



Reading in the digital age

Differences and commonalities across research approaches

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Abstract

Reading, a cornerstone of children's education, is deeply influenced by cultural and traditional factors. Despite a consensus on its critical role, divergent definitions of reading persist across disciplines and theoretical paradigms. In this perspective article, we capitalise on recent research, including our own, to illustrate how divergent approaches to reading can enrich each other. We argue that diverse perspectives on reading can transcend the simplistic dichotomy of print versus digital reading in contemporary public discussions, and foster a more nuanced understanding of literacy. Each of the authors outlines their distinctive approach and research findings, and we synthesise these insights to provide a more integrated comprehension of the intricate nature of reading in the current global educational context.

Keywords

reading, digital reading, digital literacy, e-books, multisensory

Introduction

Reading is the most tradition- and culture-contingent part of children's education, with implications for their academic success and democratic citizenship. While there may be agreement on the importance of reading across disciplines and theoretical orientations, definitions vary with respect to what reading is. For many scholars in pedagogy and education, reading is typically understood in a broad sense, as encompassing engagement with any modality (text, image, sound) in any medium (screens, print). For this reason, the term *literacy* is often used interchangeably with *reading* (see examples later in this article). Researchers in psychology and cognitive science, however, tend to apply a narrow definition of reading, denoting engagement with written texts, which is a fundamentally different cognitive and perceptual process than, say, engagement with still or moving images, or sound. Others, using an ethnographic approach would focus on the sociocultural practices where reading happens.

It is crucial to keep these different definitions and understandings of reading in mind when discussing and reflecting upon reading and technologies, and how digitalisation is changing how we read and what reading might, and should, be in the future. This is not to say that one type of reading, and engaging with some modalities, is inherently better or superior – but they are *different*, in important ways. Watching audiovisuals is a different process than listening to sound, perceptually and cognitively (and affectively), and both of these are different from processing words and sentences, in respect to, for example, cognitive load. Moreover, in today's complex and multifaceted digital reading ecology, these processes are often entangled, and are also interspersed with various forms of interaction, for example, writing or posting videos. A thorough understanding of how digitalisation affects reading and literacy, in all their guises and configurations, of children as well as adolescents and adults, in and out of school, warrants balancing a broad literacy-approach with more narrow conceptualisations of reading, typical of the experimental sciences. Taking into account that reading and literacy are both socioculturally situated practices, sociomaterial/technical phenomena, and also (neuro)psychological, embodied, cognitive and multisensory processes, could be a first step towards a more integrative approach to reading and literacy, with the potential to supplement existing, largely isolated, strands of research. Applying perspectives from embodied and distributed cognition can aid in such an endeavour.

Children's leisure reading and uptake of new media have been traditionally high and positively perceived in Norway. In light of research showing the pivotal role of leisure reading of long texts, typically in print books (e.g., Torppa et al., 2020; Duncan et al., 2016; Pfof et al., 2013) for the development of reading skills, there is a need to strike a balance between the use of print and digital media in children's and adolescents' increasingly digital lives. Moreover, empirical research focusing on the role of affordances of *all* media and technologies, digital *and* print, is needed to build a knowledge base on which to develop optimal reading materials that will engage future generations of readers. This entails supplementing existing paradigms and approaches with trans-disciplinary research that takes into consideration the affordances of analogue and digital technologies, as well as the multisensory nature of reading. Building resilient and engaging readers for a digital future rests on multidisciplinary efforts and collaborations with designers, publishers, authors, educational practitioners and researchers across a wide spectrum of disciplines, joining forces in harnessing the best of both print and digital technologies, tailored to accommodate the needs and preferences of various readers, across ages and cultures.

In this Perspective article, we draw on recent and our own research to exemplify how current and future reading research could better accommodate this variety, in an attempt to widen and bring nuance to the binary print/digital framing of contemporary discourses about reading. Below, each researcher presents their approach and their own research, based on a shared structure for presentation, and we draw the insights together at the end of the paper.

