a known environmental crisis, which has now become urgent:

> Our survival obviously does not mean more than that, our leaders have failed us, our politicians have failed us, media have failed us to the extent that we have to sacrifice our own education, to do what most adults are too afraid to do, to tell it as it is (the crowd cries out in response) regardless how unpopular and inconvenient it may be

By stressing that leaders, politicians, media, and adults in general have failed them, a set of culturally established actors of entitlements and obligations are made salient; as adults they have failed to act or speak on behalf of the young whose futures depend on them. The voice is oppositional and the meaning of the situation[2] becomes pivotal. In light of the obvious asymmetry – the absence of adults becomes morally charged to the young audience who align with their speaker by calling out their discontent. The notion of time is then again brought to the fore, now charged with moral overtones:

> The passivity of older generations will in the future probably be seen as the greatest betrayal ever, but there is still time to put things right and this is why we are here today and this is why we will continue to be here, as long as its necessary, and believe me it will take time. We ask of the adults please give us a future, is that really too much to ask for? /…/ Some adults say we are lazy and that we just want to skip school, some adults think it's bad to strike from

> school and that we should be studying to make a difference in the future, but they ignore the tiny fact that it will be too late by the time we graduate.

By presenting older generations as inept to take on actions to mitigate climate change, the crisis as they know it is portrayed to be ignored, forcing themselves to take action. The persistence of FFF to organise strikes recurrently implies that most children breach an established social contract (i.e. obligatory school attendance). This is both anticipated and justified with a counterargument highlighting that time is running out and that action is needed. In addition to the oral characteristics of the direct address to adults to come to their aid ('please give us a future') the pleading relies on earlier sequences of the speech from which the absence and ignorance of adults reverberate. Exaggeration and ridicule (shaming) here set the tone of reported speech. This rhetorically generates a strong inclination for adults to act on behalf of the young and their future; it also allows the young to refrain from the heat of the debate as such, instead they orient the attention of adults to the voice of science, to their responsibility for future generations (in retrospect) and their possibility to position themselves on the right side of history:

> We are here to ask the adults to listen to the researchers, dare to take responsibility and act. We are not here to debate, the debate is over everything we say is backed up by research, unite behind the science, listen to the science. We are at a historical turning point, we are here because we have chosen side, we have chosen to stand on the right side of history.

As we have mentioned, the school strikes are mobilised, maintained, and documented through social media, and when commented upon by legacy media sites, the voice of the young echo globally. In this sense the speech event is tailored to challenge the absence of abstract but highly recognisable 'others' and calling for their response – to act. In Bakhtinian parlance the notion of responsivity involves expected response-ability. When addressing a social dilemma in dialogical tension, moral overtones highlight the expectation to act responsibly when one has the ability to do so, and, hence, these actors are called upon to answer for their conduct. Time will tell, as it were, future generations of the historical mistakes that are currently being made. The entire framing of this youth movement is about young people demanding that adults take responsibility for safeguarding their future, and the main message echoes the voice of climate scientists, that is to say, the prevailing climate policy and emission levels must be radically changed as soon as possible, otherwise a global disaster threatens the living conditions of future generations.

Discussion

By drawing attention to how young activists in the FFF school strike movement establish a voice in the debate on climate change, we have highlighted how young people are mobilised. We have used field observations to point to the saliency of dialogical tensions (Bakhtin, 1986). We have shown how the young climate

activists in organising their joint public speech event address not only those who are present but are also in dialogue with a range of remote or absent others. The analysis reveals how complex interaction of different voices are integrated in the activist's argumentation and positioning. The FFF movement use of social media to mobilise young activists worldwide to sign-up to join a particular event visually display their joint engagement making all the local strike events count, whether small or substantial in terms of participants, in their joint image of a youth movement with global reach. As more and more children recurrently left school on Fridays the rise of a movement of activism and civil disobedience reached beyond those directly involved, with an increased public awareness of climate change. The FFF movement manages to carve out a unique voice of children in the public media space; one speaking not only from their current position but also of future generations. The theme of the debate can be re-actualised through time, and call for both institutional and parental action – by pointing to formal obligations and entitlements that are not limited to the Internet, but makes itself visible in salient spaces of public life (Jenkins et al., 2018).

At this event the decision to leave schools and turn to the streets, is acknowledged by an account that justifies their illegal action as a necessary response to an environmental crisis. When young citizens address the issue of climate change in Fridaysforfuture, they address challenging questions about how society deals with complex global problems and the future. They enter debates that involve dissenting from norms and practices like going to school, consumption, fossil energy use, and the unjust use of power in decision-making (O'Brien, Selboe, Hayward; 2018). O'Brien et al. (2018) consider the type of activism that seek to change existing political and economic structures, disruptive dissent. Disruptive actions explicitly challenge power relationships, as well as the actors and political authorities who maintain them, often through protests and collective organisation. Children joining the school strike arranged by FFF could accordingly be seen as disruptive dissenters who critique and challenge the system. Through action the school strikes thus create new spaces for alternative political voices and young actors that challenge traditional power dynamics and interests which seem unavoidable. By incorporating the voice of science, without claiming to be knowledgeable themselves, FFF are able to position themselves as children, channel their concerns and demand actions to be taken, in the public debate on climate change policy.

Youth participation can be understood and enacted in a variety of ways. Our argument here is that consideration of voices and their institutional embeddedness can offer a nuanced understanding of how young people participate in debate, are in dialogue with and engage in issues of public concern. Common analytical approaches in studies of youth movements are framing analysis and content analysis both of which are well suited to bring out important aspects of written and spoken accounts of the debate (Dahl & Fløttum, 2014). The dialogical approach invites an analysis of activists' discursive management of multiple perspectives, a multivocality recognisable in ongoing and recurring public debates, which takes as a premise the social, dynamic, and contested nature of communication and forms of reasoning.

The speakers' direct and indirect dialogues with others play a decisive role and are not compatible with producer-centred modes of action.

Although many young people show an interest in global problems, feelings of hopelessness and helplessness, as well as inactivity have been reported (Ojala & Bengtsson, 2019). By facilitating collective engagement through recurrent school strikes, the FFF movement enable young people to teach, support, and encourage each other. Emphasising a need to speak up in the absence of parents, teachers and other adults, the movement increasingly makes salient their right to be heard in matters which regard their own future – as regulated by the child convention. Through the FFF movement young people have been invited into international efforts to tackle climate change. In September 2019, UN human rights committees released a statement highlighting that children are particularly vulnerable to the effects of climate catastrophe. It emphasised that they should be included in decision-making around how to address the crisis. In April 2021, the FFF movement's complaint to the German constitutional court resulted in a demand of the government to change their climate measures as to not risk future fundamental rights of young citizens. In the absence of formal legal structures for children's participation, and in the face of government inaction on the climate crisis, protesting through school strike could be argued as children's right and one of the few ways that young people can participate as citizens in a democratic system, given that the majority do not have the right to vote. Recognising that children are not to be ignored (O'Brien et al., 2018) or treated as adults in training but as young citizens with civil and political rights, the youth activists are increasingly seen as legitimate participants in democratic practices expecting opportunities to challenge societies handling of climate change.

Notes

1 This category applies to people up to 18 years of age in line with the UN convention of the rights of the child, which has been embedded in the legal systems of the Nordic Countries. In this chapter we use 'youth', 'the young', or 'young people' to refer to children who take part in civic engagements.
2 The word *situation* relates to both place, location, and position (etymologically).

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Chapter 13

‘I could smell the sound of winter’

Children’s aesthetic experiences in their local forest through digital storying

Jenny Renlund, Kristiina Kumpulainen, Jenny Byman and Chin-Chin Wong

Introduction

A growing body of literature suggests that relating aesthetically with outdoor landscapes and wildlife promotes wellbeing (Gelter, 2007; Sandell & Öhman, 2010) and increases environmental care (Bartos, 2013; Kellert, 2013; Tooth & Renshaw, 2020). The Nordic countries have an abundance of landscapes with rich wildlife for people to enjoy and spending time outdoors in nature lies at the heart of the Nordic cultural tradition, with aesthetic immersion regarded as an important part of the Nordic outdoor experience (Gelter, 2007). Although children’s opportunities for playing and roaming outdoors are emphasised in Nordic early childhood education (Sandseter & Lysklett, 2017), urbanisation and changing lifestyles are affecting children’s outdoor activities and experiences. These changes interact with the ways children perceive and relate with their living environments (Payne, 2018). Because aesthetic experiences have the power to create paths for wonder and curiosity about the world, along with forming meaningful connections with surrounding matter and space (Rousell and Williams, 2020; Rousell & Cutter-Mackenzie-Knowles, 2020; Kellert, 2013), it becomes important to devote more attention to understanding children’s aesthetic experiences in their local environments.

In this chapter, we discuss a case study about children’s digital storying of their aesthetic experiences in a forest of their neighbourhood. With digital storying we refer to children’s digital storycrafting and storytelling processes, which include embodied and multimodal experiences and expressions (Facer, 2019). Considering that digital technology plays an increasing role in children’s lives, there is a need to investigate how digital practices interlace with children’s aesthetic experiences outdoors in nature (Scott-Stevenson, 2020). As Kim (2013) writes, ‘the screen is not always an opaque barrier, but can be a media enhanced window onto our surroundings’ (p. 2). Drawing on a relational materialist approach (Hultman & Lenz Taguchi, 2010), this study aims to increase understanding of the aesthetic and relational dynamics at play in digital storying events.

Our investigation draws on empirical data from two digital storying workshops using a novel augmented reality (AR) application, MyAR Julle, held in a Finnish primary school. Our previous research showed how children’s sensuous literacies,

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among other entangled literacy dimensions, emerged as a significant way for children to relate to their surroundings with and through the AR storytelling application (Kumpulainen et al., 2020; see also Kumpulainen, this edition). In this study, we build on our earlier findings and further investigate the aesthetic dimensions of children's experiences with the local forest in their digital storying. We approach children's aesthetic experiences through a relational perspective, which understands them as emerging in intra-actions between digital devices, augmented reality characters, children, and the environment (e.g. Hultman & Lenz Taguchi, 2010; Lenz Taguchi, 2009).

In our study, we ask the following: (a) How does digital material interlace with the aesthetic experiences of children in the forest and (b) How does digital material create movements within these aesthetic experiences?

Children's aesthetic experiences as relational phenomena

Through combining phenomenologically grounded aesthetic theories (Berleant, 2010; Rodaway, 2002) with relational ontologies (e.g. Hultman & Lenz Taguchi, 2010; Lenz Taguchi, 2009), we conceptualise aesthetic experiences as socially, culturally, and materially entangled phenomena. We recognise humans as an inseparable part of nature and understand children as simultaneously experiencing, expressing, and creating in relation with their lived environments (Berleant, 2010; Rousell & Cutter-Mackenzie-Knowles, 2020; Rousell & Williams, 2020). Children's aesthetic experiences are therefore born in communicative flows between children and matter (Rautio, 2013). This idea relates to Lenz Taguchi's intra-active pedagogy, which views children, materiality, and discourses as mutually affected and transforming within pedagogical practices (Lenz Taguchi, 2009; see also Barad, 2007). Following this line of thinking, we understand children's aesthetic experiences as transformative intra-actions with human and non-human matter that draw children's attention and invite them into embodied relational play, where both children and matter are becoming together (Hultman & Lenz Taguchi, 2010; Lenz Taguchi, 2009; Rautio, 2013).

We further elaborate our perspective on children's aesthetic experiences by following the etymological roots of the ancient Greek aisthēsis: perception through the senses, viewing aesthetic experience as an entangled phenomenon, consisting of both physical sensation and aesthetic sense-making (Berleant, 2010; Rodaway, 2002). In this entangled phenomenon, sensory impressions assemble through interconnected dimensions. Although Rodaway (2002) acknowledges the inseparability of sensory impressions, he suggests that multisensory aesthetic experiences can be explored through entangled modalities of haptic, olfactory, visual, and auditory dimensions. The haptic dimension is associated with the skin, expanding through the mobile body and involves sensations of touch and movement. The olfactory dimension involves smells and flavours associated with the nose and tongue. The visual dimension involves seeing and is associated with the eyes. The auditory dimension involves hearing sounds and is associated with the ears. While

these sensory dimensions can be identified as having unique qualities, their boundaries are diffuse and dynamic in children's aesthetic sense-making of events and environments, forming intricate blends of multiple sensory dimensions (Rodaway, 2002). Furthermore, children's sensory impressions are not only bound by their physical bodies but can also be extended through non-human materialities (Rodaway, 2002; Swanstrom, 2016). For example, sensory impressions can be experienced through technological and digital devices, which means that the boundaries between children's sensing bodies and contextual materialities are not clear or fixed; they are porous and changing within events.

Digital storying workshops

This chapter draws on empirical data collected from two digital storying workshops in a city-run Finnish primary school in eastern Helsinki. The school is located in a socioeconomically and culturally diverse neighbourhood composed of residential areas interlaced with urban woods, hills and rocks and the school buildings are surrounded by forested areas incorporating the school yard. Sixty-two children from four second-grade classrooms participated in the workshops (38 boys, 24 girls, aged 7–9 years old). The children hailed from diverse linguistic backgrounds: 70 per cent Finnish-speaking, 8 per cent Arabic-speaking, 6 per cent Russian-speaking, and 15 per cent speaking other languages, such as Albanian, Chinese, and Portuguese. The workshops were conducted as part of a four-month-long cross-curricular project that combined environmental, literacy, and arts education in exploring the local neighbourhood. The project was carried out in collaboration with the children, four teachers from the school and five researchers from the university. In the workshops, the children engaged in a storytelling activity using a purposefully-designed AR application, MyAR Julle (www.myar.community/julle/info-en.html) on tablet devices. Through the cameras in the mobile devices, the use of AR technology allowed children to project an immersive rendering of a forest elf, Julle, in their physical environment. The application also provided a set of pre-designed appearances for Julle; the children could choose from these designs and with the cameras create a composition of the character situated in the surroundings.

The workshops were conducted in three stages: listening to an orienting story about forest elves, photographing and storying outdoors with the AR application, and semi-structured interviews (Figure 13.1). During the interviews, the researchers asked open-ended questions focusing on themes, which included the Julle stories and pictures created by the children (e.g. 'What does Julle do in your picture/story?'), the children's sensory experiences (e.g. 'Are there any specific scents or sounds in nature that you like or dislike?'), and the children's emotions (e.g., 'How do you feel when you go outside into nature?').

The data corpus of this study comprised 53 video-recorded and transcribed interviews, 201 pictures created by the children, along with the researchers' videos and observational notes, documenting the children's use of the application to construct their stories in the forest. In total, 1,017 minutes of video data were processed.

Figure 13.1 Implementation of the digital storying workshops.

In accordance with the ethical guidelines put forth by the Finnish National Board on Research Integrity (TENK) (2019), research permission was acquired from the municipality and written consent was obtained from the legal guardians of the participating children. Guardians, teachers, children, and school administrators were informed about our research plans and data collection methods. During the workshop activities, the researchers also informed the children that their participation was voluntary. At times, children would verbally or with their body language express that they did not want to be video recorded; the researcher would then turn off the camera or turn it away from those specific children. Furthermore, following ethical guidelines, pseudonyms are used for all participants. Photographs of the participants are only published as edited versions, and the participants are not recognisable.

Reading the data with a relational materialist approach

Our analysis of the children's digital storying was conducted in two phases; phase one was informed by sensory ethnography (Pink, 2015) and phase two by a relational materialist methodology (Hultman & Lenz Taguchi, 2010). This approach helped us to investigate how the children's sensory aesthetic experiences with their local forest were born in entanglements across digitality and other non-human materialities, bodies and spaces. Our reading and analysing included looking at the children's verbal narration, as well as their multimodal expressions during the digital storying events. These events encompassed the children's sense-making of their aesthetic experiences, their stories about Julle, as well as their embodied engagement with the environment as they took photographs with the application.

With the sensory ethnographic approach, we began the analysis by exploring the data as a whole, identifying moments in the data that illuminated various sensory dimensions in the children's digital storying (Pink, 2015). These included haptic, olfactory, visual, and auditory dimensions (see also Rodaway, 2002). Our

motivation was to explore the sensory complexities and to investigate if certain sensory dimensions entangled in distinct ways with digitality and different contexts during the workshops.

During the second phase of our analysis, we explored the material entanglements of children's aesthetic experiences and recognised the agencies of non-human materialities in the digital storying events. For this, we directed our analytic focus towards a range of substances and bodies and their intra-actions (Barad, 2007; Hultman & Lenz Taguchi, 2010). This meant exploring the children, the researchers, the digital dimensions, and other non-human materialities as entangled agents who all contributed to the dynamics of the workshops. Furthermore, this included becoming attentive to how digital dimensions created aesthetic movements in the children's digital storying events (Hultman & Lenz Taguchi, 2010).

Children's aesthetic experiences in the local forest through digital storying

Next, we turn to illuminating and discussing our results. First, we will discuss how digital dimensions interlaced with children's aesthetic experiences in the forest, by highlighting various sensory dimensions of the digital storying events. Second, we will explain how digital material participated in creating movements within the children's aesthetic experiences in the forest.

