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**New Media, New Literacies:
Implications for Reading for Understanding**

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INTRODUCTION

The New London Group (NLG, 1996) proposed the term *multiliteracies* to describe the rapidly changing contexts of literacy learning and teaching, characterized by increasing cultural and linguistic diversity, globalization, and rapid advancements in technologies for consuming and communicating multimodal information. A multi-literacies approach to pedagogy views literacy as dependent on the variety of purposes, tools, skills, and contexts available for meaning-making, and being literate as the ability to create and comprehend meanings through multimodal forms of communication. As described in Chapter 1 of *Reaping the Rewards of the Reading for Understanding Initiative* (2020), implications from the work of the NLG related to reading comprehension include (a) expanding notions of text; (b) attending to the relationships among school-based learning, work life, citizenship, and private life; and (c) calls for literacy pedagogies that turn interpretive authority over to students, support students to connect goal-driven meaning-making to action, and foster students' critical understanding of text.

We revisit the work of the NLG in this paper, focused on future directions for reading comprehension research, because the NLG report makes salient the fact that the Reading for Understanding (RfU) initiative was focused on traditional academic texts in the context of school-based learning, rather than the more expansive view of texts and contexts proposed by the NLG. However, given technology's contemporary importance to the field, the potential ramifications of digital technologies for literacy development, instruction, and assessment, and the troubling emergence of a two-tier digital divide (Leu, Kinzer, Coiro, Castek, & Henry, 2013; Rowsell, Morrell, & Alvermann, 2017) that is characterized not by access to technology but rather by access to *online literacies*, we chose to conduct a conceptual review of technology-related reading comprehension research, as well as research related to multimodal meaning-making (both digital and nondigital) and reading comprehension in out-of-school contexts, in order to highlight future directions for reading comprehension research that complement those indicated by the RfU teams.

In the sections that follow, we present illustrative findings from our review, specifically focusing on how reading comprehension research has attended to meaning-making as it relates to multimodality, digital technologies including the Internet, and out-of-school contexts for learning. In what follows, we characterize the landscape of existing scholarship in order to suggest future directions for research in these areas. We begin with a discussion of an area of research that has received increasing attention across the past two decades: online reading comprehension.

ONLINE READING COMPREHENSION

Reading is increasingly shifting from traditional print to online, digital formats in school, work, and community spaces. Leu, Kinzer, Coiro, Castek, and Henry (2013) argued that "new technologies, such as the Internet and other Information Communication Technologies require additional social practices, skills, strategies, and dispositions to take full advantage of the affordances each contains" (p. 1159). In addition to requiring readers to be able to read and understand information within and across texts, online reading comprehension requires that readers have facility with (for example) using search engines to locate information, critically evaluating online information

to determine the reliability of the text(s) identified, and using online communication tools, such as email, blogs, or infographics, to communicate information. Contemporary standards-based reforms, such as the Common Core State Standards (CCSS) (National Governors Association Center for Best Practices, 2010), reflect the ways digital technologies have expanded the notion of text, as well as the ways readers and writers interact with text and with one another. For example, by grade 5, the CCSS calls for students to “gather relevant information from print and digital sources” and “use technology, including the Internet, to produce and publish writing as well as to interact with and collaborate with others.” Despite these calls and increased research interest, research focused on uncovering the cognitive and social aspects of online research and comprehension—especially in the elementary grades—remains limited.

Across the past decade, researchers have investigated a number of questions about reading comprehension with digital text, particularly in the context of the Internet, sometimes referred to as online research and comprehension (Leu et al., 2015). Some examples of these research foci include investigations of (a) readers’ use of strategies during online reading, pointing to the interplay of new and traditional reading strategies (e.g., Cho & Afflerbach, 2015; Goldman, Braash, Wiley, Graesser, & Brodowinska, 2012); (b) facilitative and detrimental cognitive and social processes during online inquiry (Coiro, Sekeres, Castek, & Guzniczak, 2014); (c) contextual factors that may influence online research and comprehension (e.g., Kennedy, Rhoads, & Leu, 2016; Leu et al., 2015); and (d) how learners evaluate the quality of online information (Coiro, Coscarelli, Maykel, & Forzani, 2015). In the paragraphs that follow, we share illustrative examples from these foci, highlight some high-level findings, and outline directions for future research that have the potential to further uncover cognitive and social aspects of online research and comprehension as well as classroom instructional practices that may foster the skills called for in contemporary standards-based reforms.