Digital literacy: Pragmatic resources in young people's everyday lives (Pål Aarsand)

Main focus of research approach

Not so long ago, it was suggested that children who were born after the rise of the internet were digital natives. This stance generated questions that have given us important knowledge regarding what, when, where, together with whom and how young people learn to read and

write digital texts. In addition, discussions about what it means to be digital native and what is a digital text have been raised. These questions are still relevant within social research on young people's digital practices.

The concept digital literacy aims at exploring how people make sense of, communicate and act within and across activities and practices. The extended notion of text is essential, and includes words, symbols, images (still and moving) and sounds; it may be material as well as virtual. Studies of literacies have shown that socio-economic background is of importance when it comes to what, when and how people participate in digital practices. As a result, there has been increased focus on educational systems and how they can educate children to become digital literate citizens. Simultaneously, there is a scepticism towards children's self-initiated use of digital media, which can be seen in some research projects, as well as in recommendations and guidelines regarding use of screens, applications, and games. These projects and recommendations often position children as naïve and vulnerable actors in need of protection. It could therefore be argued that this approach downgrades children as cultural producers where their cultural productions appear as less valuable, less important, and less critical, at the same time as "black boxing" their digital literacy practices.

Current advances

Recent research has described young people's use of digital media as ecologies of literacy practices (cf. Dezuanni, 2020). The concept emphasises that being, for instance, a gamer is more than just playing the game (reading and acting on what happens on the screen); it involves multiple literacy practices such as reading books, playing with Lego, drawing, clothing, talk with friends and families. Taking that stance, traditional dichotomies, such as online/offline, material/non-material and producer/consumer, are transgressed, and generate other questions regarding what is considered as digital literacy.

Yet another important aspect is that children socially organise their literacy practices through instructions and monitoring of each other's activities. In studies of young people's gaming, it is shown how they create collaborative activities with shared knowledge and goals (Danby et al., 2018). Thereby, digital literacy is expanded to include how people negotiate and deal with each other while participating in joint activities. Lately, there has also been an increased attention to the role of materiality in literacy practices. Here, the combination of perspectives such as Ethnomethodology and Conversation Analysis (EMCA) and Science and Technology Studies (STS) have been very useful in describing how digital technologies and their scripts contribute to the sociotechnical organization of literacy activities. Close up analysis of sociotechnical interaction *in situ* has contributed to a richer understanding of how epistemic practices involve people, bodies and tools in co-production of literacies.

My own research

My research aims at opening the black box of children's self-initiated use of digital media and tools to see how, where, when, and together with whom these practices are part of their everyday lives (Aarsand, 2022). I see literacy as a pragmatic resource that is "used as it is appropriate, meaningful and useful" (Gillen and Hall 2012: 14). This means that digital literacy is competences that concern reading and producing actions that are relevant in that particular place, at that particular moment and from the position one occupies. This also means that how to act competently differ across situations and activities, and that the social and material environment are intrinsic to the local definition of literacies (Aarsand & Sørensen, 2021).

In my research, I have seen how playing digital games is an activity that often involves friends and family members. Here, describing, explaining, and showing how to solve prob-

lems while playing is often part of gaming. These are also activities that display how children understand, deal with symbols, handle rules and how they manage the game as a system. Gaming is often about dealing with evolving stories and characters with different abilities. Digital literacies are made relevant to the children in that situation, but are also transferred and made relevant within other practices. In my research, digital literacy is even part of children's playing on the playground. Here, stories, characters and tools are negotiated and included in the activity (Aarsand, 2010). I have also seen how experience and knowledge from gaming are brought into classrooms when they discuss game design, presentations, and self-made algorithms.

Future directions

Digital literacy is a broad concept that involves so much more than reading and writing in the traditional sense. Combining different theoretical perspectives, such as Multimodal Social Semiotic Approach, Actor Network Theory, STS, and EMCA, can be one way to unpack digital literacy practices, and create knowledge about how these are accomplished, what norms and rules that guide the development of meaning making, and how these are entangled with others. Approaching literacy as "ecologies of practices" is another example where multiplicity and movement in and across practices are emphasised. Here, we need to know more about how young people participate in various epistemic fields, how they combine experiences from different practices, and how they move across practices: put differently, how they become competent actors.