Digital material interlacing with the sensory dimensions of children's aesthetic experiences

Our analysis shows how digital storying allowed the children to explore, express and share a broad array of sensory aesthetic experiences in their local forest. During the workshops, the children's aesthetic experiences evidenced haptic dimensions of mobility, textures, and temperatures; visual dimensions of light, shadows, colours, and shapes; olfactory dimensions of smells and flavours; as well as auditory dimensions of sounds and silences. Our findings echo previous research, which have found that digital and visual methods can promote children's multisensory perceptiveness of environmental details (Bartos, 2013; van Hoven & Trell, 2010; Kullman, 2012; Kumpulainen et al., 2020).

The children's engagement with the environment through the AR application seemed to create shifting visual and haptic experiences as the children looked through, moved with, and touched the tablets. When photographing outdoors with the digital devices and the AR application, the children often considered how, for example, light, darkness, colours, patterns, and shapes affected the image. The children seemed to be mindful of how to place Julle and frame the image, which made them aware of aesthetic details in their surroundings and allowed them to express aesthetic preferences. Many children were also inspired to share detailed descriptions of their visual and haptic everyday experiences while moving in the forest or on the playground and at times the children's stories about Julle resonated strongly with their narration of their everyday aesthetic experiences.

The children storied about beautiful landscapes and details, for instance about colourful autumn leaves, flowers, and glitter. They shared stories of climbing trees and hills, moving in difficult terrain, or running on asphalt. Furthermore, they described enjoyable sensations of touch related to materialities and atmospheres in various terrains, such as sensations of moisture, stickiness, and softness. In many of the children's stories, they also imagined Julle's bodily movements or touch sensations in the forest. A few children imagined Julle floating in the air or jumping into space, extending their imaginative experiences with Julle beyond their own material boundaries.

Additionally, the temperature was part of the children's digital storying. Our workshop took place during the cold autumn and winter seasons in Finland, and the chilly weather became intertwined with the children's aesthetic experiences. Computers worked more slowly than usual or froze, the children and researchers handled the digital devices with stiff fingers, and Julle experienced contrasting sensations of warmth and cold in the children's stories. For instance, Laura and Iris described how Julle in their photograph was sleeping on the ground and that he enjoyed being cool during his nap. Laura later explained about a sensory experience she once had in cold weather:

LAURA: Well once from my balcony I could smell the sound of winter when I was brushing my teeth.
RESEARCHER: The sound of winter? What kind of sound is that?
LAURA: Well, a fragrant one.

During our workshop discussions, smells, flavours, and sounds were also a part of several children's stories. The children shared their experiences of enjoyable smells, such as freshly cut grass, resin, or flowers and of picking and eating berries or mushrooms in the forest, naming tastes they preferred. The olfactory dimension was not as common in the children's stories about Julle. However, a few children included sensations of flavours in their stories, with Julle described as eating marshmallows or enjoying the taste of mushrooms. Auditory dimensions entangled in the storying events through the various mixtures of sounds made by children, digital devices, the AR application, researchers, nearby traffic, and construction work. The children also mentioned their experiences with sounds and silences from playing in the local forest, such as the pleasure in hearing rustling leaves or birdsong. A few children also included experiences of sounds into their stories about Julle. For instance, Nellie who described in her image how Julle had found a peaceful place where no one would disturb him and was enjoying some quiet time in the nice landscape (see Figure 13.2). Nellie explained that she enjoyed similar experiences of quietness and that she often goes to the forest to be by herself.

In summary, digital storying encompassed various sensory aesthetic dimensions, which contributed to the atmosphere and quality of the events. The way the children in our study talked about their everyday relating with the local forest indicates that they found haptic, visual, auditory, and olfactory dimensions important in

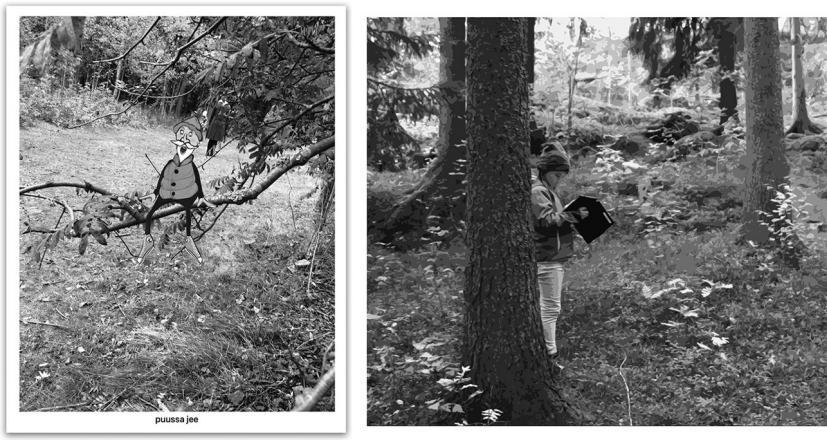

Figure 13.2 Left: Nellie's Julle photograph, about which she wrote, 'in the tree, yay'. Right: Nellie standing by a tree after taking her second Julle picture.

their aesthetic experiences. However, the olfactory and auditory dimensions were not as present in the children's stories about the forest elf Julle. This indicates that the *MyAR Julle* application may not have supported the children's auditory and olfactory engagement to the same degree as their visual and haptic engagement. These results reflect Bartos's study (2013), which found that many children emphasised visual experiences when talking about their photographs of meaningful environments.

Digital material creating movements in children's aesthetic experiences

Next, we will discuss an example from our data, which shows how digital dimensions and different materialities participated in creating movements within children's aesthetic experiences in the forest. The event below illuminates Vera's and Ida's explorations of the forest around their school yard, revealing various visual, haptic, and olfactory aesthetic dimensions. There are multiple things shifting and transforming in our example. A tree, resin, digital dimensions, the children, and a lamp post all play agential parts and co-shape the transformations within this event, illuminating how aesthetic experiences are formed in and through dynamic intra-actions (Hultman & Lenz Taguchi, 2010).

> Vera and Ida started their explorations together with Julle by a pine tree near to the school building. Vera was standing in front of the tree holding the tablet computer and immersed in creating a picture of the elf peeking from behind the tree (Figure 13.3, middle). While Vera engaged in photographing with the

Figure 13.3 Left: Vera's photograph of Julle peeking from behind the tree. Middle: Vera engaged in photographing with the application and Ida touching the bark on the tree trunk. Right: Vera sniffing and looking at the resin on her hand.

application, Ida stood close to the tree and touched the bark on the tree trunk. She noticed some resin on the trunk and called out 'There is resin here, Vera'. In Vera's photograph, Julle has his fingers positioned at the same place where the resin seeped out from the bark (Figure 13.3, left).

After finishing her image Vera handed the tablet computer to Ida and walked closer to the pine tree to pick some bark from its trunk. Through mutual engagement between the resin and Vera, some resin became attached to Vera's hand. Vera looked at her hand and, wrinkling her nose, turned to a nearby researcher, saying, 'Yuck, I got resin on my hands'. She tried to remove some of the stickiness from her skin by rubbing her hand against a lamp post. 'But it smells quite nice', she then said, bringing her fingers to her nose and sniffing the resin (Figure 13.3 right). After this Vera ran across the schoolyard to catch up with Ida who was calling for her and already heading with the tablet computer raised in front of her towards a small forest clearing at the back end of the schoolyard.

Later that day during the interview, Vera sniffed her hand again, saying, 'My fingers might still smell', recalling the resin that was still clinging to her skin from when she captured Julle behind the tree trunk. Inspired by this both Vera and Ida started talking about how they enjoy the smell of resin.

In our example, through the tablet computer, Julle engages with the tree and the resin, becoming a co-creator and co-experiencer in the event. This encounter illustrates how the agencies of the tablet and Julle affect the ways Vera moves with, touches, inhales, and views her surroundings. At the same time, the tablet, the AR application, Julle, and Vera are dynamically participating in aesthetically framing the environment. Within this digital storying event Vera and the syrupy resin become physically attached and Vera seems to be both repelled by its clinginess and attracted by the smell. Also, the lamp post with its hard and flat surface becomes involved as a merging of Vera, resin and lamp post takes place, when Vera's resin smudged hand rubs against the metal. Furthermore, the picture of Julle peeking

from behind the tree and the resin on Vera's hand resonate throughout the workshop, reminding the children and the researcher of the fluid that persistently clings to their hands and the surfaces they touch, emitting a lingering scent.

Through our theoretical lens we understand these intra-actions as aesthetically dynamic (Lenz Taguchi, 2009; Rautio, 2013). In our example, Vera, Ida, the tablet, Julle, the tree, the resin, and the lamp post are part of constant transformations, leaving aesthetically infused traces upon each other. This means that when children are experiencing aesthetic sensations through digital storying their sensory impressions are born in environmental and material relations, of which both the children and the digital dimensions are part (Berleant, 2010; Rodaway, 2002). In this way digital storying emerges as embodied events where the children's sensory relating with space, matter, digitality, and each other creates meaning and makes a difference in multimodal and material ways (Swanstrom, 2016). Digital storying can thus be understood as events of differentiation (Rautio, 2013), in which both children, digital dimensions and the environment are changed through aesthetic dynamics.

Conclusions

The results of our study challenge notions that digital technology makes children removed or inattentive of their embodied presence in the world (Ergler et al., 2016; Lentini & Decortis, 2010). Instead, our study echoes previous research, which suggests that multimodal, embodied, and aesthetic experiences through digital practices can invite children to encounter local environments with new perspectives (Kervin & Mantei, 2017; Kumpulainen, 2016; Sintonen, 2020). Our results suggest that using digital storying with augmented reality can offer pedagogical potentials for promoting children's sensory experiences and aesthetic awareness of their surroundings (Scott-Stevenson, 2020). However, there is a need to be mindful of how pedagogical discourse and practices create possibilities and boundaries for various embodied and sensuous experiences (Lenz Taguchi, 2009). Hence, we suggest that more research attention be directed towards understanding how sensory dimensions entangle with different digital practices.

In addition, this study provides insights into the material significance of digital practices with children. Our findings show how the digital dimensions, rather than being immaterial, entangled with and participated within the material dynamics of the digital storying workshops (Munster; 2006; Swanstrom, 2016), generating material-discursive shifts and transformations (Lenz Taguchi, 2009). Through relational play with the AR application and Julle, the children performed diverse roles as both perceivers and co-creators of the aesthetic conditions born in their material encounters during the workshops. These results illuminate the potential of digital matter to intertwine with children's aesthetic experiences, expressions and agencies over time and space (Munster, 2006).

Overall, our work contributes to empirical knowledge about the potentials of using digital storying as a pedagogical method of promoting children's aesthetic experiences and sense-making outdoors in nature. The way digital storying

allowed the children to have direct encounters with the forest through various aesthetic experiences offers an important complement to Nordic early childhood education, in which outdoor activities are valued and promoted (Sandseter & Lysklett, 2017; Sintonen, 2020). Although our study is situated within a specific context, it implies that aesthetic experiences through digital storying can potentially promote children's social, cultural and material awareness of their local forests (Lentini & Decortis, 2010; Scott-Stevenson, 2020) and pedagogically support children to participate actively in exploring and discussing the aesthetics of their living environments.

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Conflicts of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships, which could be construed as a potential conflict of interest.

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Chapter 14

I hate little bits

The collaborative construction of children's creative making in a public library makerspace

Gro Skåland

Situating the case

The value of creativity and collaboration is increasingly emphasised in public library policies, and the maker movement has found a home in libraries as part of this change (Lakind et al., 2019). In 2021, the Norway Makers counted eight Norwegian public libraries offering makerspaces for their visitors (Norway Makers, 2021), and 84 makerspaces were registered in schools, museums, libraries, universities, workplaces, and independent start-ups. Norway makers have had a vital role in introducing makerspaces in Norwegian public libraries and museums and in being partners in start-ups and co-producing events. The agenda is to front the Maker Movement towards education, science, politics, and entrepreneurs and align their rationale with national economic objectives.

Despite the interest in making in Norwegian public libraries, the aims and underlying rationales of makerspaces are not clear since makerspaces are not explicitly discussed in policy papers. When producing data for this study, the ruling policy in Norway was in line with an international trend emphasising performative space. Visitors in performative spaces are producers and not consumers of culture (Jochumsen et al., 2017). This policy aligns with the maker ethos – that making democratises STEAM subjects (Science, Technology, Engineering, Art, Math) (Hatch, 2013), by providing a do-it-yourself arena. Democratisation explained in these terms emphasises individual freedom and the opportunity to participate in STEAM fields. At the same time, Nordic education has long traditions for democratic socialisation, emphasising collaboration as education towards democratic habits of mind and building a sense of community at a micro-level (Oftedal-Telhaug et al., 2006). In that respect, the maker ethos, including do-it-with-others (Lakind et al., 2019), reflects a Nordic understanding of democratisation. Moreover, collaboration seems to enhance creativity (Chappell & Craft, 2011; Littleton & Mercer, 2013), making collaborative creativity a vital topic both in terms of democratic socialisation and as a method of creative work. The present study focuses on participation and collective creativity understood as two aspects of democratic socialisation in children's making.

The children in this study participate in a two-hour-long collaborative makerspace-inspired task as part of a school trip to a Norwegian Public Library. The case

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presented follows one primary school student (Frida) in her trajectory between groups and how she authors herself as a maker (Holland, 1998). The children collaborate in finding a problem to solve using a tool called Little Bits, feathers, adhesive tape, wooden sticks, pipe cleaners, and straws (Figure 14.1).

The Little Bits is a circuitry set providing parts with functions such as LED lights, switches, temperature sensors and wheels, and the pieces are easy to click together. The tool is inspired by a constructionist view on learning (Papert, 1993) and is assumed to enhance creativity because the focus on the construction process is inherent in the pedagogy of the tools (Moore & Adair, 2015).

Maker projects for children often afford creative challenges inspired by the design disciplines that usually take a departure in a design problem (Kumpulainen & Kajamaa, 2020). Early design-thinking research described the process of solving design problems as linear and logical (Lawson, 2005), but current research uses the term problem space. A problem space is the iterative exploration of a problem as it changes along with emerging solutions (Cremin et al., 2006). Research focusing on children's design thinking finds that explicit instruction in problem exploration helps children work in similar ways as professional designers and develop collaborative competencies (Hughes et al., 2019; Riikonen et al., 2020). A problem space also seems to be fuller described if many voices contribute (Schultz & Geithner, 2014), and it is, therefore, creative potential in group work.

In a school context, collaboration through verbal dialogue is found to enhance both content-specific learning (Wegerif et al., 1999) and creative outcomes (Chappell & Craft, 2011; Littleton & Mercer, 2013). However, children often work in groups without scaffolding to work effectively, and sometimes even the cleverest children fail on collaborative tasks (Barron, 2003). For that reason, it is essential to know more about how children collaborate. As collaborative work is relational, Barron (2003) finds joint attention to be a necessary factor for collaborative problem-solving. Joint attention makes individual thinking visible for evaluation and reasoning. Furthermore, relating proposals to a shared topic helped

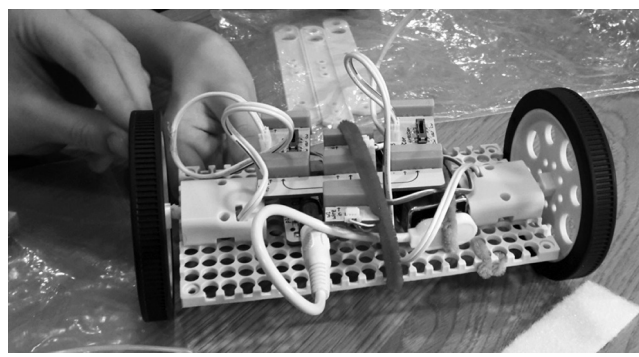

Figure 14.1 The Little Bits set offers a mounting board, wheels, and components easy to click together into circuits for driving motors, light, and sound.

children to avoid polarised debates. Following this line of research with a focus on sharing, Riikonen et al. (2020) have recently found that seventh graders sharing epistemic objects such as a prototype collaborated fruitfully in the making, and the object supported them in staying on task. Moreover, research shows that shared leadership is a condition for the possibility of allowing multiple perspectives to emerge in collaborative making (Leskinen et al., 2020). Groups of children with dominant leaders had more conflicts, few ideas, and asymmetrical opportunities to participate, while groups sharing leadership included multiple ideas inviting for co-construction.

More implicit factors of collaboration in makerspaces have also been under study. Halverson et al. (2018) find that children's innovations distribute across participants because peers replicate each other's inventions and blur ownership (Halverson et al., 2018). The researchers suggest the term collaborative emergence for this type of collaboration.

Another implicit factor concerns the ecology of materials in play. Intentions to engage children in improvisation using computer programs can be overruled by user manuals or task descriptions suggesting procedural and more school-like ways of learning (Kumpulainen & Kajamaa, 2020).

This study builds on these findings, exploring both implicit and group aspects of children's creative collaboration. The following research questions guided the study:

- What role does material play in children's collaborative problem exploration?
- How are children positioned and position themselves as collaborative makers?

Theory

In sociocultural perspectives, problem finding is mediated by cultural and symbolical tools (Vygotsky, 2004). More specifically, material anchors can trigger new ideas (Hutchins, 2005; Skåland et al., 2020), and because making means to change material surroundings, new products may also become anchors for imagination (Hutchins, 2005).