Similarities and Differences in Offline and Online Reading

One line of research within this area has examined differences in online and offline reading and strategies that contribute to successful comprehension in these different reading contexts (e.g., Cho, 2013; Cho & Afflerbach, 2015; Coiro, 2011). This research suggests that productive online reading strategies appear to include strategies that overlap with offline reading strategies (e.g., monitoring comprehension and evaluating the content of web pages) as well as strategies that are unique to online reading (e.g., navigating hyperlinks and managing goal-relevant information) (Cho, 2013). For example, while both offline and online reading comprehension strategies and skills appear to make important contributions to performance on online reading tasks, few studies have investigated instructional interventions designed to foster students’ application of traditional, offline reading strategies during online reading or teaching and supporting students’ use of those strategies that may be unique to online research and comprehension.

Influence of Cognitive and Social Processes During Online Inquiry

In a related area of research, a number of studies have focused on identifying facilitative and detrimental cognitive and social processes during K–12 students’ online

inquiry. While some cognitive and social processes appear to facilitate students' performance on online research and comprehension tasks, others inhibit performance (e.g., Castek, Coiro, Guzniczak, & Bradshaw, 2012; Cho, Woodward, & Li, 2018; Coiro et al., 2014). In one example, Coiro et al. (2014) examined the interplay of cognitive and social processes during elementary-grade students' online inquiry, observing that students who exhibited both higher levels of cognitive engagement and more collaborative social interactions more successfully accomplished online inquiry tasks. Cho (2013), working with high school students, found that more successful online readers were typically more engaged in higher-level epistemic processes, whereas less successful readers were frequently distracted by lower-level processes. While these studies have uncovered a number of processes that differentiate more and less successful online reading, there is limited research that speaks to instructional practices and tools that K–12 teachers might adopt in order to foster students' performance on online research and comprehension tasks, and how instructional practices and tools might differ across grade levels.

Contextual Factors Related to Online Reading Comprehension Performance

Literacy scholars have raised concerns about gaps in educational opportunity that K–12 students may experience related to their access to digital tools as well as the opportunity to use those tools for academically valued purposes (Leu et al., 2013). Recent studies have identified relationships among youth performance on online research and comprehension tasks, such as socioeconomic status and access to information and communication technologies in school (Kennedy et al., 2016; Leu et al., 2015). For example, Leu et al. (2015) found that differences in performance (among youth from economically advantaged and economically disadvantaged communities) on online research and comprehension tasks persisted after controlling for pretest differences in offline reading and writing, as well as prior knowledge, indicating an independent difference in achievement for online reading based on income inequality. Student questionnaire results revealed that the students from the economically advantaged community had greater access to the Internet at home and were more frequently required to use the Internet at school. These findings point to the potential role that schools might play in preparing students to meet the demands of online reading and learning through providing both access to digital technologies and classroom instruction.

Evaluating the Quality of Online Information

The final strand of research in the area of online reading comprehension that we highlight in this paper is focused on how learners evaluate the quality of online information. While the Internet has the potential to democratize access to vast quantities of information, it also places unprecedented responsibility on readers to evaluate the quality and reliability of the information they encounter online (McGrew, Breakstone, Ortega, Smith, & Wineburg, 2018). In one study, Coiro, Coscarelli, Maykel, and Forzani (2015) found that grade 7 students experienced considerable difficulty explaining a website's reliability and providing evidence to support their explanation. For example, only 25 percent of responses included a clear decision about the reliability of a website and a sufficient explanation of the students' reasoning. These findings are echoed by

McGrew, Smith, Breakstone, Ortega, and Wineburg (2019), who found that students across middle school, high school, and college struggled to evaluate online claims, sources, and evidence, and called for the design and investigation of curriculum materials to support students' development of online research and comprehension in the service of fostering civic online reasoning.