Within education, artificial intelligence (AI) became a topic when Chat GPT was launched in November 2022. This chatbot was able to generate texts within various domains. Bringing AI into the field of literacy puts forward questions, on different levels, such as: What kind of knowledge is produced in interaction with AI tools? Has the meaning of digital literacy changed when tools such as Chat GPT become part of the literacy field? What is a text? What is agency and how can it be understood? What does it mean to be an author? What new challenges and possibilities do educational institutions face as AI becomes part of (young) people's digital toolbox? However, at the end of the day, literacy is about handling everyday life.

Emerging social practices – readers and their cultural worlds (Ola Erstad)

Main focus of research approach

The key dimension of this research approach is the cultural-historical framing of researching reading and writing, since it provides an understanding of changes in reading and writing over time due to broader cultural transformations (Olson & Cole, 2006). So, what it means to read today, as a cultural practice, is very different from what it meant some years ago, due to developments of cultural resources available. As digital media and technologies have created new possibilities and challenges in reading and writing, from hyper-text in the 1990s and new ways that readers navigate across texts formats, to multimodality in the 2000s, to hyper-connected ways of reading in the 2010s (Brubaker, 2022), it is important to understand how reading and writing as cultural processes change over time. In research, the emphasis should be on reading and writing as dynamic practices, as part of diverse social contexts that change over time.

Another dimension concerns how reading and writing is embedded in people's lives and cultural worlds (Barton et al., 2007). Young people move between formal settings, where the

focus is on how they learn to read and develop as readers, and more informal settings where reading is motivated by other interests and means. It is of utmost importance to understand the sociocultural practices of reading, and how readers navigate between different modalities of texts and generate meaning from the contexts where reading takes place. Reading, across both screens and paper-based modes, unfold in different ways for different people throughout everyday activities.

Current advances

The increasing complexity in ways of reading and writing has triggered new research initiatives and concerns about what current developments imply. During the last ten years, we have experienced cultural transformations in access to digital resources, reduction in reading of traditional books, and an increase in people's listening to audiobooks in the same period.

One new research area concerns how digital media increasingly influence reading and writing activities in early childhood (Erstad et al. 2020). Young children today engage with reading and writing from an early age, and they use touch when interacting with screens, and this is combined with reading paper-based books. The implications of reading on screens from an early age, in diverse family settings, is still an emerging field of literacy research.

The temporal and spatial dimensions of reading and writing have become important in research, as literacy researchers try to better understand the complexity and inter-connectiveness of literacy today. Spatial literacies (Leander & Sheehy, 2004) and embodied aspects of reading and writing have made us aware of contextual settings for such practices and the engagement of the whole person, as cognitive, socio-emotional and embodied. Reading is then understood as distributed and connected within socio-material ecologies (Loh, Sun & Lim, 2023; Rowsell, Arnseth & Cabello, 2023).

Recent research is also trying to bring nuance to what digital reading is, because the term is often used too generally, as digital reading implies many different ways of reading, from reading on a Kindle, or reading text messages on a mobile phone, to being part of fan fiction communities engaged in reading and writing long texts. With reference to advances within social semiotics, the richness of the text universes that young people encounter today is fundamentally different from before, and needs new research approaches for deeper understanding.

As such, new methodological approaches have also been emerging in ways of using design experiments, interventions and participatory methods. The diversity in reading and writing necessitates a variety of methodological approaches for better understanding of reading practices among young people, since they often explore new texts earlier than older generations do.

My own research

During the last decade, I have been leading several large-scale research projects funded by the Norwegian Research Council. In the project 'Local literacies and community spaces' (2009-2013), we studied three age cohorts over a two year period as part of transitions from one educational level to the next (pre-school to 1st grade, 10th grade to upper secondary school, and upper secondary school to higher education, work or other), and we followed individual learners from school to activities in the local community. Reading and writing practices were studied as interconnected and distributed, for example in the way such practices differed between subject domains when following the class across different subjects and teachers throughout a school day, and how there were continuities and dis-continuities

of reading and writing between school practices and leisure practices. (Erstad, Gilje, Sefton Green & Arnseth, 2006)

This research was further developed in another project called ‘Knowledge in Motion across Contexts of Learning’ (2013-2016), following students in two classes in two different lower secondary schools through grades 8-10. This research also focused on how teachers encourage reading and writing among students by drawing on their everyday experiences with texts and the challenges, for both teachers and students, of crossing boundaries between reading practices and meaning making from everyday experiences to classroom activities.