This study focuses on how different ways of collaborating provide diverse opportunities for children to socially position themselves (Holland, 1998) as contributors in creative collaboration. The study defines the social position as interactively achieved and, the position may therefore be contested by the participants as re-positioning (Davies & Harré, 1990). The groups are analysed using two approaches to dialogue in collaborative work; persuasive dialogue and collective pooling.

The art of persuasion means rhetorical argumentation. Uneven distribution of authority is therefore inherent in the persuasive discussion. When one participant increases their authority, the position of their peers will be affected (Engle et al., 2014). That is, this study approaches rhetoric as social dominance rather than rational argumentation, looking at the social negotiation of who is counted as credible contributors to the conversational floor (Engle et al., 2014). According to

Engle et al. (2014), several components interact when access to the conversational floor is negotiated. What counts as a merit of quality may be undue influence based on the social authority and giving more access. A discussant can also come into position through his/her spatial privilege demonstrated by gaze and physical orientation between peers or access to the material.

Collective pooling (Vass et al., 2014) connects to dialogic views on creativity, underscoring the distributed character of creative thinking and authority. In line with our take on persuasive discussions, collective pooling is understood as more than talk, including affective aspects of interaction such as laughter. Vass et al. (2014) explain how participation in collective pooling is grounded in mutual trust, often displayed in laughter and how trust opens for a willingness to explore the unknown with someone else. Collaboration characterised by collective pooling shows as messy interaction dominated by overlaps, interruptions, and speedy exchanges, and ideas are often unrelated, bizarre, meaningless, and intermediate (Vass et al., 2014). Nevertheless, cohesion may still be achieved implicitly in the joint crafting of stepping stones for new ideas or by fusing multiple ideas.

Methods

The research design focused on collecting data for interaction analysis of participants' verbal, embodied and collaborative interactions during a two-hour making activity in a public library in Oslo, Norway (Jordan & Henderson, 1995). Following a sociocultural research tradition, my study considers creativity embedded within these social and material practices (Säljö, 2009). Video recordings of one sequence from an inventor course serve as primary data for this analysis. The presented case is selected from a dataset recording five school classes from four different schools registered for the course. The participants were between 10 and 12 years old, the library's recommended age group. The selection of groups for filming was made by the respective class teachers, based on the students' submission of formal parental consent forms supplied by the researchers prior to the visit. In sum, ten groups of three to four children were filmed over a period of several months in 2018 and 2019, with about 20 hours of video recordings.

Following Susan Leigh Star (2010), interaction standing out as anomalies has been used as a methodological heuristic selecting this case. Anomalies have the potential to reveal social expectations within a practice (Leigh Star, 2010). Changing groups within the regular class structure were one such anomaly that affords a scope into negotiations of creative, collaborative work. After selection, recordings of the two groups were transcribed in total length, attending to talk, bodily orientations, gestures, and use of materials. Further, four episodes were chosen to represent meaningful units of interaction. Concepts were iteratively introduced after the first round of data selection, including the idea of positioning (Engle et al., 2014; Holland, 1998) as an analytic perspective. The narrative presented follows Frida during her trajectory from being positioned as a non-collaborative child in one group and how she re-position as a productive contributor in another.

Analysis

The first group uses a persuasive style of collaborating. Guro, Victoria, Tomas, and Frida approach the task by first agreeing on a problem to solve and then using Little Bits to make an invention that solves this problem. This approach corresponds to the task. In addition to the Little Bits, feathers, straws, tape, paper cups, pipe cleaners, and wooden sticks are on the table, but out of reach for Frida, and the librarian asks them to place the Little Bits box at the centre of the table to ensure access for everyone. With this message, the librarian supports and strengthens Frida's access to the conversational floor, which has both a verbal and a material character in this setting. In the following episode, Frida uses the position given to her through the librarian's support in a persuasive discussion concerning ownership and access to the Little Bits.

Episode 1. Negotiating uneven distribution of authority and position

1. Guro:	where are the buckets (.) victoria did you take these buckets
2. Frida:	((reaches for the ice cups and puts them in front of herself. takes a foam ball from the cup and throws it in the air))
3. Guro:	((takes the cups)) you put it in there ((gazing towards frida))
4. Frida:	no ((gazing towards Guro. continues to throw the ball))
5. Guro:	but it's not yours
6. Frida:	( ) I have to be allowed to (1) and by the way ((leaning towards little bits box)) we have to bring it to the middle (.) ((move feathers, straws and pipe cleaners into the centre)) we have to keep it here ((reaching for the box and lean back again, lifting the wheels)) we at least take something that can dri::ve ((gazing towards Victoria))
7. Victoria:	((smiling, gazing towards Frida))
8. Guro:	Victoria do you have an idea ((gazing towards Victoria))
9. Frida:	((grabbing the box and place it in the middle. looking at Victoria and Guro)) we can keep them he↑re then:::::: ((leaning back throwing the ball again))
10. Victoria:	((turning head away from the group))
11. Tomas:	grabbing a piece from the box
12. Guro:	Victoria do you have any ideas
13. Victoria:	no ((gazing away from the group))

Frida demonstrates access given to her by the librarian. She moves the cups to her side of the table, and in that way, she also strengthens her spatial privilege. Being in control of the material gives her attention from Guro, who is gazing at Frida. However, Guro is restricting Frida's access and authority by opposing Frida to herself. She takes the paper cups back, saying it isn't 'yours', but Frida continues to argue for her access to the Little Bits saying they have to place the Little Bits at the centre of the table. Access to the Little Bits and spatial privilege allow Frida to start a process of anchoring, and she suggests they should make 'something that can drive in any case.

However, access and spatial privilege do not give her authority. None of the participants in the group elaborates on her suggestion, and Guro starts treating Victoria as an authority, asking her if she has any ideas. Hence, although Frida has spatial privilege and access, her social position in the group restricts the value of her merit. Victoria, on her side, determines the spatial privilege of her group as a whole, repeatedly turning her torso and gazing away.

Frida continues to have access to material and spatial privilege in her relation to Guro, and together they are anchoring several ideas from their approximate environment. Among the suggestions stated by Guro and Frida is a drawing robot that can talk, a sound recorder, and a sound recorder on a driving robot. However, Guro repeatedly faces Victoria for confirmation by gaze, and she rejects their ideas by staring at the table. The rejections are accepted, and Frida continues searching for pieces in the Little Bits box. At one point, she is messing around with a LED light bulb, and suddenly Victoria moves her gaze up from the table, stating she has 'an excellent idea'.

Episode 2. Group 1: How a persuasive dialogue positions Frida as opposition and marks her as a non-collaborator

The idea fronted by Victoria anchors in the LED light activated by Frida and the library they are situated in – a book light. Guro immediately takes up the idea, and Frida follows with practical elaborations. However, she continues to demand access to the conversational floor, suggesting merging the book light with the wheels.

1. Frida:	but we can have a rolling book light ((looks at the other two))
2. Victoria:	eh::::: ((gaze towards Guro, then down at the table))
3. Guro:	((gaze towards Frida)) it's a little weird
4. Frida:	no it's going to be cool
5. Guro:	but why can't we have just a regular book li↑ght ((looking sideways at Victoria's hands))
6. Frida:	yes↑ and then we can put wheels on it

7. Victoria:	((gaze down at the table. keeping pipe-cleaner in her hand. persistent))
8. Guro:	((sits down)) okey (.) we can vote then
9. Frida:	so that if you are hyper you can run around while reading and sort of chase it
10. Victoria:	((looks at Tomas)) Tomas↑ shall we have a regular book - ((looks at Frida))
11. Frida:	((bends over the table)) we can make a ( ) toy ↑ (1) with wheels eh: ( ) can chase
12. Victoria:	yes but if it gets hold of it gets a shock (3) so that will not work ((shaking her head looking at Frida. Keeping pipe-cleaner in her hand))
13. Guro:	Tomas↓ (1) do you want kind of regular reading lamp with wheels or without wheels
14. Tomas:	i want wheels ((looking at Guro))
15. Frida:	with wheels ((move gaze from Tomas to Guro and Victoria))
16. Victoria:	okay two against two

This excerpt shows how Frida initiates collective pooling, suggesting merging two unrelated ideas. Victoria rejects her contribution by gazing down, and Guro strengthens Victoria's position by saying Frida's statement 'is weird'. Frida is further positioned as the other side of the debate concerning 'wheels are strange versus wheels are cool'. Her position as an opponent is materialised in the wheels. That is, the polar structure of their debate makes Frida stuck in the wheel argument. At the same time, it is clear that their social position in the group determines the relative importance of their opinions. Victoria is in a position to reject ideas by silently gazing at the table. Frida counters, giving task-specific statements, narrating that chasing the driving book light would solve the problem of 'being hyper and wanting to read simultaneously'. Describing possible problems is a relevant and possibly meriting argument, but Frida's merit is cut off from further elaboration. Frida's argumentation is finally stopped when Guro introduces voting as a second way to come to an agreement.

The vote ends in a tie, and Guro persuades them to play by chance instead. Guro and Victoria end up winning the game, and they start preparing the book light. However, Frida does not abide by the results of the game and states she wants to make an invention of her own. This side-track is evaluated as discoordination by the teacher. He insists on her collaborating with the group in terms of working on the same object. Frida is now positioned as a student in discoordination with the group's way of doing things; namely, consensus defined as the power of the majority. The episode ends with Frida being dismissed because she is not able to collaborate with her group.

Episode 3. Group 2 alters the distribution of authority with humour, and Frida becomes a collaborator

This episode shows how Frida re-positions herself by moving to Group 2. Changing groups would typically be a discoordination bypassed or suppressed in a school setting, but in this case, neither the teacher nor the librarian seems to notice what is happening.

1. Ada:	but you are in their group
2. Frida:	no i don`t care ((looking at Ada og Ida)) so you can exercise while reading (2)
3. Ida:	exercise ↑
4. Frida:	if you like reading and don't have time to exercise you can exercise while you are reading
5. Ida:	((gazing towards Frida)) but how can you do that ((keeps a paper plate in her hand)) wi:th that ((nodding in the direction of the wheel platform))
6. Frida:	you know it drives (1) then you can run after it while you read
7. Ada:	we could make it ((tapping at the wheel platform with a stick)) we don't have anything anyhow so ((palms pointing up)) it's better than nothing
8. Frida:	((looking in the direction of her former group)) yes↑ (1) that's true↑ (2) okay ((grabbing a finished circuit from the table))
9. Ida:	((leaning over the table closer to the central working space and the circuit, gazing towards Frida)) that (1) we tried to make like a light machine but eh: it was a bit defective cause eh:
10. Ada:	hhh ((gazing towards Frida))
11. Ida:	yes (1) we didn't make it work properly and the others made one too ((picking up researchers mic from the table)) here's a microphone so they hear everything we say
12. Ada:	((leaning head towards mic)) i hate little bits
13. Ida:	we said we hate little bits and such (hhh)
14. Frida:	okay but eh:
15. Ada:	okay (1) a driving light what do we need for that then
16. Frida:	I've no idea (2) but eh: we just have to improvise (2) eh: we need light

In this episode, Frida brings a wheeled platform, and in that sense, she is getting access. Her suggestion to 'read while you exercise' is taken up by Ida, who invites further elaboration, saying 'exercise' with a high intonation in her voice. Hence, Frida both has access to material, spatial privilege, and access to the conversational floor. Ida's question also invites Frida into a dialogue without being in defence of the wheels. Frida is lucky with the timing when it comes to changing group. Group 2 is in a state of 'hating' Little Bits, and by questioning the task, they let loose – laughing about their own mistakes and talking to the researcher's camera. Within this scene, Frida is accepted on the premise that 'anything goes because they do not have anything anyhow'. In the moment of giving up – they build mutual trust in a shared joke about their shortcomings and the stupid research project, and at the same time, they even out the distribution of authority. Research does not matter, failing does not matter, and the rules for working in groups at school are broken. Simultaneously, the jokes are directed to Frida by gaze and body, inviting her to share. Frida does not take up the joke immediately, so Ada asks her what they might need for making the wheeled platform, acknowledging Frida as an authority on the subject. However, Frida does not take the role of an expert but invites her fellow participants to improvise. Within this collaborative atmosphere of mutual trust and humour, Frida re-positions herself and becomes a collaborator in the group.

Episode 4. Tata::::! connecting silly things and rejected ideas

In the following episode, the group are pressed for time to actually have an invention to present, and the transcript shows how collective pooling helps them come up with their final invention.

1. Ada:	it's bo:::ring::: ((holding a bit in her hand, looking at it))
2. Ida:	a:::::::::h I'm so tired of this falling apart and I mean it if this doesn't work I give up
3. Frida:	I take scotch tape ((pulling out tape)) lots of scotch tape
4. Ada:	((picking up a straw and a stick and puts the stick into the straw. Then she turns a pipe cleaner around the end of it))
5. Frida:	lo:::k I have scotch ((holding scotch in front of the scratcher and Ida and Frida starts to fasten the fan on to the scratcher))
6. Ada:	((grabs a feather and mount it on the straw under the pipe cleaner)) tata::: ((holding the feather-straw in front of her))
7. Iris:	((smiles and look at the feather-straw)) nice ((walking over to Ada's place))
8. Frida:	((looking at the straw thing)) you can make a eh: yesyesyes↑ ((walking over to Ada, grabs the straw and puts it into one of the holes in the wheel platform)) yes↑ we can have this on and kind of ((bowing over the feather making it tickle under her chin)) so if one's a bit bored so eh:: one can run after

9. Ada:	that one ((pointing at the feather with a stick)) a cat toy for the cat
10. Frida:	yes↑ ((turning towards Ida and Iris)) cat toy↑ we can try to make a cat toy if that one doesn't work ((looking at the scratcher))
11. Ida:	it works
12. Ada:	we can call it the catapult

The group continues collectively pooling material anchors in their subsequent work. Ada modifies a stick by turning a pipe cleaner around the end of it. The pipe cleaner stick emerges in parallel to the driving book-light project, and nobody seems to notice, except Iris, who is picking it up and continuing to modify it, putting the stick into a straw. Because collective pooling is the ruling practice, Frida has time to explore the wheels, and later she finally rejects the wheels on her own initiative. As authority and access are not directly connected with the wheels anymore, leaving the wheels does not reduce Frida's rank as an acknowledged contributor.

This episode is characterised by collective pooling as the situation appears as chaotic and seemingly unrelated unplanned actions. Ada is placing a feather under the pipe cleaner. Then she bursts out: 'tata:::' Her emotional expression connects with Frida, who bursts out 'yesyesyes!' She puts the feather stick into a hole in the wheel platform in front of her, where it fits perfectly. This combination of two products results in a new material anchor for a problem. Frida suggests running after the driving feather in cases when you are bored. Then Ada anchors the feather platform as a toy for the cat and names it The Catapult.

Their work continues, discussing alternative names for the catapult. Frida turns the cat toy on, and it starts to spin around within a small radius. Ida imagines the cat is running after it. Frida continues by anchoring a narrative in the spinning, suggesting the toy moves in small circles because it is for lazy cats. Later, the invention 'Lazy Cats' is presented to the class as a cat toy solving lazy cats' low capacity to run.

Discussion

Analysing this case, I asked what role material plays in children's collaborative problem exploration. Further, I asked how they position and are positioned as collaborative makers. Findings concerning material in joint problem exploration show that material (such as feathers) anchors children's imagination about what kind of meaningful problems they might solve (Hutchins, 2005). Simultaneously, the imaginative process distributes across participants (Halverson et al., 2018) and time. This finding resonates with the collaborative emergence found by Halverson et al. (2018), where inventions wander from child to child and work as an implicit collaboration. In the present case, children activate material anchors for imagination in a similar implicit way. Messing around with the LED, for example, was

essential for the book light to emerge. This finding has implications for what it means to stay on task in collaborative creative work. Seemingly non-collaborative off-task actions seem essential in collective creativity because children take up each other's mess (Vass et al., 2014). This finding invites a continued discussion on what we talk about when we talk about creative collaboration. In this case, messing around together rather than shared attention oriented group dynamics (Barron, 2003; Riikonen et al., 2020) facilitates joint production of anchors for imagination. Further, things made, such as the stick inside a straw, have potential as anchors for children's imagination (Hutchins, 2005) over time. Anchors may be taken up by peers a long time after being created. Hence, this finding has implications for how turn-taking in material conversations is analysed.

Moving on to the design challenge, none of the groups takes departure in a problem. Before reaching a problem, objects are activated in their proximate environment (Hutchins, 2005) and later work as anchors for imagining problems (Skåland et al., 2020). For example, the cat-toy spinning on the floor triggered the story about a lazy cat. And by this, the following problem emerged: how to make lazy cats run. Hence, both groups work within a problem space to some extent, defining problems in concert with emerging solutions (Cremin et al., 2006). However, this task is more open than design tasks usually are. At least a purpose of some kind usually initiates the design, for example, 'how can we improve the quality of life for people living with a chronic illness?' (Sanders & Stappers, 2008). In that regard, findings from this case may align more with participation in informal makerspaces, where there is no pre-defined problem (Sheridan et al., 2014). Hence, approaching problem exploration with an explicit departure in available material and narration may be a suitable way to help children find a meaningful project. However, this study also shows how the social situation in collaborative work may hinder anchor production.