One clear direction for future research related to online reading comprehension is investigating curriculum and instruction that support students to learn and use productive strategies for engaging in online inquiry. While few studies have investigated instructional interventions designed to scaffold online reading comprehension, findings from existing research have begun to illustrate promising instructional practices, routines, and tools. For example, high school students who used an argument graph during online reading and source-based writing had more time to focus on reading and synthesizing information and considered more relationships between arguments and concepts than students who were engaged in note taking during online reading (Kiili, 2013). Case study research by Henry, Castek, O'Byrne, and Zawilinski (2012) revealed that elementary- and middle-grade students who participated in an Internet Reciprocal Teaching intervention developed online literacy skills and increased academic achievement. As a final example, McGrew et al. (2019) investigated whether instruction focused on civic online reasoning could improve university students' ability to judge credibility when evaluating online information and found that students in the treatment group were more likely than their peers to show gains on an assessment of civic online reasoning. These studies illustrate the potential of a variety of instructional practices, routines, and tools to support online reading comprehension across grade levels.

Future research in this area should include observational research in classrooms to understand curriculum and practices teachers are already using to support students to interpret digital text in online spaces, as well as design-based implementation research using multiple qualitative and quantitative research methods and conducted in collaboration with teachers, schools, and districts to design, test, and iterate upon the design and enactment of curriculum materials to achieve these ends. In addition, while some research in this area has focused on students in the elementary grades, the vast majority of the research on online reading comprehension has been conducted in secondary and postsecondary contexts. Thus, a second direction for future research relates to expanding research efforts to earlier grades in order to better understand how students develop strategies and skills for online reading over time.

MULTIMODALITY

Since its origination in the late 1990s, the term *multimodality* has gained traction in a variety of disciplines, including linguistics, semiotics, education, media studies, and sociology. While the concept is defined and operationalized in a variety of ways in and across these and other disciplines (see Jewitt, Bezemer, & O'Halloran, 2016, for a detailed discussion of theoretical and methodological approaches to multimodality grounded in conversation analysis, systemic functional linguistics, and social semiotics), scholars of multimodality generally have a shared interest in the many modes used to communicate in everyday life (Bezemer & Jewitt, 2010). They recognize that people

create meaning with a wide range of semiotic (meaning-making) resources, and that each of these resources (modes or modalities) offers distinct possibilities and limitations (affordances and constraints). Furthermore, they understand that different ways of making meaning almost always appear together and that different modal affordances and constraints interact to produce a multimodal whole. For example, images, written language, and layout can be combined in particular ways to communicate certain meanings.

Although print-based reading and writing are and always have been multimodal activities, the significant increase in multimodal forms of text in everyday spaces makes it essential to rethink not only notions of text but what it means to make meaning from these texts. Multimodal texts mark a departure from “heritage print texts” and the traditional hierarchical ordering of textual practices (Kress & Van Leeuwen, 2001), and this shift in what counts as text has changed what it means to comprehend text. As Kress (2003) noted, “[n]ew forms of reading have consequences for the relations between makers and remakers of meaning (writers and readers, image-makers and viewers)... Above all, *the shape of what there is to read* has its effects on ‘reading’” (pp. 140–141; emphasis in original). Broadening the “shape” of text to include graphic novels, artwork, interactive digital books, websites, and picture books—to name but a handful of everyday texts—centers questions about how readers navigate and integrate modes to comprehend and compose. New technologies in particular require us to rethink how readers make meaning, as digital texts afford semiotic opportunities that are different from print texts (Jewitt, 2005). The near ubiquity of technologies such as computers, smartphones, and tablets in the United States, particularly among young people (Pew Research Center, 2019), means that readers and writers have reliable access to novel and evolving modal configurations that are central to expanded notions of literate activity in our advanced digital age.

