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# A Confluence of Complexity: Intersections Among Reading Theory, Neuroscience, and Observations of Young Readers

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**ABSTRACT**

In this position article, the authors explore a confluence of evidence that supports the understanding that multiple factors, various processes, and multiple sources of information inform reading. The authors open by briefly describing concerns related to how some scholars and media reporters have characterized the simple view of reading and narrowly applied that model to teaching young readers. The authors then explore a confluence of complexity across (a) theoretical models of reading based on empirical research, (b) emerging information related to the brain and reading, and (c) research findings based on close observations of young learners. Finally, the authors argue that reductive and singular models of reading fail to not only honor the individuality of young readers but also to recognize the systemic changes needed in schools and communities to equitably serve all students.

In recent years, we have witnessed the dissemination and public acceptance of misinformation related to reading. A literacy leadership brief by the International Literacy Association (2019) noted the "resurgence of articles and reports in media outlets…that have created confusion and provided misinformation by oversimplifying both the sources of reading difficulties and how to address them" (p. 2). We review three compelling bodies of empirical research that identify a confluence of complexity that challenges these reports. We do not argue for wholistic approaches to reading, nor do we critique research findings related to the nature and effects of specific reading components. Both wholistic and component models of reading recognize the complexity and multidimensional nature of learning to read. Instead, our review challenges instructional approaches (e.g., structured literacy) that deny or ignore the multidimensional and networked nature of young learners' reading processes and/or unique literacy learning trajectories. This article is an empirically based correction to singular and universal approaches to teaching reading to young students (ages 5–10), particularly media reports that have misrepresented and/or selectively drawn on reading scholarship (Hanford, 2018, 2019; International Dyslexia Association [IDA], 2019; Paige, 2020; Pierson, n.d.; Spear-Swerling, 2019).

We empirically support Moje's claim "that reading is a complex, multidimensional cognitive process situated in and mediated by social and cultural practices" (National Education Policy Center, 2018, p. 2). In doing so, we agree that "teaching depends on knowing what students know and can do and then determining what they need" (p. 3). Responding to students is particularly significant for those who are underserved by schools. As the NEPC and Education Deans for Justice and Equity (2020) noted,

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reading educators cannot ignore the impact of "opportunity gaps that arise outside of school tied to racism, poverty, and concentrated poverty" (p. 5). We argue that the complexity of reading demands complex solutions that honor teacher expertise and involve well-funded and culturally responsive schools and communities.

In this article, we use the term *multidimensional* to reference various factors, processes, and sources of information that inform reading. Multidimensionality informs the distinct learning trajectories that young learners traverse as they become readers. We open by briefly describing concerns related to how some scholars and media reporters have characterized the simple view of reading (SVR) and narrowly applied that model to teaching young readers (e.g., IDA, n.d.; Malchow, 2014; Spear-Swerling, 2019; Wooldridge, n.d.). We then explore a confluence of complexity across (a) theoretical models of reading based on empirical research, (b) emerging findings related to the brain and reading, and (c) research based on systematic observation of young readers. Finally, we argue that reductive and singular models of reading fail to honor the cultures, experiences, and humanity of readers. This confluence of complexity reveals an unequivocal need for caution as states, universities, schools, and teachers consider assumedly universal and narrow approaches to teaching reading.

## The SVR and Structured Literacy

Although historically, reading instruction in North America has been plagued by controversy, polarized arguments, and polemical claims (Pearson, 2004), in this article, we focus on a barrage of media reports that have presented exaggerated, misleading, and at worse, false statements promoted by a small group of scholars, educational activists, and media reporters. Like Pearson (2004), we worry that policymakers are often attracted to simplified arguments and solutions that can be mandated, packaged, and sold to schools. These approaches have been described as reflecting the SVR (IDA, n.d.; Wooldridge, n.d.) and require structured literacy approaches (e.g., Malchow, 2014; Spear-Swerling, 2019).

We argue that the SVR is more complicated than media reports have suggested. Theoretically, we complicate what scholars, advocates, and media reporters have referred to as the SVR, which is often cited as the foundation for structured literacy approaches (e.g., IDA, n.d.; Wooldridge, n.d.). Then, we problematize structured literacy approaches.