As part of these projects, we have also developed methodological approaches that grasp the fluidity and connectedness of literacy practices, for example by asking young people to write diaries, take photos, and send audio files documenting their literacy practices in everyday life, in what has been termed ‘ethnography as logic of inquiry’ (Green, Dixon & Zaharlick, 2004).

Future directions

There are numerous interesting directions building on this research approach. Common to these are again the insight that reading and writing is increasingly complex and diverse, across both digital and analogue modalities.

One direction further explores the temporal and spatial dimensions of reading and writing. This has more recently been followed up in a special issue of an international journal studying boundaries of literacy and learning in the digital age (Erstad & Silseth, 2023). As such, reading in the digital age is studied in more diversity than before.

The OECD and other international agencies have raised issues about 21st Century children and the possibilities and challenges in ways that reading and writing is embedded in young people’s lives today. One focus that has grown in attention are the socio-emotional skills involved and the wellbeing of young people influencing their ways of reading and writing.

One apparent direction refers to the growing influence of artificial intelligence, where we are not in control of our reading and writing the same way as with the paper books, as well as the power of algorithms and digital data when dealing with information access, and how these developments can be studied both as a resource for reading processes and a threat to deep reading. These cultural transformations need integrative research approaches.

Multisensory reading in early childhood (Natalia I. Kucirkova)

Main focus of research approach

The benefits of digital reading have become increasingly evident, particularly for children facing special needs, reading difficulties, or limited exposure to reading at home. Systematic studies have shed light on the substantial learning potential offered by thoughtfully crafted e-books in nurturing traditional learning skills such as comprehension and vocabulary (Furenes, Kucirkova & Bus, 2021). Nevertheless, these studies also underscore a critical issue – the generally subpar quality of many commercially produced e-books intended for young children (Hirsh-Pasek et al., 2015; Sari, Takacs & Bus, 2019).

One of the prominent drawbacks is the scarcity of popular children’s e-books available in local languages, posing a barrier to children’s language development (Sari, Takacs & Bus, 2019). Additionally, many of these e-books contain distracting games that impede a child’s focus on the story, thereby hindering comprehension (Furenes, Kucirkova & Bus, 2021). These digital publications often come bundled with advertisements that exhibit minimal

concern for safeguarding children's data (Kucirkova, 2018; Day et al., 2022). Moreover, a substantial number of e-books have been developed without the input of professional educators, inadvertently sidelining the valuable expertise that teachers bring to the learning process (Kucirkova, 2018).

In response to these challenges, colleagues and I have collaborated closely with developers and publishers of children's books, striving to integrate principles from the learning sciences into the design of digital books. The International Collective of Children's Digital Books is a global think-tank bringing together stakeholders from academia, industry and practice to collaborate on developing effective, evidence-based digital reading experiences for children (<https://www.childrensdigitalbooks.com/>). Evidence of positive impact is important, because when digital books are designed by researchers, or when the digital books follow key learning principles, then they can enhance children's comprehension of stories, to the same extent or more, than print books (Furenes, Kucirkova & Bus, 2021). Even more importantly, the effect was found to be most pronounced among children from lower socio-economic backgrounds, who often do not have access to print books at home.

Current advances

A relatively emerging field of research that is gaining considerable attention is sensory reading, emphasising the engagement of all six senses—vision, hearing, touch, taste, smell, and proprioception—in children's reading experiences. In a recent research endeavour, supported by the Norwegian Research Council and The Jacobs Foundation, my colleagues and I have delved into the fascinating realm of olfaction and its significance for children's reading (<https://www.uis.no/en/sensory-books>). Within this project, we are exploring the impact of odours on reading, encompassing both digital and traditional print books, but also stories shared in the space and experienced with the entire body. Our fundamental hypothesis revolves around the notion that it is the specific sensory stimuli and the unique responses of children that influence their comprehension of stories, rather than the reading format itself.