Finally, attention turns to positioning in collaborative making and the opportunities to identify with making emerging within the two groups. Group one was dominated by persuasive discussion. Within the persuasive climate (Engle et al., 2014), the wheels get a symbolic function as the opposition. This situation has two consequences. First, Frida cannot reject the wheels without giving up her position as an acknowledged contributor. Hence, she continues to demand a position in the group by insisting on the wheels. Second, the teacher treats this behaviour as non-collaborative. However, the underlying problem in this group is not Frida's low social competence but the hidden demonstrations of authority fuelling the polar debate. The strongest arguments in this group are based on undue influence (Engle et al., 2014) acted out as embodied signs difficult for outsiders to notice. The social negotiation of participation going on underscores that we cannot take the democratising potential of makerspaces for granted (Lakind et al., 2019). The Little Bits do not themselves spark a creative process, as suggested in previous research (Moore & Adair, 2015) because the social situation must open up to this possibility. We see from this example that Frida is willing to explore and tinker with the wheels, but her position in the persuasive discussion does not allow tinkering. Moreover, situations like this may hinder a child from identifying as a maker

(Holland, 1998), making the makerspace to be a less democratic place. Nordic education has a strong tradition in democratic socialisation that values collaboration and community building (Oftedal-Telhaug et al., 2006). However, as Barron (2003) pointed out in her research, being placed together in groups does not necessarily work out as planned, and the same can be said about the current case. The group that succeeded the most was breaking the institutional rules for collaboration, not following them.

Hence, policy plans for inclusion in library makerspaces need to be followed up by pedagogical practice taking departure in the unique character of collaboration where the dialogue is material. My observations of Frida in group two may inspire future research in that regard. The wheels are not talked about in a debate. When material in action becomes the conversation, multiple opportunities to participate emerge simultaneously and increase creative outcomes. At the same time, findings suggest positioning oneself as a maker might be challenging for children who take the initiative to start material dialogues, as this genre may collide with existing expectations for how group work should be done.

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Chapter 15

Making digital play work

Danish children's playful and creative production with digital media

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Introduction

Recent research on childhood policies in the Nordic countries of Europe indicate that these policies are moving away from a focus on children's play, collaboration, and productive activities towards a focus on a more centralised curricular socialisation that marks most other European countries (Karila, 2012). Yet, there still exists a gap between policy transformations and practices. Theory-based empirical studies can help close that gap, in particular studies that are mindful of the fact that children's tools of learning are increasingly being digitised, be they playful and child-led or curricular and adult-directed.

Noting that children in the Nordic countries grow up within shifting socio-material networks and immersed with digital, meaning-making media, this chapter aims to help minimise the gap by asking: How do children's digital production practices evolve as playful, and often creative, collaborative processes? To answer this question is important because it provides empirical grounding that may help nuance often very binary policy discourses and actions.

So, the chapter takes a contextualised and processual approach analysing how digital media catalyse situated negotiations of meaning-making across groups of children, adults (professionals or parents). Such an approach is relevant because it provides nuances and complexities that may easily evade more compartmentalised studies focusing on individual children, on particular groups of adults (parents, educators, caregivers), or on digital technologies themselves.

In empirical terms, the chapter is based on findings from case studies conducted at three different settings in which Danish children (aged 5–8) engage in playful, and often creative, production practices: extramural film workshops, schools, and private homes. We define digital media as digital technologies that afford the joint shaping, sharing, and archiving of signs for semiotic meaning-making (words, text, images, and sounds). The modes of production involve, for example, stop motion animation, multimodal books, and productive in-game features.

Based on a brief outline of existing research, we analyse children's meaning-making production processes across the three settings. Highlighting commonalities and differences and relating playfulness and creativity in digital production processes, our findings demonstrate that children enact these processes as

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socio-material negotiations vacillating between a making and breaking of social, semiotic, and material rules, and with a constant eye to keep a playful situation going. We then discuss the implications of these results and contextualise their implications for children's future learning and rights of expression.

Existing research

In the expanding research on children's digital production practices, two approaches stand out: one is technology-driven, the other child-led. Many technology-driven studies focus on a particular technology, be it born digital or made digital, such as tablet computers (tablets), mobile applications or books (Neumann, 2014; Noorhidawati, Ghalebandi, & Hajar, 2015); or they hone in on a particular technological feature or function such as printing, programming, texting, or tagging (Kafai & Burke, 2014). Being concerned with how digital technologies interact with their users, researchers often approach these issues from cognitivist design tradition or a human–computer interaction tradition where designing for individual usability, safety and enjoyment during production are key aspects of interest (Goldman & Kabayadondo, 2017).

Not least within education, this tradition has successfully expanded to include joint forms of interaction such as collaborative teaching, gamification, and computational literacy (Gee, 2003; Peppler, Halverson, & Kafai, 2016). Importantly, the technology-led approach demonstrates an increasing concern with the ways in which digital technologies may support joint construction and what has been termed productive learning where students are at the centre of attention, rather than reproductive, teacher-driven learning (Dede, 2010). Such a concern brings this approach closer to a child-led tradition of studying children's digital production practices.

The child-led approach typically departs from an interest in individual children, or in particular groups of children, and how they shape and share content through the application of a variety of connected digital media. Being concerned with technologically mediated meaning-making, many researchers have a background in media studies where users' engagement with semiotic modes of articulation is a well-established focus. With children's wide uptake of multimodal, multi-sited and interactive media in many parts of the world, increasing attention is now being paid to the ways in which young media users are also producers. This attention has pushed boundaries in media studies towards production practices and children's expression of voice across many sites and settings (Bennett, 2008; Drotner, 2020). The attention to youthful production practices equally informs media and information literacy education, although such practices are unevenly taken up due to the contentious position of children's rights of expression across the globe (Brown & Pecora, 2014).

Still, child-led approaches tend to underestimate the constitutive role played by media technologies in what Castells et al. (2007) have termed modern 'technosociality'. According to Castells, technologies, rather than being mere tools, mould our experienced environment in terms of socio-cultural relations, time, and space.

Hepp specifies this moulding as 'deep mediatization' (Hepp, 2020) concerning all elements of our social world.

Drawing on insights from technology-driven as well as child-led approaches, our point of departure is a holistic understanding of children's digital media production as contextualised practices of meaning-making with digital media unfolding across sites and settings as part of deep mediatisation. A holistic approach, it should be noted, does not imply collapsing all forms of digital media production into one and the same thing. Rather, such an approach must be attentive to nuances and complexities in how meaning is shaped, expressed, and shared. For example, when children interact hands-on with 3D printers in makerspaces meaning is shaped in 'the emotional, relational and cultural processes surrounding [the artefacts'] use and construction' (Blum-Ross, Kumpulainen, & Marsh, 2019, p. 4). In uncovering children's digital production, we are mindful of the dual articulation of meaning as a semiotic and social practice. Moreover, in our analysis we have been struck by the processual nature of digital production practices and by the often intricate relations between playful and creative aspects. So, these aspects are foregrounded in the following since they are as empirically important as they are theoretically understudied.

Materiality and meaning-making: a theoretical perspective

This chapter is informed by a materialist turn in cultural and social studies (Miller, 2005) and, particularly, by what may be seen as a bottom-up perspective on this turn, namely a growing interest in everyday practices (Reckwitz, 2002; Schatzki, 2001). While a focus on everyday activities and cultural performances is integral to anthropology, ethnomethodology, and microsociology, among others, an uptake of practice theory in more mainstream human sciences indicates a growing acknowledgement that 'social practices govern both the meanings of arranged entities and the actions that bring arrangements about' (Schatzki, 2001, p. 15). Practice theory is a meso theory positioned between macro theories of societal structure and agency and micro theories of individual perception and cognition. As such, it lends itself well to empirical analysis of digitally mediated group interaction as analysed in the following. Still, during our analysis we noted how our young informants' media production practices undergo various phases, so our study adds a concern for the processual, or temporal, aspects that few practice theorists address. This concern is an added reason why we prefer the term 'digital media' to 'digital technologies' in order to describe situated practices of meaning-making. By referring to digital media we hope to avoid a technology-driven perspective where 'the digital' translates into a catalogue of functioning parts, the perils of which have been discussed at length in previous media research (e.g. Couldry, 2004, pp. 123–124). Instead, we wish to signify the highly situated and dynamic nature of our object of study in conceptual as well as empirical terms.

In taking a holistic approach to youthful media production practices, we follow recent studies emphasising how these practices encompass dynamic entanglements

of contexts, material and non-material agents such as children, educators, parents, digital media and content (Livingstone & Blum-Ross, 2020). Importantly, our analysis is informed by recent research noting the importance of play in digital production practices (Burke & Marsh, 2013; Fróes & Tosca, 2018). Game studies has been an important catalyst in transforming cultural theories of play into the digital realm, relating concepts of play to concepts of gaming and widening the application of play beyond the realm of child development (Myers, 2010; Newman, 2008).

This widening has also implied an attention to activities that may not be defined as dedicated play practices, yet retain an inclination to 'put reality into parenthesis' so characteristic of play. Such an inclination is known as playfulness (Barnett, 1990; Sicart, 2014), a position taken in social interactions marked by pleasure and having fun together. We apply this widened concept to our empirical analyses since it eminently captures the often brief interludes where young producers create and share merry moments, for example by repeating particular phrases or exploring new ways of replaying sounds.

As is evident, the concepts of playfulness and creativity share a disbanding with instrumentality, perceived rules, and what is taken for granted. Not surprisingly, the two concepts are often discursively conflated or they are seen as different stages of personal development where 'childhood-play models, and perhaps scaffolds, adult problem solving and creative thought' (Banaji, 2011, p. 40). We hold that it is analytically advantageous to make a distinction between the two. Playfulness is a social practice that aims to extend the momentariness of fun and joint pleasure. Creativity is an ability and intention to promote change in terms of knowledge, application of tools or materials. Like playfulness, it is often enacted through social interaction, and playfulness may certainly be part of creative processes. This is why it is difficult to think of creativity without playfulness, while playfulness may evolve without creativity.

Our empirical analyses demonstrate how playfulness and creativity often co-exist in actual production practices. In some phases, children exercise playfulness through repetition or training of existing tools, skills, and rules of expression, while in other phases they exercise playfulness through a creative challenge to, or circumvention of, tools, skills, and rules. Following Vygotsky, we term these phases reproductive and combinatorial actions, respectively: '[A]ll human activity […] that results not in the reproduction of previously experienced impressions or actions but in the creation of new images or actions is an example of this […] creative or combinatorial behaviour' (Vygotsky, 1967/2004, p. 9). As is evidenced in the following, children, unlike adults, rarely display any normative grading of these phases, since their primary aim is often to facilitate and extend the joy of playfulness, be it creative or not. This is why it is important to map how such differences play out empirically across different settings.

Digital production at play: three settings

In this section, we present findings from three cases which emanate from major studies, all conducted in Denmark and addressing 5–8-year-old children's playful

and creative processes with digital media in different settings. The first case draws on an ethnographic study with three age bands of children (6–8, 10–12, 14–16, N = 171) conducted in 2015 at a film production facility located at the Danish Film Institute DFI) in Copenhagen, Denmark. The case represents the widest analytical perspective, since it maps the dimensions of creative production processes when 6–8-year-old children (N = 49) create stop-motion films (Drotner, 2020). The second case draws on a design-based study of digital co-production processes during children's transition from day-care to school and it involves 5–7-year-old children (N = 87) and their educators (N = 12) (Odgaard, 2019). The case zooms in on a primary-school setting where children are tasked with producing digital, multimodal books. The focus is on analysing educators' and children's respective perspectives on meaning-making in a formalised learning environment. The third case presents a micro-analytical perspective on an individual child and her interactions with a tablet computer in a private home setting. The study focused on how young children (N = 7) play with tablet computers, particularly with the highly popular *Ramasjang* app for young children, provided by the National Danish Broadcasting Company (Lundtofte, 2019). Using a video-based observational approach, the children in this study were not tasked with producing anything; rather, they were asked to show how they like to play with their tablet. In the context of this chapter, we present an empirical finding regarding three phases in one child's playful meaning-making with digital media.

The three major studies we draw on in this chapter were all conducted prior to the introduction of GDPR data regulation across the European Union. We followed general research ethical and data protection guidelines when generating and analysing data. This included obtaining care givers' written consent, introducing young informants in a child-friendly manner to process and objectives of the study and a constant attention to their reactions during interview and observation sessions (Dockett & Perry, 2011).

Importantly, the three studies on which the following cases are based follow different research designs, and our cases are not meant to form objects of comparative analysis. Rather, we aim to highlight commonalities and nuances of general points when it comes to empirical analyses of children's playful and creative meaning-making processes. These nuances include the important disentanglement of children's and adults' perspectives, the making and breaking of rules and the constitutive role played by different sites and settings.

Case 1: Interlacing social, semiotic, and material dimensions

This section focuses on how this meaning-making evolves through joint processes of creativity. As noted, our empirical site of analysis is the DFI, more specifically its

production facility for children, Film X. It runs four-hour workshops for children aged 3–16 (mostly during school hours), inviting children to 'strengthen their creative production skills and critical approach' to film in order to advance their 'digital citizenship' (Film X, n.d.). Film X offers five studios with green screens, sound editing kiosks, and a costume and make-up area. Two DFI guides are present as practical and technical facilitators of school classes that collaborate in groups of five to six, and visitors can take productions home for possible evaluation in class.

Data collection is based on participant observation of stop-motion film productions, generated by 6–8-year-old children, and including ad-hoc interviews with guides, educators, and some children as a means of exploring particular actions or choices during sessions. All data was analysed through coding iterations that involved optimising inter-coder reliability.

Our results demonstrate that joint processes of playful meaning-making interlace social, semiotic, and material dimensions of creativity. The social dimension is defined by children's playful interaction. While they join the Film X workshops as part of their school day, the children clearly define the location in opposition to curricular activities and as an opportunity to have fun. Most groups spend a good deal of time playing around with the various tools at hand, laughing with peers and focusing on 'tangible pleasures and meanings' (Tripp, 2011, p. 366) while making the most of available costumes and make-up kits, dressing up and extending delights of the moment. They circumvent the DFI guides' attempts to have them start production at their assigned studios, for example by emotional appeals to the entire group to keep playing: 'This is awesome as it is', seven-year-old Magnus claims.

The semiotic dimension of creativity illustrates how playfulness and having fun are drivers of children's narratives. This drive often serves to overrule guide-led preparation of storyboards, or what Fróes and Tosca (2018) call 'playful subversion' of narrative rules. Playfulness also means that children are quite egalitarian when it comes to negotiating different narrative claims. Many demonstrate considerable insights into the genre of animation when they discuss narrative options: 'It should be more Frost-like', as Alma, aged six, argues with reference to the popular Disney film. Yet, few uphold such claims if these challenge how the play can continue.

The material dimensions of creativity mostly concern technology. The children need help to handle the technical facilities, and they are not always happy about being dependent on a guide: 'We are just little kids and have never worked like this before', says Maria, aged eight, in order to justify to her group why they should accept adult demonstration of cameras for their stop-motion animations. They are less concerned with the material product, a finished film, than with the material properties involved in the playfulness of the moment.

Taken together, the social, semiotic, and material dimensions highlight that young children's creative processes evolve through playful collaboration. Results also document our theoretical point made above that playfulness can exist without creativity but not the other way round: 'having fun' is an overriding motor of child interaction and not a polished product of their own. Moreover, children's playfulness repeatedly challenges adult objectives and expectations: they explore social space as an extra-curricular leisure space; they overrule genre conventions if needed in order to uphold the conventions of interaction; and they are more concerned with process than product. This interplay of adult and child perspectives is particularly clearly illuminated in our second case.

Case 2: Tensions between children's and educator's perspectives

In this section, we home in on 5–7-year-old children's co-production of digital books in school. The focus is on tensions between participants' perspectives in digital co-production processes within a formal educational setting. A data excerpt from a primary-school classroom exemplifies this focus.

An educator in the reception class, the first year of compulsory education in Denmark, has asked her class of 5–7-year-old children to seek out favourite things and places in their school environment, and to insert photos of these into digital books under the headline 'Our School'. The educator winds up her task instruction as follows: 'The important thing is that there are pictures, that something is recorded about the pictures, or that something is written about the pictures.' The children leave the classroom in pairs carrying tablets. Two children take the board game Wildcat from a shelf nearby, open the box and place its contents on a table: myriads of tiny picture pieces with photos of food, tools, animals, etc. Two more children join in; they all start picking pieces, excitedly sharing findings: 'Yeah, a hotdog!' 'We actually found the kitten!' A child then suggests: 'We'll find some unhealthy pieces, right?' Ice-creams and burgers are compiled, accompanied by the search for other appealing pieces: 'Yeahh! A treasure box!' 'A screwdriver!' Photos are inserted on pages in the books.

Suddenly, the educator enters the room. She looks at the scattered picture pieces with a frown: 'Ehm … why are you ehm… carrying on with this?' The children keep their activity going. The educator hesitates for a few seconds. Suddenly, a child replies: 'It's because …we take pictures of all the good stuff that one wants to have.' She shows the tablet to the educator who swipes through the book pages and asks the children to make voice recordings. 'You have made more than enough pages with

photos now,' she concludes. The children still keep their activity going. Then a child asks: 'Ehm … who has the most pages in their book?' The educator pauses, smiles and responds: 'I guess that you have.' The child makes a happy gesture. The activity continues for a few more moments, then the lesson ends.