Studies suggest that reading researchers have taken up the NLG’s call to examine how meaning is made across modalities and in novel communication environments. Researchers have paid particular attention to (a) the effects of “sandboxed” (i.e., not open-Internet) multimodal digital environments on comprehension (e.g., Coyne, Pisha, Dalton, & Cook Smith, 2012; Dalton, Proctor, Uccelli, Mo, & Snow, 2011; Korat, Levin, Ben-Shabt, Shneor, & Bokovza, 2014), (b) students’ uses of multimodal nondigital texts and related meaning-making processes (e.g., Mason, Pluchino, & Tornatora, 2013; Sommer, Hinojosa, Traut, Polman, & Weidler-Lewis, 2017), and (c) the role of multimodal composition in meaning-making (e.g., Ajayi, 2015; Begoray, Higgins, Harrison, & Collins-Emery, 2013). We share here some broad findings from these three areas, as well as potential directions for future research that may further expand our understanding of how readers’ interactions with various communicative modes in digital and nondigital environments can support reading comprehension.

Effects of “Sandboxed” Multimodal Digital Environments

One line of multimodal comprehension research has investigated the potential of digital text to help learners actively construct meaning through embedded multimodal supports. Working with early elementary students with significant intellectual disabilities, Coyne et al. (2012) found that scaffolded digital storybooks that enabled students to view hyperlinked videos and photo essays, listen to stories, and interact

with embedded pedagogical agents supported significant comprehension gains. In their examination of the relative contribution of reading comprehension strategy and interactive vocabulary learning in the web-based digital reading environment Improving Comprehension Online (ICON), Dalton et al. (2011) found that ICON's interactive, multimodal texts supported vocabulary learning for middle-grade monolingual and bilingual students. Results from these studies suggest the potential value of multimodal instructional scaffolds in digital environments that may provide important learning supports to students who vary widely in abilities and needs.

Nondigital Multimodal Texts

Other research has investigated students' uses of nondigital, multimodal texts (e.g., graphic novels, picture books, and textbooks) and related meaning-making processes. Studies of students' uses of nondigital, multimodal texts suggest that these kinds of texts can encourage question asking (e.g., Auckerman & Schuldt, 2016), promote more integrative processing of material (e.g., Mason et al., 2013; Sommer et al., 2017), and support social opportunities to make meaning, particularly for language learners (e.g., Sun, 2015; Wong, Miao, Cheng, & Yip, 2017). Studies of how readers process and interpret across written language, maps, images, and infographics indicate that the process of textual meaning-making differs significantly depending on the reader's experience with multimodal interpretation (e.g., Jiménez & Meyer, 2016; Mason et al., 2013). For example, in studying how expert print-dominant readers and expert graphic novel readers made meaning in graphic novels, Jiménez and Meyer (2016) found that print-dominant readers relied on written language rather than illustrations to support or extend their comprehension of the text. Conversely, the expert graphic novel readers first attended to visual elements to gain an initial understanding of genre, character, and plot points before turning to the written text.

Multimodal Composition and Meaning-Making

A third area within multimodal comprehension research has focused on the role of multimodal composition in meaning-making (e.g., Ajayi, 2015; Dalton et al., 2015; Kesler, Lenwood, & Turansky, 2016). Specifically, increasing numbers of researchers are looking to digital and nondigital multimodal composition as a valuable form of comprehension assessment. For example, Kesler et al. (2016) studied grade 5 students' digital stories (created in Microsoft PowerPoint) that they created to share their interpretations of historical fiction novels. Analyses of students' digital stories suggested that students' multimodal designs showed inferential skills, metaphorical thinking, and their understandings of character motivation. The digital stories also made visible to researchers and the students' teachers the limits of students' understandings, such as misconceptions about plot sequence and gaps in background knowledge of historical context. These studies underscore a synergistic relationship between reading and writing.

There are a number of possible future directions for multimodal comprehension research. First, the field could benefit from longitudinal research that follows students over time to determine the effect of scaffolded learning in designed digital environ-

ments and the implications for students' achievement in and beyond the classroom. Second, although findings suggest that multimodal nondigital texts are useful tools that can support comprehension in K–16 settings and among diverse learners, it would be helpful to know how teachers might support students in learning how to interpret and synthesize communicative modes as they read. Studies suggest that interpretation of even mundane multimodal texts such as picture books or textbooks is a complex process, and one that requires thoughtful guidance and ongoing opportunities to practice. Finally, there is still relatively little comprehension research that focuses on critical literacy and multimodality. While some researchers have explored how young people understand and evaluate multimodal texts using explicitly sociocritical lenses (e.g., Ajayi, 2015; Begoray et al., 2013), studies that consider how integration of modal resources can support learners' inferential and sociocritical understandings of texts are still uncommon.