This hypothesis is grounded in the theory of multisensory reading, which posits that the interplay of sensory experiences is the central factor governing the effects of reading (Kucirkova, & Rodriguez-Leon, 2023). In other words, it is not merely the medium—digital or print—that matters, but rather the intricate orchestration of sensory engagement that unfolds as children immerse themselves in the world of stories. Through our research, we aim to elucidate and map the ways in which sensory elements define children's reading experiences and could ultimately augment their understanding of the narratives they encounter.

My own research

When thinking about reading more broadly, it is important to emphasise the important role of age in the methodologies and approaches to reading. My research has been centred on young children's literacy, a critical phase in readers' lifelong trajectories. Young readers, often referred to as early or emergent readers, typically span the ages of 2 to 8 years. Within this age bracket, the concept of reading extends to encompass two vital dimensions: the process of learning to read and the act of reading to extract meaning from various forms of text, including picture books that convey stories visually through texts and illustrations.

For young readers, reading engagement transcends the boundaries of format, as they engage with various formats of stories, encompassing both digital and printed texts, but also comics, audiobooks, and moving stories on tablets and TV that often include written texts. What truly matters to these young learners is the presence of a compelling narrative and relatable story characters that guide their reading experience. Indeed, several observational

studies found that young readers exhibit remarkable fluidity in moving between digital and print platforms, as long as their interaction is underpinned by a captivating story and characters that resonate with their identity and imaginations (e.g. Frederico, 2018; Hermansson & Olin-Scheller, 2022).

Future directions

Future directions in research hold great promise for delving deeper into the significance of the hidden senses – olfaction, gustation, and proprioception – on children’s reading experiences. Many unanswered questions remain, and there is still much to be explored. One particularly intriguing aspect to investigate is the impact of edible books, crafted from consumable materials, on stimulating multiple senses simultaneously. While perhaps controversial at first glance (books should be read and not consumed, one might argue), the multisensory approach challenges traditional notions of literacy and offers insights into the role of sensory interplay in enhancing reading enjoyment. From the sensory perspective, a story that is created from various edible ingredients might be ephemeral as it decays after a while, but carries even more an affective potential, an emotional value, for the reader and creator of the story (Kucirkova, 2023).

In the forthcoming research, an emphasis will be placed on exploring embodied experiences in reading, acknowledging reading as an activity that engages not only the mind but the entire body. By recognizing this holistic approach, we can better align the benefits of reading, encompassing cognitive, social, emotional, and overall well-being aspects of it. This is vital in the present age of automated content generation. By incorporating all six senses in reading – vision, hearing, taste, smell, touch, and proprioception – we can unlock new avenues to stimulate children’s agency, and foster a deeper level of engagement and enjoyment in reading experiences, which goes beyond cognition- and vision-centric approaches to literacy.

Multisensory, embodied reading across substrates and media (Anne Mangen)

Main focus of research approach

Ongoing digitalisation invites questions about the role of the affordances of the substrate and device on various aspects of reading – whether in the broad sense, as in multimodal and/or multiple texts across media, or in the narrow sense, as in the sustained reading of linear, single texts on the substrate of, for example, an e-reader display or on paper in a print book. Digitalisation makes apparent how reading is a process and experience going beyond what we do with our eyes and our brain. Recent insights from 4E and distributed cognition can contribute to shedding further light on the role of the affordances of reading technologies, as well as the role of sensory modalities not typically acknowledged as parts of reading, such as touch, haptics, olfaction, and proprioception (cf. above).

4E posits that cognition, hence reading, is *embodied*, that is, that the whole body plays a constitutive role in cognition. Further, reading is always *embedded* in a context which will affect cognitive processing, for example, in terms of cognitive load. Next, reading is *enactive*, in that cognition emerges from or is constituted by sensorimotor activity (O’Regan & Noë, 2001), entailing multisensory engagement which affects the nature of what is perceived, learned and understood (Malafouris, 2013). Finally, reading is *extended*, meaning that it may be extended through technologies and tools such as paper and screens in various manifestations.