As this excerpt demonstrates, the joint activity evolves through participants' recurrent negotiations. As the educator enters the room, a tension occurs between the 'authoritative' (Fróes & Tosca, 2018, p. 40) production task initiated by the educator, and the pleasure-driven playfulness maintained by the children. The educator seemingly assumes the children to be off-task and asks why they are 'carrying on with this'? The mutual hesitation, and the dialogue following it, makes this tension between perspectives endure rather than settle. The child's delayed response regarding 'good stuff … that one wants to have' does not entirely subvert the task of photographing favourite things at 'Our School' – though the Wildcat game was obviously not an intended element. Rather, the response displays the children's appropriation of the task by making it their own (Wertsch, 1998) through playfulness. When the educator enforces her original task by asking the children to start making voice recordings, this is completely ignored by the children. And as a child asks the educator who has 'the most photos', a potentially alternative objective of the task is installed – and notably one legitimising the children's photo-abundancy on new terms. Importantly, the educator does not reject this indirect suggestion, nor does she repeat her demand concerning voice recordings. Rather, she acknowledges the child-suggested premise with an affirmative answer. Thus, the excerpt shows children and educator upholding a durable tension between their diverse perspectives without conflating it into a one-sided dominance of either of the two. And while the digital product, in this case, will only partly meet the standards initially set by the educator, the children have managed to imbue their production process with playful intentions.

Case 3: Three phases in playful meaning-making with tablets at home

Our last empirical case introduces a recurring processual pattern of meaning-making strategies in young children's play practices with tablets at home: (1) exploration, (2) routine, and (3) digression. We turn to an example of the circumstances under which they were observed, focusing on when a shift appears meaningful to the child.

Five-year-old Emma turns her attention to a game called The Robot Workshop (provided by the National Danish Broadcasting Corporation). She taps on the icon that launches the game, looks at her mum, and smiles. Emma has played this game quite a few times as is visible when she navigates the interface and enters a 'trophy

room' where shelves are stocked with proof of her achievements. During this explorative 'rediscovery phase' she quickly familiarises herself with the game, making several remarks directed at her mum and the researcher. Subsequently, Emma enters the 'body shop' section of the game devoted to customising the robot avatar. She then concentrates on configuring the robot to her liking from the different available parts (Figure 15.1). After 30 seconds of customising her robot using different parts, she decides on a paint job and asks the researcher if he agrees with the chosen colour. He does, and Emma exits the body shop and enters the main game: an arcade-style metaphor for block programming.

Emma enters another short exploratory phase of refamiliarising herself with the controls, but she quickly sets into a routine of solving problems in ways that draw on her accumulated knowledge. During this second phase she observes and sticks to the affordances of the game, overcoming obstacles with her robot avatar using simple block programming. Yet, after some five minutes of the routine, she exits to the main menu. Here, she starts tapping an object, which prompts a sound, multiple times in quick succession. Emma's tapping causes the sound to cut off and replay several times, like scratching a record. In this digressive phase of playful meaning-making, Emma uses her knowledge of the interface in a combinatorial action, creatively steering away from the routine. She looks at her mum, smiles, and laughs.

Figure 15.1 Emma's customised robot.

The presented phases in play practices illustrate how variation keeps the overall playful practice going. Emma was able to settle into a routine afforded by the game in the game's 'arcade mode'. However, the effect of the routine wore off, so to speak, and Emma decided to interact with the game interface in a digressive way, where she playfully subversed (Fróes & Tosca, 2018) ancillary affordances of the interface in an apparent search of merriment. In this study it became clear that the meaning-making phases of exploration, routine and digression came in cycles, usually following that order. Additionally, digressive meaning-making often coincided with attempts to expand the immediate context of play, so as to include more people, as was the case in the example with Emma. Every so often, this digressive meaning-making would provoke parents to ask why the child was not following the apparent objective of the game/app. For instance, Emma's mum reacted to the digressive meaning-making with questions that indicated she thought Emma was being silly. Judging from Emma's proneness to laughing at these comments, it appeared they were contributing to making this sort of play work. In other cases, a child's digressive process would lead to parents expressing a strong interest in helping them return to the apparent affordances of the game/app through a series of micro-negotiations. These recurring processual phases and practices underscore how creativity, play, and production with digital media take place as processes of pleasure; processes in which the outcome of a production, in whichever shape or form, might not be a top priority for the child(ren) involved. In this sense, digressive meaning-making should be seen as children's creative approaches to making digital play work as playful subversion (Fróes & Tosca, 2018) through combinatorial practices (Vygotsky, 2004).

Discussion and conclusion

Our analysis provides a situated account of playfulness as a driving force in children's creative processes with digital media across diverse settings. As we have seen, understanding the nuances of meaning-making and, subsequently, creativity is paramount to adult (co-)facilitation of such processes. We have demonstrated that digital production encompasses social, semiotic, and material dimensions whose entanglements will often surface in negotiations between participants. Furthermore, we have illustrated how children's meaning-making processes with digital media often work in cycles of exploration, routine, and digression, contributing to similar findings in previous research (e.g. Fróes & Tosca, 2018). Digital media are cultural objects in situated meaning-making practices, and should not be reduced to their technological functions. The holistic approach taken in this chapter leads us to conclude that practices that may seem messy and playful for the sake of nothing but play, can in fact be part of a process that varies in relation to creativity. In relation to Vygotsky's combinatorial practices (2004), children seem to go through the phases, noted above, in developing and sharing knowledge of

how digital media can be valuable in relation to play, thus catalysing creative production as well.

Our findings underscore a need to respect the processual and relational nature of how children develop their agency in creative practices. If we remain focused on developing children's relationship with digital media using technology-centred and scholastic notions of creativity, we are likely to create obstacles for playfulness and thus minimise child-led creativity. However, children find ways of challenging adult agendas, and we are perhaps wise to understand these challenges as signs of children's appetite to employ their own agencies in creative practices. In line with these insights, educators must remain curious towards understanding children's use of digital technologies as sociomaterial meaning-making practices.

Finally, our results indicate that studies of children growing up in the Nordic countries of Europe offer a future lab for the formation of educational policies on such literacies. Media and information literacies are not merely about securing equity of technology access or privacy of use. Nor are they merely a question of formal training in computational thinking or critical media comprehension (Buckingham, 2019; Grover & Pea, 2013). Children apply digital media as collective means of expression and joint reflection, as ways of acting in the world and on the world. If adult society is to adhere to the UN Convention of the Child within a 21st-century framework, then media and information literacies must encompass sustained support of children's digital production skills. As the present chapter has shown, such support must be open to different sites and settings, to a variety of catalysing agents and to the serious work of play.

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Chapter 16

Rethinking boundaries

Sociomaterial perspectives on digital technologies and early childhoods

Kenneth Pettersen, Kenneth Silseth and Hans Christian Arnseth

Introduction

Early childhoods are changing in the Nordic countries. In the public parks of Oslo, young children gather, with their parents' phones glued to their hands, chasing Pokémon, constituting new hybrid entities that make it difficult to understand where their bodies end and the digital begins. In nearby pre-schools, YouTube hits blast out into the playground, drawing tens of young children fighting to be in close proximity to the wireless speaker. Most young children in the Nordic countries now have access to a tablet at home, in addition to a gaming console, computer, and phone (e.g. Norwegian Media Authority, 2018). In Nordic pre-schools, most young children also regularly come across digital technologies, such as tablets, digital microscopes, and smart boards (e.g. Fjørtoft et al., 2019). Furthermore, recent research initiatives have underlined the importance of digital technologies in young children's lives in and across everyday settings (Sefton-Green et al., 2016). Against this background, we argue that the boundaries between children's play practices have become less demarcated and more fluid. Furthermore, digital technologies are informing and transforming play in profound new ways. To address these changes, there is a need to explore new concepts and methods for capturing the entanglements of children and digital technologies. In this chapter, we explore how sociomaterial theories can enable us to interpret these changes. To not only explore how sociomaterial theories may be used but also how they are used in different research practices, we discuss five recent empirical studies in detail.

As young children are introduced to new digital technologies in their everyday lives, they interpret and use them in multiple ways. However, these technologies also sometimes seem to have a will of their own. As digital technologies become more widespread across settings and entangled in the everyday lives of young children, we are encouraged to rethink some boundaries that are prevalent in ways of talking about early childhoods, such as digital and non-digital and pre-school and home. In the following paragraphs, we review a vignette from ethnographic fieldwork (carried out by the first author) in a Norwegian pre-school in which young children are engaged in a child-led outdoor activity. Outdoor free play is an important characteristic of Nordic early childhood education (Sandseter & Lysklett, 2017). Yet somehow, the digital realm manages to penetrate their play:

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Since the COVID-19 lockdown, the class spends their time exclusively in a small patch of forest next to the pre-school. The forest patch is located in a wild area, with roots sticking up from the ground, ad-hoc constructions made in collaboration by children and staff, and no fences. It is late afternoon, and all the children, mostly aged 3–6, are playing, some joined by the staff but most with each other, spread across the area.

Yahtzee Champignon and Captain Sabretooth[1] (both five years old) are playing behind a big boulder at a distance from the rest of the children and staff. They stop playing when they see me. Yahtzee Champignon talks about a friend with whom he has designed a game in his garden. He calls it a 'game' in English. He has previously corrected other children when they say that they are 'playing a [video] game' ('spiller et spill') and explained that they are rather 'gaming'. In the game, a person controls the children and makes them do different manoeuvres, like jump, pick up things, or walk. There are different worlds: Stick world, grass world, and stone world. The name of the 'boss' is Donka Wonka. Yahtzee Champignon asks me to be the controller of himself and Captain Sabretooth. This was not possible when he and his friend played it earlier, because no one wanted to be the controller. The game was also impossible to play in his garden because he '[doesn't] have grass in [his] garden.' They ask me to get them to scrape moss off a boulder and put the moss down on a nearby slope of land (Figure 16.1) by extending my index finger and swiping and touching things in their surroundings. They also ask me to get them to jump over tree branches by swiping my extended index finger upwards in a quick motion (Figure 16.2). We are playing this for around 20 minutes, going back and forth, scraping off, and putting down moss until the staff is telling the children to get ready to get back to the pre-school area. When the other children are putting on their knapsacks and leaving, Yahtzee Champignon picks up chalk from the ground and draws on the wooden floorboards of a small outdoor stage. He shouts for me and says it's Donka Wonka (Figure 16.3).

In our initial reading of the vignette, we notice two interesting boundaries. The first is between digital and non-digital. Even with no digital technologies present, they are still there. The outdoor environment provides materials for the game, such as a game controller (the researcher) and grass/moss. The other boundary is the one between pre-school and home. A game that emerged in Yahtzee Champignon's backyard is now reassembling in a forest patch. The motif of their play practice may challenge dominant narratives of what free play is supposed to look like. Gaming, for example, is openly discouraged in their class. In a literal way, they are also playing outside the fences of the pre-school, and Yahtzee Champignon and Captain Sabretooth have positioned themselves on the margins of the area set up by staff, out-of-sight, behind a big boulder.

In this chapter, we discuss how boundaries are constructed. While sociocultural frameworks in education often revolve around the social construction of

Figure 16.1 Moss on a slope of land.

boundaries, we are inspired by Barad's (2003, 2007) relational ontology and drawn to reflect on how seemingly non-social, non-linguistic materials can be said to participate in networks with other participants, producing more porous boundaries between, for example, home and pre-school and digital and non-digital. Recently, contemporary educational research has taken a material turn and new sociomaterial theoretical frameworks are adding to and contesting existing socioconstructivist frameworks by decentring the taken-for-granted human subjects of educational research (Kuby & Rowsell, 2017; Peppler et al., 2020). Similarly, Burnett (2010) claims that narrower literacy conceptions are dominating the field of digital technology and literacy in early childhood research and suggests adopting sociomaterial theories as a way of deepening the analysis. As childhoods in the Nordic countries now take place in unprecedented material conditions within increasingly digital technology-rich environments, we use sociomaterial theories as analytical tools for studying the boundary-making practices of young children's play.

To focus our discussion, we limit the selection of studies to those with ethnographic methodologies, as this may afford more comparability across studies. Our

Figure 16.2 Yahtzee Champignon jumping over branches.

selection of key studies for this chapter comes from a mapping of the theoretical frameworks of, to our knowledge, all peer-reviewed journal articles from the past four years in the field of ethnographic observation studies on digital early childhoods, from which a total of five articles have been categorised as having sociomaterial theoretical frameworks (Gillen & Kucirkova, 2018; Kervin et al., 2017; Land et al., 2019; Lundtofte et al., 2019; Marsh, 2017). The limited number of studies affords a closer view of their contribution of sociomaterial theories to the research field.

Aided especially by Barad's (2003, 2007) post-human terminology, we construct three broad themes from our reading of these articles to describe research moves afforded by sociomaterial theories. The themes are decentring the child, de-/recentring things and spaces, and de-/recentring the researcher. In the next section, we present the three themes and, using the above-presented vignette as an illustration, we also explore how the three themes emerge in the children's play in the child-led outdoor activity.

Figure 16.3 Chalk drawing of Donka Wonka.

Decentring the child

The first theme concerns a basic feature of sociomaterial theories – namely, that humans are sociomaterial assemblages that emerge through various practices. What has been termed a relational ontology (Barad, 2003, 2007) posits that entities, both human and non-human, are relationally constituted. While interaction traditionally has denoted the relations of presupposed entities, intra-action denotes relations as primary and entities as emerging products of these relations. The emerging entities are discursive and material. This destabilises how agency and intentionality are normally understood, which represents an obvious challenge for humanist early childhood researchers using sociomaterial theories, especially those coming from the new sociology of childhood (e.g., James et al., 1998), where young children's agency just recently has been recognised and institutionalised (see also Chapter 2). While scholars from this research field have been wary of, and written in opposition to, ways in which public discourse, for example, frames children's use of technology as passive consumption, new materialists also want to account for how

technologies participate in the unfolding of practices, decentring the child's agentive meaning-making and linguistic activities. In her analysis of video recordings of three-year-old Amy playing with an internet-connected Furby and PAW Patrol toy at home, Marsh (2017) argues that the play constitutes a new practice where Amy, while physically remaining still, experiences her body extending into virtual spaces. This may remain unaccounted for if she were described as an agentic, intentional user of a digital tool. Marsh claims that the use of toys connected to the internet intensifies these kinds of experiences of being enveloped by digital technology. The way in which sociomaterial theories are used in the reviewed studies neither presupposes an agentic child nor agentic technology but argues that agency is enacted in the relationship between the two. The anti-essentialism of the studies discussed here may answer the appeal of childhood studies scholars who call for researchers to transcend the essentialist dichotomy of the competent and vulnerable child (e.g. Tingstad, 2019).

While a relational ontology underpins all five studies, we find analytical and methodological differences in how they use sociomaterial theories. For example, Lundtofte et al. (2019), through video observations of children using tablets at home and in pre-school, develop the conceptual innovation of 'absorbency' and 'utensilency' – a spectrum that describes the material status of the tablet in play practices, respectively, from the use of a tablet as a prop in play practices to the use of a tablet as a more immersive play experience. The unit of analysis is, thus, experiences of the children. Marsh (2017), in describing Amy's variation in intensity when playing with internet-connected toys, also falls into this category. While Barad (2003, 2007) refers to intra-action on an ontological level, these studies claim that the ways we relate to technologies may also be experienced differently across situations. Since these practices decentre human subjects' phenomenal field, they cannot be accessed by researchers referring only to human accounts, such as traditional interviews. They should also be considered embodied and distributed across human and non-human materials, making ethnography an apt methodological framework.

Finally, both Lundtofte et al. (2019) and Marsh (2017) claim that play theories may be compatible with sociomaterial theories because they historically have attended to the dialectic of agency and structure in a nuanced way. Play has been described as a transcendental experience of surrender of control and agency to a playful state of mind. Gadamer, for example, mentioned in Lundtofte et al. (2019), claims the act of playing is to be simultaneously 'playing with' and 'played with'. The authors suggest a more positive spin on children's immersive practices by drawing an explicit link to play concepts, rather than, for example, the discourse of addiction.

To sum up, sociomaterial theories disturb humanist discourses of agency, and vice versa. However, the ways relational ontologies are put into action seem to challenge traditional dichotomies of the vulnerable and competent child. Play theories are combined with sociomaterial theories with less conflict between the two. In addition, sociomaterial theories are used to refer to both ontological and experiential phenomena.

Decentring the child illustrated by our vignette

Yahtzee Champignon's game is similar to what Huizinga (1949) calls the magic circle of play. Rules, according to Huizinga, are an essential feature of games, creating different worlds (cf. the stick/grass/stone world) where everyday rules do not apply, and participants commit to following a set of arbitrary rules, locally constructed but often relying on cultural-historical conventions, that the players wilfully impose on themselves. To join the game, the researcher, for example, is expected to behave in specific ways, with Yahtzee Champignon explaining what is expected of him. Yahtzee Champignon and Captain Sabretooth are also constrained by the game in a repetitive practice of scraping off and putting down moss for 20 minutes. The materials constitute the practices as different from playing in a digital realm. They provide more resistance and children must do a lot of work to recruit them into their play. Then, when all the human participants are seemingly dictated by something outside of themselves, who or what is really at the centre of this nexus of activity? It is not obvious that the answer is the children or the children's use of moss. However, locating the non-human materials in the centre would diminish the contributions of the children and may position them as passive and vulnerable. The relational ontology suggested by Barad would rather position the relations as primary – a phenomenon of play that is intra-actively materialised and congealed locally as various entities interacting with each other: the controller, the grass, or Donka Wonka. In addition, though no digital technologies are present in the episode, we are nevertheless struck by how technologies still permeate their actions as Yahtzee Champignon and Captain Sabretooth become characters in their own real-life video game. We are encouraged to further explore these perspectives when we see the ways the children, digital technologies, and surroundings in our case seem to be merging as the play unfolds.