COMPREHENSION IN OUT-OF-SCHOOL SETTINGS

Studies of comprehension in out-of-school settings have attended to varied contexts, disciplines, and age groups, including a science, technology, engineering, and mathematics (STEM) program for minoritized middle school girls (Pinkard, Erete, Martin, & McKinney de Royston, 2017), an afterschool literacy program for recent-arrival immigrant teenagers (Park, 2016), and a summer science and data literacy camp for high school students (Sommer et al., 2017). While there is clear interest in what young people read and how they make meaning of texts outside of school in digital and nondigital environments (e.g., Hutchinson, Woodward, & Colwell, 2016; Jiménez & Meyer, 2016; Turner, Hicks, & Zucker, 2020), a sustained line of inquiry related to reading comprehension in out-of-school spaces is not yet clear. However, existing research in this area provides some compelling illustrations of how comprehension in nonschool settings can provide learners with opportunities to engage with texts that support agentive design of meaning and identity work. For example, Pinkard et al. (2017) found that multimodal, interactive narrative stories that addressed racialized and gendered stereotypes supported the development of girls' practice-linked STEM identities. The narratives, which featured characters and situations that were recognizable and relatable to the girls, helped them make connections to their own experiences and supported their participation and identification with STEM activities.

Although comprehension in nonschool settings is not a new area of study (e.g., Hull & Schultz, 2001), this is one area of literacy research that has not yet received sustained attention. Indeed, many of the questions raised by Hull and Schultz (2001) in their review of research related to out-of-school literacy learning remain salient directions for future research almost two decades later. For example, more research is needed to understand reading comprehension in out-of-school spaces and its relationship to in-school learning, including (a) how to bridge students' out-of-school worlds and lived experiences with classroom practice; (b) how to leverage learning in afterschool and other "school-like" spaces in the classroom; and (c) how to support teachers to view and leverage students' out-of-school meaning-making practices as assets for classroom learning. More recently, Ito et al. (2013) outlined a research agenda and framework for pedagogical design, dubbed Connected Learning, to address gaps between in-school

and out-of-school learning. Ito et al. (2013) advocate for research that investigates the interplay among in-school and out-of-school supports for technologically enabled, socially embedded, interest-driven, and self-directed learning through the lens of opportunity and equity. Sustained research attention in these areas is important for understanding students' development and uses of reading comprehension processes in out-of-school settings, and the interplay of these processes across multiple contexts for learning.

CONCLUSION

A multiliteracies approach to meaning-making is rife with possibilities: possibilities in terms of the ways we create and comprehend meaning, possibilities in terms of what and how we choose to teach, and possibilities in terms of what we study specific to comprehension. The landscape of scholarship in this area is complex. Some areas are barren at the moment, for example, research regarding the cognitive and social aspects of online research and comprehension in the elementary grades. Some areas are quite familiar in the sense that the research indicates that there is a lot of carryover between the strategies that are used for offline reading and those that are productive for online reading. The landscape also includes a number of warning signs; one example is the growing opportunity gap between more- and less-well-resourced communities with respect to accessing digital technologies and classroom instruction. Another is the importance of attending to the development of readers' ability and inclination to evaluate the credibility of online information in the service of civic engagement. Some areas of the landscape are especially fertile; take, for example, the potential of digital environments to support meaning-making with multimodal supports enabling learning among students who have widely differing needs and abilities. Finally, the landscape is expanding in significant ways; for example, scholarship in nonschool settings will be fruitful to the field's understanding of the synergies between the development and uses of comprehension across multiple contexts for learning. We can say with confidence that the contours of this landscape will be changing rapidly over the next decade.

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