Applying the perspective of *distributed cognition* entails looking at reading as a cognitive process which is not only happening inside the skull or with the eyes and the mind, but which involves (1) coordination of processes across internal (i.e., mind-brain; cognitive) and external (i.e., material, environmental) structures; (2) distribution of across members of a social group; and (3) distribution through time, across multiple timescales, such that outcomes of earlier events, for example, personal memories from past reading experiences, may transform the nature and experiential impacts of later events (Hollan et al., 2000; Trasmundi et al., under review).

Current advances

Capturing the richness and complexity of reading requires a combination of methods and types of data, and both process measures and post-hoc measures are needed. Data collected only post-reading will not adequately reflect the temporal dynamics of the process; reading is a continuous, temporally extended and multiscale activity during which processes unfold at different timescales – for example, neural, behavioral, phenomenological, and biographical (see e.g. Trasmundi et al., 2021). Some timescales are directly observable, whereas others are less so, and they all constrain and shape the reading, in various ways. Processes at the neural level can be observed and studied with appropriate neuroscience methodologies and technologies, and the same applies to processes at the behavioural level, such as eye-tracking, or sensorimotor engagement with devices that can be captured on video. However, reading also unfolds along slower and nested timescales that relate to experiential and phenomenological dimensions (Trasmundi et al., under review). These include aspects such as social and cultural normativity, and different readers' different reading trajectories, social experiences, personality, and so on. Capturing how traces of such experiences may come to impact the reading process and experience requires other methodologies, for instance phenomenological or narrative interviews.

By implication, some aspects of reading engagement are readily available for the reader to verbalise and express orally or in writing tasks, whereas others are implicit and hence not readily available to report verbally, such as physiological indications of affect (e.g., electrodermal activity, heart rate variability, as indications of stress or anxiety). Applying a 4E + distributed cognition perspective to reading across media, technologies, modalities, and reading contexts makes it possible to integrate the reader's cognitive, affective-emotional, and sensory-motor processes of material engagement with their personal history, contingent on sociocultural contexts as well as personal experiences. Importantly, such an approach may bridge the current gap in reading research, between (neuro)cognitive paradigms on the one side, and sociocultural approaches on the other.

My own research

In collaboration with colleagues from fields such as neurophysiology, experimental and cognitive psychology, literary studies, cognitive ethnography, and education, I have been doing empirical research comparing the effects of substrate and medium affordances, on cognitive and emotional facets of reading. In particular, I have been interested in the role of the hands, and of touch and haptics, for cognitive as well as affective dimensions of reading (e.g., Mangen, 2008; 2016). More recently, I have taken a particular interest in applying insights from 4E and distributed cognition to the study of extended, long-form reading of authentic reading materials by the use of various technologies (print as well as digital) in naturalistic settings, for instance, students' reading of scientific articles or monographs at a university library, or literary reading. This research is inspired by cognitive ethnography (Trasmundi

et al., 2021), which invites studying temporally and spatially extended phenomena “in the wild” (Hutchins, 1995). As an example, we are exploring extended study reading in disciplines such as literary studies, and anthropology. Students read assigned texts for five hours, with and without access to digital technologies. Data consist of video recordings, physiological measures, ratings, focus groups, and eye tracking measures. The objective of this pilot is to gain empirical observations on how the presence of digital technologies during study reading affects reading behaviour, in turn guiding educators to help students to grapple with challenging, long-form reading in school and in academia.

Future directions

Understanding the impact of digitalisation on reading, in both a broad and a narrow sense, warrants supplementing a literacy-oriented sociocultural/technical/material view with due scholarly attention to the particularities of modalities (i.e., static and dynamic images, text, audio), textual parameters (genres; length; complexity; etc.), substrates, and media. Modalities differ in how they capture, guide and retain our attention, tax and build our cognitive capacities, and hence how they support and develop various aspects of reading. In the same vein, different substrates (e.g., screen displays and print) invite and require different sensorimotor engagement when, for example, navigating back and forth, bookmarking, underlining, and moving between texts. Adequately accounting for the role of affordances of media and substrates for various experiential reading outcomes requires that the fields of reading and literacy research strike a balance between focus on literacy (broadly defined) and reading (narrowly defined) – and the role and impact of all technologies (old and new; print/analogue and digital) for various cognitive and affective-emotional facets of these skills.