De-/recentring things and spaces

As the decentring of humans is a central move in the reviewed articles, other non-human materials are brought to the fore. This reflects a built-in apparent paradox for researchers using sociomaterial theories: While researchers aim to bring materiality to the fore – challenging anthropocentric analyses – they also aim to challenge the very distinction between human and non-human materials, rendering the idea of bringing (non-human) materiality to the fore less meaningful. Yet Sørensen (2009) claims that while relying on this distinction may be a paradox, (non-human) materiality is still a useful concept in place of other more nuanced terms that may arise. A move often performed in the reviewed studies is the re-centring of things and spaces, but the paradox is not resolved.

In Gillen and Kucirkova's (2018) analysis of video observations of the use of digital technologies in a pre-school classroom, classrooms are not considered entities but relational and becoming, and binary divides, such as home and pre-school, are challenged. The authors also note higher levels of engagement as the richness of these trajectories' entanglement increases. Through innovative data collection

methods, Kervin et al. (2017) consider the classroom space a resource for learning identities and a crucial participant in how movements unfold. They study a five-week teaching unit on multimodal text construction in a pre-school classroom, and while more traditional writing exercises seemed more restricted and disciplined, children's engagement with digital technologies seemed less restricted to pre-defined spaces. Methodologically, both articles move away from emphasising the individual or the group. The contradictions and difficulties of this task, however, present a central methodological issue for studies situated within this theoretical framework. In what ways should, for example, interview data be used, as this type of data often is used to report on individuals' experiences? New, innovative methodologies, such as a video algorithm in Kervin et al. (2017), may facilitate studying spaces and things in greater detail than before.

The issue of a digital disconnect refers to a claim that children's digital lives are diverse and rich at home and less diverse and rich in traditional educational institutions, which in turn, leads to students experiencing the use of digital technologies in the classroom as less meaningful. While one answer to this challenge may be to consider the settings complementary, each of them contributing to children's digital lives with distinct qualities, Gillen and Kucirkova's (2018) use of sociomaterial theories enable them to view these settings as more fluid and less bounded. Perhaps a normative claim that may be drawn from this is not to cultivate the distinctiveness of each setting but to let boundaries between settings be porous and in-the-making by choosing more eclectically what practices for which to facilitate in early childhood education institutions.

To sum up, while previous digital early childhood studies have centred on interactions between humans, in the reviewed studies, the focus is expanded to include the sociomaterial and the things and spaces of practices. Educational researchers may, however, experience challenges in reconciling theories of intra-agential practice assemblages and aspirations of bringing non-human materials to the fore. The studies also make normative claims about desirable educational practices based on sociomaterial theories.

De/-recentring things and spaces illustrated by our vignette

Our initial reading of the vignette suggests that boundaries are traversed between the digital and non-digital and between home and pre-school. Using Barad's (2003, 2007) notion of intra-activity, ideas of boundaries being traversed may be challenged, because this relies on the presupposition that the entities of child, pre-school, and home already are there, fixed with specific attributes. An agential realist way to look at this would be to consider the child, pre-school, and home intra-actively becoming, produced as discursive-material effects.

In our vignette, we are struck by how the boundaries between home and pre-school, as well as digital and non-digital, are constructed as percolating and fluid. The digital act of swiping is, for example, translated onto the non-digital mossy boulder. Since the surface does not invite swiping in the same way as an iPad, the

activity becomes messier and more dependent on the materials, which might more easily break apart or become wet – that is, become uncoupled from the activity of playing. The surfaces of the boundaries are locally, intra-actively constructed but also potentially locally deconstructed, giving rise to new becomings – namely, a home pre-school assemblage where moss and stones co-exist with jumps and swiping. Sociomaterial theories seem to afford tools that can conceptualise boundaries as materially and discursively emerging. In sociomaterial theories, the emergence is not just epistemic and social but also ontic. In reading the vignette, we find these ideas especially useful because they provide tools for interpreting an episode that, neither for us as researchers nor, do we think, for the participants, have clear-cut boundaries that exist from the beginning. The unpredictability of play practices is perhaps more accurately captured by these approaches.

Considering the Nordic context of our ethnography, we also want to add a note on conflicts that may arise between Nordic liberal ideals of outdoor play as a central setting for free play (Sandseter & Lysklett, 2017) and more protective attitudes toward digital technologies as threats to free play (Ljung-Djärf et al., 2005). A sociomaterial reading of our vignette suggests that these boundaries are fragile and fluid and may merge in myriad ways. In outdoor play, material and discursive resources from nature and digital technologies are drawn upon, producing new hybrid practices (see also Chapter 13).

De-/recentring the researcher

A critique of the idea of a disengaged observer is integral to contemporary qualitative research (Hammersley & Atkinson, 2019). Barad's (2003, 2007) notion of agential cuts has served to launch similar critiques of research practices. Agential cuts are made in research and make the object of study knowable for the researcher, but they also construct a researcher who knows the object. In research, material instruments, such as video cameras, notebooks, or interview guides, are put in play, and together with human actors, these apparatuses, the outer boundaries of which are indeterminate, produce meaningful conceptualisations through agential cuts that make the world known (Barad, 2003, 2007). A central agential cut is, for example, the categorisation of humans and non-humans, with the privilege afforded to humans. The intra-action of human and non-human materials in research has consequences for descriptions of research practices and what research does. Land et al. (2019) study young children in an Australian early childhood class using a digital recording device and FaceTiming in a Canadian early childhood class while visiting a creek on Indigenous land. In this study, the researchers and participants are collectively referred to as 'we' to 'show how our inquiry questions and concerns emerge from collaborations between children, researchers, technologies, and more-than-human others' (p. 12). Here, we can see the idea of research practices as sociomaterial assemblages expressed. Similarly, the authors put forward an idea of the participants not learning about nature or technology on their technologically permeated walks along the nearby creek but, rather, learning with technology and nature. Both the space (creek) and the things (FaceTime) linked

to the practices are, thus, called upon, not as neutral backgrounds or tools but as central participants that shape the practices in significant ways. Including even the researcher in these assemblages makes for a radical introspection that differs from the previous four articles, with a more literary quality of the writing, and discarding the traditional IMRaD structure of research papers.

What also makes Land et al. (2019) stand out in the company of the other studies is the more ethical–political position adopted in the study. The area in the study is described, for example, in terms of 'neoliberal urban land development practices' and a 'silencing of Indigenous presences and knowledges' (p. 2). This can also be traced back to a specific interpretation of sociomaterial theory. Knowledge production will always entail an entanglement of ontological, epistemological, and ethical issues, which in turn, implies that the researcher needs to reflect on which materialities are privileged in the agential cuts performed in the study (Barad, 2007). Ethical and political issues are, thus, foregrounded. This more ethical-political position is also mirrored in the more normative claims made in other studies mentioned: Are the implied pedagogies more rigid and entity-based or more relational and fluid?

To sum up, the role of the disengaged researcher is problematised and interpreted as connected to an entanglement where the distinction between the object of study and observer is blurred and more ethical-political researcher positions seem to be afforded by specific uses of sociomaterial theories.

De-/recentring the researcher illustrated by our vignette

In ethnographic research, the subjectivity of the researcher is recognised as significant, and the field notes on which our vignette is based are typical in this regard: A narrator–researcher is situated in the game, for example, as someone making an observable difference as a controller. However, reading this as a sociomaterial phenomenon, we can add the notebook or the camera as part of the research apparatus that, in turn, generates the entities under study, such as a line of moss or a jump (Figures 16.1 and 16.2, respectively). Different conceptualisations, such as literacy, would perhaps make the agential cut of two children and a researcher interacting, and possibly learn about video games. These cuts are ethical, materialising new, not merely discursive, realities. For example, after the researcher asks Yahtzee Champignon about Donka Wonka once the game has ended, Donka Wonka materialises as a chalk drawing (Figure 16.3). The porous boundaries between the researcher, her instruments, and the objects of study, which in ethnography are very evident, means that researchers in very real ways are bringing things into existence, raising new ethical questions about 'what is excluded from mattering' (Barad, 2003, p. 827).

Final words

In this chapter, we have discussed recent ethnographic studies on digital early childhoods situated within a sociomaterial framework. Ethnography has historically

had an implicit triangulatory streak also when it comes to theoretical frameworks (Flick, 2011). As ethnographies rarely frame their findings as definitive truths, various theoretical vantage points are often employed to understand their objects of analysis. New theoretical frameworks may afford multiplicities of data sources and methodologies that can capture life in its richness. More specifically, in this chapter, we argue that centring non-human materials and intra-actions, rather than humans and interactions, can be said to add to existing ethnographic ideals for understanding the world in new ways. However, it is worth noting that features of ethnographies may carry the humanist anthropocentric assumptions that sociomaterial approaches are challenging. In Hammersley and Atkinson's (2019) seminal handbook, ethnographic studies are said to study 'actions and accounts' in 'everyday contexts' and analyse by 'interpretation of the meanings, functions, and consequences of human actions and institutional practices, and how these are implicated in local, and perhaps also wider, contexts' (p. 3). Thus, there may exist conflicts between traditional ethnographic methodologies and sociomaterial theories.

Three themes have emerged from our analysis: Decentring the child, de-/recentring things and spaces, and de-/recentring the researcher. Each of these refers to a category of moves that sociomaterial theories afford to researchers in the field. We have identified paradoxes and challenges for these kinds of studies, as the relational ontology forces us to reconsider basic assumptions, rendering our current vocabulary deficient. This leaves us in search of new concepts that can describe the hybrid nature of reality in new ways. We remain convinced of the applicability of these perspectives. As our fieldwork points toward digital technologies occupying Nordic early childhoods in ways that go beyond the mere use of tools, our reading of these studies encourages us to further explore and think with these new concepts, to challenge more traditional ways of understanding early digital childhoods.

Note

1 Pseudonyms chosen by the children.

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Part IV

Commentaries: international reflections

Chapter 17

Digital childhoods as nexus of practice

Karen Wohlwend

Nordic digital childhoods and nexus of practice

One way to conceptualise children's engagement with technologies in Nordic homes, classrooms, and makerspaces is to consider the tensions around digital interactions as the convergence of multiple discourses, each circulating different sets of expectations for relationships, practices, and materials. From a nexus perspective, this book spotlights a site of engagement where multiple discourses collide and conflict, in the shifting expectations within the nexus of practice of learning, play, childhood cultures, and technologies. *Nexus of practice* recognises moments of interaction as entangled bodies, things, identities, and meanings that activate cultural histories and expectations. Informed by Bourdieu's (1977) concept of habitus, Scollon (2001) conceptualised nexus of practice as 'a network or matrix of linked practices which are the basis of the identities we produce or claim through our social actions'. Nexus analysis is a method for unpacking nexus of practice, (Scollon & Scollon, 2004; Wohlwend, 2021) that seeks to discover which actions hold the most promise for addressing tacit inequities in what is regarded as the normal way of doing things.

> Nexus analysis unpacks the meanings and expectations that practices bring into a moment of action, the well-worn ruts that shape interaction that have accrued over years of use across groups and cultures. … Additionally, nexus analysis not only uncovers the hidden assumptions behind an action but it also identifies actions with potential to become tactics to change the nexus to better address equity and participants' concerns. In this way, nexus analysis is not just critically deconstructive, it is reconstructive.
>
> (Wohlwend, 2021)

In a nexus of practice, interactions happen with others, enacting normalised practices that shape who can and cannot interact with materials (in this case, technologies), regulated according to discourses that enable or restrict access (in this case, with impacts on learner agency and children's participation).

Using nexus analysis as a lens, we might ask several questions of each chapter in this book:

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- What expectations circulate in the nexus of Nordic childhoods?
- What ruptures and openings does technology create in the nexus?
- What tactics look promising for working with the ruptures of the nexus?

What expectations circulate in the nexus of Nordic childhoods and digital technologies?

Who is expected to participate in an interaction? (i.e. what are the typical interaction orders)? Interaction orders (Goffman, 1983) are unwritten rules for being together in a particular place. For example, children might be accustomed to sharing a screen with other players while playing video games with others at home but when reading at school, children sit alone and silent with an e-book. Interaction orders give meaning to arrangements of bodies in an event and activate expectations for the kinds of action that are anticipated and viewed as appropriate. Through the lens of interactions orders, we can ask: Who is the Digichild? Who is with the child and to what purpose? The chapters in this book show young children actively engaging technologies, with support from parents (Sairanen, Kumpulainen, Nordström, & Kajamaa, this volume) and teachers who mediate technologies as guides on the side. For the youngest children, such interactions with technology are made possible with adult mediation.

What are people expected to know how to do? (i.e. what practices for historical bodies are expected here?) Historical bodies are expectations for almost-automatic actions in engrained practices that children learn to value and perform as expected ways of participating. Even toddlers easily manipulate an iPad through already engrained finger swipes, taps, pinches, and stretches on touchscreens that enable them to deftly use digital literacies (Wohlwend, 2014). These fingerings are modelled by adults and absorbed by young children through hours observing and participating in ordinary activities in family life. What digital literacy practices are expected of children and their families? How do these practices fit into expected ways of being and belonging in Nordic homes and classrooms? A theme that develops in the book is a view of children as able and active learners, in countries with widespread access to digital tools and good connectivity. However, the expectation for children as agentic and independent learners is tempered by an expectation for adult supervision to maintain a healthy balance between virtual and lived spaces.

What discourses matter here? (i.e. How are discourses in place coming together)? Discourses in place (Scollon & Scollon, 2003) reside in the emplaced meanings of materials and the actions they evoke, materialising a global discourse that justifies access to or use of particular materials by particular users. The people and the materials in a place carry meaning, and not only in the immediate moment. Materials carry expectations embedded their histories so that current and future possibilities are shaped by how an object or tool has been used in the past. When people share a common understanding of an object's histories, they also share expectations for future actions with that object, including who should use it. In this way, materials materialise discourses that justify which technologies should be available (or not available) to children, how they should be used, how often, with

whom, and so on. How do global discourses justify/challenge digital technologies in Nordic homes, schools, and makerspaces and how do these shape the technologies that are made available and what's expected of Nordic children, adults, and technologies? In Nordic homes, 'cultural values and educational policies … appreciate children's initiations, interests and agency in their life worlds in which children are viewed as agentive, playful, connected and able' (Sairanen et al., this volume). Technology becomes part of daily life, brokered and mediated by parents (Säljö) and negotiated with children toward a balance of indoor/outdoor play. In Nordic schools and makerspaces, a focus on learner-driven, playful collaborative and productive use of technology is supported by democratisation discourse that advocates wide and more equitable access to robust technologies (Erstad & Silseth, this volume). Across the chapters in this book, themes emerge that suggest a complex relationship between global discourses and children's practices with technologies: some that monitor and limit children's digital engagements and frame these as over-exposure, others that expand access as a need and a right within democratisation.

What ruptures and openings does technology create in the nexus?

Tensions arise when multiple discourses collide and conflict when they come together in a site of engagement as in the current convergence of global discourses around the site of children, learning, and technology. We can frame these challenges as ruptures in the nexus and in valued practices of everyday life and ask: How does technology rupture the nexus of practice of Nordic childhoods and what unexamined practice is now made visible and actionable?

- Erstad and Silseth identify five controversies that have challenged educational nexus of practice: time for technology, disparate access in community infrastructure, school expectations for print literacy that overlook children's digital media expertise, fears about screen time, and concern about reliance on technology rather than teachers.
- Discourses about globalisation and technology circulate a prominent fear (not supported by the research here) that digital interactions cause children to depend on English language which erodes heritage languages such as Icelandic (Guðmundsdóttir, Sigurjónsdóttir, & Nowenstein, this volume).
- An immersive human/machine relationship enables more independence and acts as a catalyst that prompts a re-examination of teacher–student power relations and redistributes responsibility for learning in makerspaces and classrooms (Leskinen, Kumpulainen, & Kajamaa, this volume).
- Immersive technologies blur responsibility altogether, disrupting the notion of human agency and questioning who/what is doing/making in the maker/tool relationship (Pettersen, Silseth, & Arnseth, this volume).
- Increasing engagement with screens may conflict with a core value in Nordic early education that promotes balance in interactions with the technological/

natural environments, indoor/outdoor play, virtual/face-to-face interactions with others, and material/immaterial contexts (Nilsen & Lundin, this volume).
- As Drotner points out, Nordic children's robust access to mobile devices extends learning far beyond home and school to servers that capture data behind the screen, with implications for children's privacy.

Technology creates ruptures in the existing nexus that overturn the tacitly-accepted and automatic patterns of learning and living. Ruptures cause us to see, question, rethink, and revise our expectations and our practices. Of course, these disruptions are highly frustrating. They present societal dilemmas that must be addressed by individuals but are at the same time impossible for individuals to resolve. However, ruptures also invite openings for doing things differently.

What tactics look promising for working with the ruptures of the nexus?

Ruptures create openings for tactics, through bricolage or making do: small acts of reappropriation that shift what's possible in a given moment of time and space (de Certeau, 1984). Tactics enact a momentary redesign of nexus of practice, by renegotiating the interaction order – resemiotising the meanings of an interaction or reassembling its components – scrambling the meanings, materials and bodies (Wohlwend, 2021).

One tactic is to use the rupture to see something new. If we look through the rupture at the exposed underlying practices, we can examine an unremarkable practice with fresh eyes and problematise the underlying discourses that uphold and justify particular ways of being in the nexus. In the current case, we can see that discourses about literacy and learning, nature and technology construct binaries that expand or limit children's agency and participation with technologies at home and school. These binaries create gnawing feelings of guilt or anxiety for parents who worry about harmful effects of overuse of technology on children who must also use technology to fully participate in daily living. Similarly, teachers are caught between conflicting discourses that justify opposing pedagogies. For example, digital literacies are essential preparation for functioning in modern Nordic society and align with values for child-centred playful pedagogy but are at odds with the growing global dominance of an autonomous model of literacy (Street & Street, 1984) and narrowly defined print-focused literacy skills (Skantz-Åberg & Lantz-Andersson, this volume).

Another tactic is to change the meanings of the activity by using the lens that an opening provides. Following Sefton-Green (2000), we can understand creativity as shared cultural production. This orientation frames literacies as collective negotiation, rather than individual production, redistributing responsibility for authoring and learning across both bodies and things. Further, recognising play as an embodied literacy changes the meaning of play from a pleasant diversion or optional

classroom activity to fluid meaning-making, amplified by digital devices and the collaboration they afford (Lundtofte, Odgaard, & Drotner, this volume).

Toys provide a clear example. Toys are designed to invite a particular anticipated identity performance in a particular imaginary (Medina & Wohlwend, 2014). Children can easily alter these invitations for their own purposes by changing the meaning of the toy just by pretending together to enact an alternative identity or role. When animating a toy, children collaboratively negotiate who will play whom, what action is possible, and what their shared narrative will be. Such negotiation becomes a tactic when it reassembles the relationships among materials, children, and meanings in an interaction.

Using the previous toy example, my research team has used what we call toyhacking as a way to alter the material makeup of a toy to encourage more ruptures and possible storylines (Scott & Wohlwend, 2017). Toyhacking is a tactic that adds or removes fabric, fur, toy parts, or found objects by gluing, taping, painting, stapling, or using other tools in a makerspace, thereby changing the physical characteristics of popular media toys in ways that can disrupt a character's stereotypical texts, creating an opening for 'imagining otherwise' in a different imaginary (Medina & Wohlwend, 2014) with the possibility of alternate and new story actions. A maker ethos provides open-ended opportunities for reassembling the meanings of people and things in productive and collaborative remaking within makerspaces (Skåland, this volume).

It is important to note that tactics are not necessarily something done by adults on behalf of children, but adults' tactics can make room for children to negotiate nexus and exercise tactics to create remakings of their own that suit their purposes. In this book, we find children remaking worlds by creating playgrounds on Minecraft (Kjartansdottir & Thorsteinsson, this volume) and by extending and reassembling their sensory relationships with the natural world through augmented reality and digital storying (Renlund, Kumpulainen, Byman, & Wong, this volume). Solli and Mäkitalo provide the most powerful example of child-led tactics in their documentation of a youth movement that works toward reassembling human/nature relationships through protests that seek climate justice.

Overall, this book engages the nexus of technology and Nordic childhoods, identifies the openings in its ruptures, and begins the tactical work of reimagining 'the Nordic imaginary of an autonomous and independent child. It questions whether this imaginary ought to be revised into the notion of a relational child that positions the child as part of a network of social, cultural, technological and environmental relations' (Kumpulainen, Chapter 5, this volume).

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Chapter 18

Nordic childhoods and entertainment 'supersystems' in the digital age

Michael Dezuanni

Commentary

In terms of distance, climate, and terrain, my home country Australia couldn't be further away from the Nordic countries. Our geographic areas are literally on opposite sides of the globe. When my children play outdoors in Brisbane's sub-tropical climate, for much of the year their play differs quite a bit to the kinds of outdoor play experienced by children living in the cold temperate and subarctic climates of the Nordic countries. Despite these differences, however, our children experience some distinct similarities due to the opportunities afforded by global digital media. As Kirsten Drotner points out in Chapter 3 in this volume, Nordic children are among the world's most media rich in terms of uptake and diversity of use. This is also largely true of Australian children. While recognising that an unacceptable percentage of Australian children live in poverty, with an over-representation of Indigenous children in this group, the majority of our children grow up in comfortable homes with access to an array of digital media and technologies. Nordic and Australian children participate in a global children's media culture dominated by a small number of trans-national companies. The United States-based technology companies that dominate our information, social media, and entertainment experiences (Apple, Facebook, Amazon, Google, Microsoft, and for children's content, Disney) rely on international scalability of experience for their success. Although there are some regional differences, when children living in post-industrial societies around the world use these companies' products, they share a similar experience.

Let us consider Minecraft, which is one of the most successful digital games in history, and which provides probably the most common digital experience for children, internationally, for the past decade. Hundreds of millions of children have played Minecraft or have watched Minecraft gaming on YouTube. In Australia almost all children have had some contact with Minecraft. Research we undertook in six geographically and culturally different Australian schools in 2019 indicated that over 96 per cent of the eight- and nine-year-old students in those schools had played the game (Dezuanni & Macri, 2020). As a sociotechnological experience, Minecraft can be considered a digital platform as much as a game, as it provides a

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range of affordances that enable its users to participate in many different ways for a wide range of purposes.

Of course, Minecraft is one of the Nordic region's most visible and successful exports, originating in Sweden. Although the game's producer, Mojang, has been owned by Microsoft since 2014, it has retained a core aesthetic and attributes centred on world building through block construction. At its heart, the game provides players with an open world in which they gather and use blocks to make experiences for themselves and others (Hjorth et al., 2020). Research shows that children love Minecraft because it enables them to be creative, to socialise with friends, and to learn new digital skills (Hjorth et al., 2020; Mavoa, Carter & Gibbs, 2017). It is not difficult to draw a line between the simultaneous simplicity and complexity of Minecraft's block construction techniques and another highly successful Nordic export – Lego. In turn, both Minecraft and Lego might be seen as high profile successors to the Scandinavian and Finnish craft movements discussed in this volume in Chapter 9 by Skulina Hlif Kjartansdottir and Gisli Thorsteinsson and in Chapter 11 by Jasmiina Leskinen, Kristiina Kumpulainen and Anu Kajamaa. At least in terms of constructive play and learning through making, both Lego and Minecraft promote sociomaterial learning through digital and non-digital making. Fanning and Mir (2014) argue, for instance, that the construction toy genre exemplified and commercialised by Lego encourages 'players to build, tinker, and create new objects or structures from modular units' and its educational benefit is assumed to derive from the positive consequences of children playing, building and undertaking architectural practice. Although learning is undeniably present when children build with Minecraft and Lego, these building systems are also entertainment juggernauts. At the heart of these experiences for children is pleasure, fun and fandom.

Minecraft and Lego have become highly valued digital content and global entertainment franchises. They are examples of what Marsha Kinder referred to in the 1990s as 'superentertainment systems built on transmedia intertextuality' (Kinder, 1991, p. 116). Writing in the pre-digital era, Kinder analysed the Nintendo Entertainment System and the connections between children's television and movie entertainment and their video game play in franchises like the Teenage Mutant Ninja Turtles. Kinder's argument was that these entertainment 'supersystems' were deeply connected to children's cognitive and ideological development, particularly regarding their construction of gender identities. I have argued (Dezuanni, 2020) that Minecraft is likewise at the centre of an entertainment supersystem. The Minecraft 'supersystem' includes multiple game versions across several platforms; the Minecraft Marketplace for purchasing game modifications and specialist items; millions of community produced resources, available to download online; Minecraft Story Mode; Minecraft Dungeons; a range of official publications; a feature film planned for a 2022 release; Minecraft-themed Lego sets; merchandise and toys; fiction and fan fiction; internet ephemera such as memes; and of course, Minecraft YouTube content. Indeed, Minecraft is the most watched game on YouTube. According to Statista (2021), Minecraft received 201 billion views in 2020 alone. The next most watched game was Roblox with 75

billion views. We know from international studies that children are moving away from traditional 'set top' television for entertainment to YouTube and other digital platforms (Ofcom, 2019a, 2019b; Smith, Toor, & Van Kessel, 2018).

Minecraft and its connections to entertainment is relevant to my response to the chapters in this book because it is an exemplary instance of a digital entertainment experience that crosses the boundaries of communication, learning, and education – the three key words in the book's subtitle. My provocation is that those of us interested in understanding digital childhoods across these domains might also productively pay attention to children's *entertainment* in digital contexts. We need to understand more about how children spend their leisure time with digital media, how they have fun, the passions they develop, and how they participate as fans of digital content – across the varied and multiple opportunities available to them. The international effort to understand digital childhoods rightly focuses on the connections between communication, learning and education, and it often focuses on children's digital/technological experiences to understand the relationship between learning and play. However, as Thomas Enemark Lundtofte, Ane Bjerre Odgaard, and Kirsten Drotner point out in Chapter 15 of this volume, 'Digital media are cultural objects in situated meaning-making practices, and should not be reduced to their technological functions.'

We can understand a great deal about the complexities of how children communicate, how they learn and the implications for education if we pay attention to what they are entertained by, why they find it entertaining, and how they respond as fans, particularly through online practices such as commenting, posting fan art, and through fan fiction. To date, there are comparatively few in-depth sociocultural studies about children's entertainment experiences in digital contexts and fewer still that make the connection between entertainment, learning and education. We need a greater number of rich studies of children's entertainment and particularly specific case studies of children being entertained on platforms such as YouTube, Minecraft, Roblox, and Twitch and the intertextual connections across these. We need to understand the entertainment 'supersystems' children immerse themselves in today to more completely understand communication, learning and the implications for education.

Several chapters in this volume demonstrate the opportunities to make rich connections between children's digital entertainment and learning. In pointing out examples from these chapters I deliberately home in on aspects that make connections to entertainment. Although entertainment is not the main focus of the chapters in this volume, it is present in the majority of chapters. In Chapter 2, for instance, Roger Säljö argues that due to the centrality of digital media in children's lives, schools are no longer the single source of information and knowledge for Nordic children. He implies that children may often gain information and knowledge from their everyday entertainment experiences. Kirsten Drotner shows in Chapter 3 how the various binaries that underlie public discourse about children's media use typically malign media content in the hierarchy of their learning experiences. However she argues that access to knowledge on digital platforms potentially challenges established power relations between educators and students and

between parents and children. In Chapter 4 Ola Erstad and Kenneth Silseth argue that schools and teachers are hesitant to open up to the broader media culture outside of school, such as social media or online gaming. Their focus on student agency provides an opportunity to think about media entertainment, which is at the centre of young people's out of school lives.

Kristiina Kumpulainen's discussion of augmented reality and environmental education in Chapter 5 prompts reflection on how children's worlding and storying may involve negotiation with their broader popular culture experiences. Chapter 6, by Heidi Sairanen, Kristiina Kumpulainen, Alexandra Nordström, and Anu Kajamaa raises questions about how parents and young children negotiate digital technologies and entertainment content in their daily lives. Ewa Skantz-Åberg and Annika Lantz-Andersson's Chapter 7 demonstrates how when making stories, children draw on agency they have formed in their interactions with popular culture. In Chapter 8, Dagbjört Guðmundsdóttir, Iris Edda Nowenstein, Sigríður Sigurjónsdóttir, and Iris Nowenstein draw attention to how entertainment content on digital platforms is associated with the English language and potentially changing young people's attitudes towards Icelandic. Entertainment is not the main focus of Skulina Hlif Kjartansdottir and Gisli Thorsteinsson's discussion of Minecraft in Chapter 9. However, the focus on literacy events provides scope for considering how the introduction of narrative into Minecraft draws on children's prior experiences of Minecraft narrative through entertainment, for instance through viewing Minecraft YouTube videos. In Chapter 15, Thomas Enemark Lundtofte, Ane Bjerre Odgaard and Kirsten Drotner focus on digital production practices and the connections to entertainment content are clear. The authors note how they prefer the term 'digital media' to 'digital technologies' precisely to draw attention to the entertainment forms children engage with, including the semiotic and social practices associated with media production and use. Kenneth Pettersen, Kenneth Silseth, and Hans Christian Arnseth outline a fascinating example in Chapter 16 of children negotiating the sociomaterial boundaries of school/non-school, and digital/non-digital game space as they introduce video game play into the school yard. In this case, an entertainment form is introduced into school by the students.

Several chapters have less obvious connections to entertainment on digital platforms, including Chapter 10 by Malin Nilsen and Mona Lundin; Chapter 11 by Jasmiina Leskinen, Kristiina Kumpulainen, and Anu Kajamaa; Chapter 12 by Anne Solli and Åsa Mäkitalo; Chapter 13 by Jenny Renlund, Kristiina Kumpulainen, Jenny Byman, and Chin-Chin Wong; and Chapter 14 by Gro Skåland. However, even in these chapters where entertainment is less obvious, it is not difficult to consider how there are connections to children's broader digital entertainment experiences.

Across the chapters of this volume, entertainment is referred to, referenced and implied but is never the central focus of analysis. This is not a criticism of the chapters or the volume as a whole, which makes an important and exciting contribution to international research about digital childhoods. Rather, I make this comment as a prompt to suggest that future work in Nordic digital childhoods,

and indeed scholarship internationally, might more directly address children's entertainment on digital platforms. I would like to suggest three reasons for this. The first is simply that entertainment is central to children's digital experiences. We can gain a great deal of insight into children's culture by paying close attention to what children find entertaining and that is important in its own right. There is sometimes a tendency within Educational research to use phrases such as 'digital culture experiences' to stand in for the complex and varied entertainment available to children across different digital platforms. There is a need for deep analysis of the differences between, say, 'Unboxing' videos and 'Let's Play' videos on YouTube, both of which have been wildly popular in recent years.

Second, while our field acknowledges that children are always learning in one way or another when they engage with entertainment on digital platforms, we need a greater understanding of how this occurs. My own attempt to address learning on digital platforms has sought to identify how 'peer pedagogies' are enacted in the learning relationships that exist between Minecraft Let's Players and their fans (Dezuanni, 2020). I extended on the tradition of media and public pedagogies (Ellsworth,1997; Giroux, 1992, 1994; Hartley, 1999, 2011) to argue that digitally networked pedagogies operate in specific ways. In the best instances, the pedagogical relationships available to children through entertainment online are supportive, non-hierarchical, and based in shared passions. However, peer pedagogies are not necessarily positive and supportive, and this brings me to my third point.

We need to consider how to help children and young people to become critical consumers of online entertainment through the development of media literacy knowledge and skills. As Kinder argued (1991), children's identities are at least partially negotiated within the normative representational practices they encounter in complex media 'supersystems' and that the roles entertainment makes available across gender, race, sexuality, and class are frequently problematic. The largely unregulated nature of the internet makes the challenge of assisting children and young people to have positive online experiences more challenging than ever.

We know that some forms of entertainment online rely on hetero-normative hyper-masculinity, and that misogyny and hate are common in some corners of the internet. We have also seen a rise in mis-and disinformation online, often distributed via social media entertainment platforms such as YouTube. While acknowledging that young people are agentive and capable of negotiating problematic online content, there is a role for education to play in helping children and young people to develop the knowledge and skills necessary to have positive online experiences. There is a well-established tradition in media literacy education (Buckingham, 2003), including by Nordic researchers (Kotilainen & Arnolds-Granlund, 2010), that can be built upon to consider how we can educate children and young people to be more critically reflective of their digital entertainment experiences. A critical orientation is an essential aspect of thinking about children's digital culture through an entertainment lens.

I would like to end by saying that although my city of Brisbane in Australia is a long way from the Nordic region, I feel a great affinity with the scholarship in this volume. It has been a joy to read each of the chapters and to gain insights into

digital childhood research projects in each of the Nordic countries. This volume makes an essential contribution to global scholarship about contemporary digital childhoods and I have found the insights in each of the chapters highly productive for thinking about how to continue to undertake research in this important field.

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Chapter 19

Ethical provocations for early childhood research

Rosie Flewitt

Re-evaluating ethics in early childhood research

The steady growth of research into young children's digital lives and the parallel digitalisation of research tools have led to many new research practices, with new digital research sites, digital recording devices, and online databases being employed for data collection, data sharing, and the dissemination of research findings. These interrelated developments call for a re-examination of past ethics practices that linger long in contemporary ethics guidance and governance. As researchers know well, contemporary ethics norms and practices are rooted in biomedical research in response to atrocities committed in the name of research during WWII (Alderson, 2013; Flewitt, 2020; Flewitt & Ang, 2020), and they are underpinned by the assumption that it is feasible for ethical guidelines to act as universal benchmarks for ethical conduct. In the ensuing years, the global move towards research ethics regulation may have helped protect research participants from questionable ethical research practices, but contemporary research ethics governance has been frequently critiqued for serving primarily to protect institutions from litigation and loss of prestige (Cannella & Lincoln, 2007; Hammersley, 2010).