Acknowledging the fundamental multi-scalarity of reading, such an integrative reading and literacy research programme rests on the willingness of scientists and scholars across disciplines to engage in transdisciplinary dialogues, each bringing their theoretical and methodological expertise to the table. More ground can be covered by combining types of data across paradigms, in particular, across the persistent cognitive versus sociocultural schism. Although ambitious, studying reading in authentic contexts, using authentic digital and print reading materials, ideally applying first-person as well as third-person approaches, and capturing the reading behaviour at neural, behavioral, phenomenological and sociocultural level, would set the stage for significant advances in our knowledge about what reading is, and how it is currently changing, with the transition to digital devices. Multi-method, multi-level approaches such as these would allow, for example, thorough investigation of hitherto neglected but potentially significant aspects of reading, such as breaks or ruptures (Trasmundi et al., 2022) – that is, when readers look away from the text, whether on paper or screen. In an influential paradigm in reading research such as eye-tracking, breaks such as these would simply amount to non-existing data. However, plausibly important processes are taking place when readers detach, perceptually, from the ongoing ocular scanning of the text, and let their minds wander as they, for example, look out the window. The role of such internally prompted mind-wandering is known to be very influential in nurturing creativity and imagination, typically considered vital elements in so-called 21st century skills (Ananiado & Claro, 2009), and it is a key empirical question for future reading research to explore the role and effect of various technologies and substrates, on such processes during reading.

Reading in the classroom across paper sheets, printed books and digital screens (Marte Blikstad-Balas)

Main focus of research approach

How we read is changing and expanding rapidly, as we have seen across the previous sections. But one thing remains constant: the societal institution mainly responsible for providing children and adolescents with reading competence are still schools. Schools are also, for most young people, the place they do the most sustained reading: from the very first grade and all the way up to higher education, reading is fundamental in learning processes and as a means to convey knowledge and information. A pressing question when the mediums of reading are expanding rapidly, is how schools – the institutions responsible for teaching reading – respond to this expansion.

Drawing on a longstanding tradition of literacy research mapping how and what students read in different subjects, literacy researchers are now facing new challenges keeping up with the increasingly fluid notion of text in digitalised classrooms. A key ambition within this research approach is to provide insight into what characterises students and teachers literacy practices in hybrid classrooms. How does reading change when the texts read are no longer solely print text? Does it matter if the students read novels from a book, an e-reader or just listen to an audiobook? Do the teachers frame reading assignments in different ways if the texts are on screen? What happens to text length, reading instruction and the assessment of reading in increasingly hybrid classrooms? Questions like these deserve to be answered with systematic empirical evidence from classrooms.

Current advances

Around the world, schools are expected to digitalise education and provide students with relevant technology (Blikstad-Balas & Davies, 2017; Salmerón et al, 2023). More and more, students are being provided with their own digital devices for educational purposes, and an increasing amount of the texts they read both in their personal life and as part of their formal education, are digital texts. However, paper texts are also very common in classroom situations. Thus, capturing the complexity of reading in today's classroom requires a combination of multiple methods and data sources. Inspired by pioneering literacy researchers (e.g Barton, 2006; Heath, 1983), the ideal for many researchers is still to observe literacy events to be able to say something about prominent literacy practices. In a classroom today, these events are often taking place across devices: some of the reading is still on paper, some of the note-taking may be on paper or screen, the tasks may be distributed to students by digital learning platforms but answered orally in groups, and so on. To capture this richness and complexity, it is important to draw on multiple data sources. Video data has proven particularly relevant, due to its ability to capture multifaceted literacy events (Blikstad-Balas and Sørvik, 2015; Blikstad-Balas, 2018) that could not be observed directly in situ. Videos can also be combined with screen-captures of students' and teachers' screens, as well as copies or pictures of all paper texts. To analyze how students and teachers make sense of all these texts across formats, it may also be very relevant to interview them or ask them questions about their reading while it is actually happening.