Gaining formal institutional consent to proceed with a study is a prerequisite for academic researchers, yet this process can seem far removed from the real-life ethical issues encountered during the everyday practicalities of research in specific situations with specific participants, all of whom have their own histories and beliefs that cannot be predicted and are unlikely to have been anticipated by universal ethics guidance. Research projects rarely unfold as intended, with unforeseen and unforeseeable ethical issues inevitably arising in the research field. These tensions are exacerbated for the early childhood researcher, as standardised institutional ethics regulation pays little or no heed to child-centred perspectives (Skelton, 2008, p. 23). For example, negotiating institutional requirements for written Participant Information Sheets and signed consent forms can be highly problematic for researchers who are investigating the lives of the very young and who seek young children's consent alongside meeting legal requirements for parental consent.

Furthermore, the processes of ethics regulation and governance have arguably shifted the responsibility for ethics conduct away from the individual researcher,

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creating an illusion of ethical practice through the imposition of particular power structures, behaviours and values on research practice (Cannella & Lincoln, 2007). Standardised ethics procedures as described through familiar phrases such as: 'Informed written consent was obtained from the parents of all participating children' or 'Prior to the commencement of the study, university ethics approval was gained' give the impression that moral concerns, power issues, justice, protecting other human beings (and so on) have been addressed with no further need for concern.

This regulated approach to research ethics has in turn given rise to a thriving knowledge economy on ethics, with publications advocating 'quick fixes' for research ethics, accompanied by tantalisingly reassuring advertising straplines that researchers can 'Ensure research is ethical with this Little Quick Fix, giving you a solid grasp of this tricky subject in an hour's read' (Poth, 2020). Such practices are emblematic of the environment in which academic researchers operate, where human activity is viewed through an economic lens of efficiency, where knowledge is commodified (Lincoln, 1998) and where entrepreneurial profit is often applauded as an important dimension of universities' achievement (Rifkin, 2000).

What are the effects of these trends on the ways in which we work and on what it means to be 'a good scholar'? There is a risk that the agency of the contemporary academic is increasingly conditioned by 'regimes of performance' (Morrissey, 2015, p. 614) that shackle academic freedom. In the neoliberal rush to commodify knowledge and to regulate research ethics governance, ethical considerations risk being diminished to the status of a hurdle to be jumped over rather than as a centripetal force that drives all aspects of research design and practice.

Post-colonial lens on research ethics

The editors identify a core aim in this volume to challenge narrow approaches to the role and meaning of digital technologies in children's communication, learning, and education by focussing on local characteristics and contexts. This sparks questions about the ways in which a post-colonial lens might illuminate how the processes of research ethics governance and subsequent research design operate to smuggle in colonial, Western, masculine, white and other biases 'in the guise of objectivity and good science (Baez & Boyles, 2009, p. 22). In an imperialist frame of reference, it is assumed the researcher has a right to interpret the world, so the claim to hear the voices of Others, including the voices of young and very young children, can all too easily become another 'colonising apparatus' (Cannella & Viruru, 2004, p. 147). The challenge for early childhood researchers is to refuse simplification, embrace contradiction, and recognise that research practices can result in the unconscious Othering of the research participant. As early childhood research moves forward, post-colonial theorisation could help us to see how the distorting lens of imperialist and neoliberal values obfuscates the complexities and intersections of young participants' lives and downplays young children's capacities to express their own views:

> The injustice children face is not that they may lack knowledge in certain domains, as all adults also do, but that they live in a world where epistemic and communicative resources are constructed and enforced by adults by default. They live in an epistemic tyranny of the majority. When they are attributed with being credible knowledge bearers, it is an exception, not the rule.
>
> (Baumtrog 2018, p. 299)

In short, a post-colonial lens on early childhood offers a critical framework to challenge the 'epistemic injustice' (Baumtrog, 2018, p. 294) that has all-too-frequently been done to young children in the name of research.

New materialist and more-than-human perspectives

More than three decades of childhood studies (James & Prout, 1990/1997/2015) have helped to shift the mindset of early childhood researchers towards the conceptualisation of children as competent social actors. However, there is still a tendency in research across disciplines for childhood to be viewed from an adult perspective, from a 'looking down' standpoint. This remains the default position of ethics governance and attunes with the legacy of colonialist constructs such as accountability and protection. The chapters in this edited volume suggest that early childhood researchers have reached a significant point in time when we can no longer accept that research and ethics will be narrowed, controlled, and legitimated through imperialist, humanist regulatory practices and discourses. Rather, there is evidence of a growing commitment to research practice that recognises children's knowledge, experience and values and looks afresh at ways to include children as experts in their own lives. Ethics is central to this endeavour. The task ahead is to notice and value the diversity of ways in which children express their views and to recognise that ethical conduct in research is always multivocal and characterised by complexity, diversity, and situated responses to events that happen in the moment, often in unpredictable ways.

As we build pathways for future early childhood research, new materialist thinking offers novel approaches not only to re-conceptualise young children's lives but also to re-explore research ethics as constellations of power relations, where discursive and material forces intra-act. A new materialist lens dislodges the researcher's assumed sole responsibility for ethical action by moving away from the notion of research as individualistic endeavour to embrace research partnerships and collectivist endeavour, where ethical dialogue and negotiation sit at the heart of research practice. In collectivist endeavour, researchers and participants share in decision-making and co-construct an ethical framework through the social and interpersonal process of conducting research. From this perspective, we might constantly scrutinise whose knowledge, experience, values, and context are being represented, and what gets to matter. As Powell, Francisco, and Maher (2003) propose, when video is used in educational research, there has been a tendency to focus on 'viewing the video attentively, describing the data, identifying critical events, transcribing, coding, constructing a storyline, and composing the narrative' (p. 413).

Yet insufficient attention has been paid to how digital video technologies produce 'a phenomenological image of the student/teacher body' (de Freitas, 2016, p. 555), and alternative approaches are possible. For example, in her participatory research with infants in Australian early childhood education and care, Elwick (2015) used two different digital video recording devices to observe the infants' experiences – a 'baby-cam' worn by an 11-month-old infant and a tripod-fixed camera. Juxtaposing digital images produced by these different devices and sharing these with the research team and early childhood educators enabled Elwick to explore how one event filmed through two different camera technologies was perceived or sensed differently. Through her conversations with others, Elwick came to recognise that research is embodied and multi-sensory practice and that human perception is shaped by the materiality and positionality of the recording devices. Elwick proposed that baby-cams 'may provide participatory researchers with a useful heuristic device, in that the generated images can remind researchers of the limits of their own "gaze" and ways of knowing and theorising infants' (Elwick 2015, p. 336).

Moving towards dialogic, reflexive, relational, and responsive ethics

Moving forwards in our thinking about ethics does not mean we turn our backs on familiar ethics practices that are embedded in the mechanisms of research guidance and governance. Rather than accepting the conceptualisation of ethics as inscribed in universalist moral codes, we might each seek to recognise our own unconscious bias and limitations, to problematise how we are rooted in particular bodies, histories, and privileged contexts, and to counter the inclination toward oppressive power within ourselves (Foucault 1986, p. 41).

One way to achieve this, Marmé Thompson (2020) suggests, is to cultivate positions of epistemic modesty, acknowledge our role and subjectivity in the production of knowledge, and recognise that adults, like children, navigate the world with only partial knowledge of many things 'making our way more or less successfully in a world where we never fully comprehend' (p. 98). This suggests the need to revisit our own and more widely held assumptions about children's competences in research and be mindful of our personal role in shaping the particular truths we attribute to data as we 'become-with' young participants as partners in research. As an example of how this approach might be applied in research ethics practice, in their search for ethical dialogue with three- to eight-year-old children about what their participation might involve, Mayne, Howitt, and Rennie (2017) developed an 'interactive nonfiction narrative approach' to discuss the children's rights to consent by sharing a storybook they had designed featuring research-related photographs of real people, places and events as a basis for ongoing dialogue about the research context, purpose and rules of participation. In instances such as this, the relationship between the researcher and research participant forms the basis for ethical decision-making. For this relationship to work, there must be reciprocity and a sense of connectedness, where our bodies and senses as well as our minds are attuned to the many ways in which children

express their understandings. We need to focus on noticing things – the small acts children make and the seemingly small moments in their lives – the remarkable in the unremarkable and the 'difficult differences' (Osgood & Robinson, 2019, p. 29) that come to light when researching young lives that do not conform to universalist and heteronormative models of childhood. As Kind (2020) observes:

> Not being able to speak is not the same as having nothing to say, and not being able to show one's knowing in conventional ways is not an inability to communicate or an absence of knowing.
>
> (p. 55)

This work is essential if our aim as early childhood researchers is to ensure that diverse and multiple life positions, locations, and 'voices' of research participants are present in research knowledge – not Othered but Included.

Concluding thoughts

As research into young children's digital lives in the Nordic sociopolitical and cultural context develops over the coming years, it will be important to bear in mind that new practices and new theorisations call for novel ways of conceptualising research ethics. Developing models for reflexive, relational, and responsive research ethics could play a major role in dismantling the stranglehold of colonialist and humanist values that have sedimented in contemporary research ethics guidelines and governance, acting to constrain the very autonomy, agency, and participation of children in society that early childhood research aspires to attain. To achieve this, we must recognise that the knowledge we produce through our research will be dependent on how the research apparatus is set up, and we must remember that 'research methodologies and practices are necessarily political and ethical activities' (Coleman & Osgood, 2019, p. 6).

For individual researchers and research teams, the following far-from-exhaustive provocations might act as a starting point for the development of new ethics approaches that promote rich conditions for young children's autonomy, agency and participation in research (also see Flewitt & Ang, 2020, Ch. 2 *Ethics and Early Childhood Research*):

- What kind of moral and ethical being do I aspire to be and how is this reflected in my research conduct and the conceptualisations of research that I choose?
- What ethical relations do I make possible in my research?
- What opportunities do I create for dialogue with children of all ages (e.g. through creative, arts-based, and productive methods)?
- Does my research recognise the many different ways that children make their contributions to dialogue? How do I engage with silent, quiet children and children who do not (yet) articulate their thoughts and feelings through language? How do I respect inarticulacy?
- Is consent constructed as a dialogic process rather than a single event in my research?

- Is my research designed on, to, with, for or by children, and what are the ethical and ontological implications of this (Bodén, 2021)? If a study aims to be *by* children, does it enable the production of new worlds with children as the main investigators, shaping all parts of the process? Are analytic processes inclusive of children's perspectives?
- What potential do new materialist and post-human approaches offer for research with children to create new world visions that reflect both the messiness and complexity of children's lives (see Schulte, 2020; Murris, 2016; Osgood & Robinson, 2019)?

Beyond individual research projects, as a global community of early childhood scholars, we need to create national and international dialogue about global and local research regulation practices. Together, through collaboration and debate, we might build understanding of how regulation is culturally grounded, consider if research participants are less or more protected than without regulations, and constantly work to ensure that the values we hold dear in terms of children's perspectives, competences, agency and participation become enshrined in our individual and collective research ethics endeavour.

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Chapter 20

Conclusions

Kristiina Kumpulainen, Anu Kajamaa, Ola Erstad, Åsa Mäkitalo, Kirsten Drotner and Sólveig Jakobsdóttir

This edited volume has brought together researchers from the Nordic countries to share their insights and empirical research findings on children's communication, learning, and education in the digital age. Drawing on the works of the Nordic Research Network on Digitalising Childhoods (DigiChild) the volume responds to calls for generating more research knowledge about local cultures, values, and communication practices that make up childhoods in times of major social, cultural, economic, ecological, and technological transformations. This is important as an incomplete understanding of the cultural characteristics and local contexts can lead to narrow approaches and misinterpretations about the role and meaning of digital technologies in children's lives, learning and education (Livingstone et al., 2017). Not only do countries and cultures differ around the world in how they view and value childhood, and see children in relation to the digital world, but their demographic, technological, socioeconomic, geographic, and political contexts also shape children's lives and childhoods at large. Therefore, research on children's communication, learning, and education in the digital age needs to be situationally, culturally, and spatially sensitive, addressed in this volume by investigating both formal education and everyday informal spaces as research sites situated in the Nordic countries.

This volume highlights how the inherent principles and practices of children's communication, learning, and education are played out, challenged and transformed amidst technological, social, cultural, and environmental developments. Importantly, the volume portrays children's communication, learning and education as fluid and under constant development, entangled with other sociocultural transformations taking place in Nordic societies and globally. From this perspective, it becomes difficult or even impossible to define Nordic childhoods from the outset but rather to view the notion as a social construction, a materially, culturally, and socially defined life space of children (Dencik, 2020). In doing so, the present volume draws a complex and dynamic picture of Nordic childhoods in the digital age by shedding light into its various manifestations, developments, and tensions in the social and communicative practices of children living and learning in the Nordic countries in a specific time and space.

Many of the studies of this volume are based on holistic research designs across sites and settings, and a child rather than an institutional or technological

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perspective. The studies also move beyond the seemingly dichotomous discourses between children's protection and participation rights as well as screen on/off time. Instead, understanding the 'digital' as permeating children's everyday lives and recognising children's rights and agency in the digital age, the digital is viewed as an integral element of contemporary Nordic childhoods. This approach taken in this volume differs from the international literature, where navigating a balance between risks and opportunities so that children can enjoy the benefits of the digital age is often impeded by anxieties that accompany the risk of harm to children, resulting in protective responses that at the same undermine their digital participation (Livingstone, et al., 2020). Instead of focusing on the risks and concerns related to children's uncritical, passive, or consumerist engagement with the digital world and its effect on their values, habits, and identities – rhetoric often emphasised in the current research and in discussions held in public media (e.g. Kirschner & De Bruyckere, 2017) – many of the chapters in this volume focus on children's creativity and agency with digital technologies and media within and across settings. Additionally, in this volume, emphasis is given to the unpredictable and uncontrollable nature of children's communication, learning and education with digital technologies (Kumpulainen, Kajamaa, & Rajala, 2019).

The Nordic insights of this volume contribute to the wider international body of research on how digitalisation is shaping children's communication, learning, and education that make up contemporary childhoods. The chapters advance scholarly knowledge about the ways in which children and young people engage with and are afforded to use digital technologies and media in and across settings. They also illuminate theoretical and methodological advances in Nordic research in the field(s) addressing how digital transformations are impacting children's communication, learning, and education. Originating from Vygotsky's ideas (1978), many chapters share a joint emphasis on cultural and material mediation as being central in children's communication, learning, and development. From a sociocultural perspective, digital mediation is viewed as being connected to the historical changes, present context, and future activities and social languages in the lives of children (Gutierrez, 2008). Further, cultural and social values a.nd tools that emerge or are used in interaction and shared learning activities define, guide, and support participation and learning in a community (Rogoff, 1995). The sociocultural lens of this volume unpacks conditions and mechanisms that position children and young people as active, creative, agentive, and critical investigators and users of digital technologies for personal and social change across formal and informal everyday sites of digital mediation, online and off. In doing so, this volume demonstrates how digital technologies and media can mediate children's participation and agency in their lifeworlds, also bringing them closer to civic engagement and decision-making processes. From this standpoint, it becomes possible to understand digitalisation as a dynamic, tool-mediated entity with opportunities and tensions for learning and development over time, and across societal, institutional, and personal situations (see Hedegaard, 2012).

Despite the widespread optimism in the Nordic countries about the potential of digital technologies and media, especially for information and the formal and civic

education of children and young people, this volume also acknowledges to some extent the multifaceted challenges related to digitalising childhoods. These challenges are entangled with evolving globalisation, migration, mobility, heightened economic inequality, and marginalisation together with technological developments (Hiitola, et al., 2020; Wedin, et al., 2017). Furthermore, while the authors of this volume were writing up their chapters, the COVID-19 pandemic suddenly forced schools, education and children's families to engage in multiple, fast digital transformations, such as distant schooling and management of new digital tools, due to lockdowns (Iivari, Sharma, & Ventä-Olkkonen, 2020). The pandemic has required remarkable resilience and perseverance from children and their educators, as well as families, school administration, policy makers and the whole society.

It is clear that there is a constant need for new research knowledge in the area to construct a more nuanced picture of the opportunities and challenges of the digital age for children's communication, learning, and education. In particular, more research attention needs to be given to issues around equity and the 'dark sides' of digitalisation for children's learning and wellbeing. Furthermore, current research reveals scattered research evidence and an insufficient evidence base to guide policy and practice in the area of digitalising childhoods in the current COVID-19 'new normalcy'. The original themes of our Nordic Research Network on Digitalising Childhoods (DigiChild) create a fruitful pathway also for future research with a focus on a) inequalities and opportunities of digitalisation for children's learning and education, civic engagement, social life and leisure, b) the impact of digitalisation on children's physical and mental well-being, health, and safety, security, and privacy, and c) on research methods and ethics to study childhood in the digital age.

Widening our understanding of the opportunities, inequalities and risks of digitalising childhoods can better inform policy and practice in the field, to prepare both children and societies for the future. This requires not just accepting 'what is' but efforts to imagine new ways to research and enhance children's communication, learning, and education in the digital age (Kajamaa & Kumpulainen, 2019). With this volume, we hope to encourage researchers and other actors, such as educators, digital content developers, third sector professionals, and representatives of industry and policy, to continue their important work in addressing the potentials and pressing issues related to digitalising childhoods in different cultural contexts so that all children can access the digital world creatively, knowledgeably and fearlessly.

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