My own research

My research is grounded in a genuine interest to understand what roles both print and digital texts can have in classroom situations. What is being read, for what purposes, and what characterises the talk and tasks provided along with the texts? In my work, I have recorded students' screens with head mounted video cameras and analyzed second by second what they

have spent time on – ranging from note taking in Word to reading news on Facebook. I have also, in collaboration with colleagues, investigated how reading happens across a large-scale data set from almost 50 video recorded different lower secondary classrooms (Magnusson et al, 2019; Gabrielsen et al, 2018). I have also investigated, with colleagues, what digital technologies are being used for across different classrooms (Bliktad-Balas & Klette, 2020; Kure et al, 2022). Across all these studies, a key finding is that teachers and students do not really address reading mediums. There is little talk about the differences or similarities in reading on paper versus screen, and little attention to what kind of reading strategies and reading habits you may benefit from in one format versus the other. This has important implications for anyone responsible for teaching students how to read – as we know there are indeed differences in affordances in different reading formats.

Future directions

Going forward, we need more studies looking systematically into how the rapid digitalisation of schools changes what we mean by “reading”. A trend that is becoming evident in Norway, is that screen reading often means shorter texts, rather than the traditional sustained reading of paper novels. Digital texts can often be read for you, by clicking on a button and having the machine read it aloud while you read – or while you just close your eyes and pay attention. Is this also “reading”? Scholars subscribing to a broad view of reading, akin to literacy, would perhaps say yes to this question, whereas researchers studying reading applying paradigms in psychology and cognitive science, would likely rather stress the differences between listening – processing audio – and reading (processing written text). Issues such as these relate to a number of important questions we need to ask, revolving around assessment of reading and what we want students to do with what they have read. Such questions hinge on what modes of reading we consider important for future readers to master. If we want future readers to be able to read extended, written text, consisting of words and sentences, whether on paper or on various screens, we need to distinguish between modalities – acknowledging that listening to audio does not train that type of reading skill, nor does watching audiovisuals. Reading digital, multimodal texts may, and probably should, be part of this training, but decades of research have shown that fluency in the reading of written text – that is, reading narrowly defined, is best trained by bulk reading of long texts, preferably, in print (Delgado et al, 2018). Hence, the investment in and use of digital technologies in classrooms needs to be carefully balanced with sufficient access to and use of print media, in particular for the training of what is called deep reading – reading of long, complex texts, which require sustained focus over an extended period of time.

Conclusion

As shown across the researchers’ short summaries above, contemporary reading practices among children, young people and adults are becoming increasingly complex and interconnected across modalities and social contexts, as “ecologies of practices”. The so-called “practice turn” within social sciences during the last decades implies an orientation towards what people do in specific situated social practices and authentic interactions, framed within institutional and cultural constraints. For studies of reading, and writing, this meant that the focus turned from defining literacy as something pre-defined towards studying how young people themselves engage with diverse texts in everyday practices (see New Literacy Studies), and how meaning making and cognition involved in reading and writing were closely related to cultural contexts. That reading and writing are conceptualised as emerging have

two meanings; first, as emerging from diverse social practices, such as school classrooms, at home or reading with friends, both online and offline; and, second, as emerging over time, through cultural historic developments. Part of what is argued is that research has to understand the unfolding of reading and writing practices in diverse socio-cultural contexts.

Another approach focuses on recent theoretical advances in cognitive science, such as 4E and distributed cognition, as well as empirical research in various strands of psychology and neuroscience concerning the effect of medium affordances on cognitive and experiential aspects of reading, supplement a socio-cultural focus with knowledge about reading as an embodied, multisensory process in which we engage with substrates and devices of various kinds.

Thus, overall, and as showcased in these five short summaries, we can see many similarities across the approaches as well as their distinct foci. In the current context of uncertain national policies about the best approach towards reading, we modelled how one can bring together literacy researchers with various perspectives and show the variation in approaches towards studying and understanding reading in a coherent and mutually enhancing way. It is this research variation and research integration that we recommend following for future research development and implementation in practice.

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