### *The Complexities of the SVR*

As Gough and Tunmer (1986) maintained, "the simple view clearly asserts that reading ability should be predictable from a measure of decoding ability (e.g., the ability to pronounce pseudowords) and a measure of *listening* comprehension" (p. 7). Although Gough and Tunmer maintained that "decoding is not sufficient" (p. 7), some contemporary reading proponents have ignored the range of issues, considerations, and complexities that are entailed in listening comprehension, which Hoover and Tunmer (2018) described as the "ability to extract and construct literal and inferred meaning from linguistic discourse represented in speech" (p. 304). Thus, listening comprehension references an extensive range of language practices, including interactions with peers, stories, television shows, adult conversations, rhymes, games, and songs. As Hoover and Tunmer argued, "the SVR does not claim that reading is simple. Both word recognition and language comprehension are highly complex, and because of that, reading is complex. The SVR simply separates the complexity of reading into two component parts" (p. 306).

Contemporary reading scholars have extended the SVR by arguing that reading components interact and develop over time, across texts, and across individuals (Castles, Rastle, & Nation, 2018; Foorman et al., 2016; Hoover & Tunmer, 2018; Lonigan, Burgess, & Schatschneider, 2018). As a result, some scholars have argued for a complete view of reading (Francis, Kulesz, & Benoit, 2018; Snow, 2018) that attends to reader development, textual characteristics, and deep comprehension. However, some contemporary advocates of the SVR have focused only on phonetic/decoding aspects of the theory (e.g., IDA, n.d.; Wooldridge, n.d.). As Snow (2018) noted, due to "strong (and insistent) guidance about teaching decoding, and relative neglect of approaches to oral language facilitation in the preparation of early-grades teachers, the balance potentially present in SVR theory can be easily distorted in the course of implementation" (p. 313). Furthermore, the SVR "is silent on the instructional protocols to build those skills" (Hoover & Tunmer, 2018, p. 306). Lonigan et al. (2018) identified a large degree of shared predictive variance between decoding and linguistic comprehension, causing Hoover and Tunmer (2018) to argue that "instructional programs that work to develop both decoding and linguistic comprehension in the early grades may be the most effective approach" (p. 310). Too often, thoughtful and nuanced arguments about how phonics contributes to reading have been reduced to simple claims that neglect the multidimensional nature of reading.

### *Challenges to Structured Literacy Approaches*

The term *structured literacy* was officially adopted by the IDA board in 2014 to refer to "all of the programs that teach reading in essentially the same way" (Malchow, 2014, para. 3) and in accordance with the IDA (2018) standards, such as Orton–Gillingham and multisensory approaches (Malchow, 2014). Whereas we do not contest

the use of structured literacy approaches when warranted by the needs of particular students, we argue against states, school districts, schools, and colleges of education privileging these approaches because of a failure to recognize the multidimensional and individualized nature of reading.

We recognize that some teachers using structured literacy approaches will find ways to respond to the interests, experiences, and literacy abilities of individual students; however, we are concerned about the indiscriminate and unwarranted implementation of the following practices:

- Directive and/or scripted lessons that tell teachers what to say and do and the implementation of lesson sequences, often at a predetermined pace (Hanford, 2018)
- Privileging of phonemic awareness and phonics as primary decoding skills (Hanford, 2018, 2019; IDA, 2019; Paige, 2020; Pierson, n.d.; Spear-Swerling, 2019)
- Use of decodable texts that do not engage multiple dimensions of reading (Hanford, 2018; IDA, 2019; Paige, 2020; Spear-Swerling, 2019)
- Specialized forms of reading instruction designed for particular groups of students as core literacy instruction for all students and teacher educators (Hanford, 2018; Hurford et al., 2016; IDA, 2019; Pierson, n.d.)
- Mandating structured literacy programs despite the lack of clear empirical evidence to support these programs
- Privileging the interest of publishers and private education providers over students

Particular concerns relate to the assertion that there is a consensus across the research community about the primacy of systematic phonics approaches. This supposedly undisputed consensus was severely challenged by the findings of a review of meta-analyses (Bowers, 2020).

In some cases, proponents of structured literacy approaches have denigrated instructional practices that attend to multidimensional aspects of reading. For example, Spear-Swerling (2019) argued against encouraging students to attend to multiple-cueing systems when reading. Arguing that explicit teaching of decoding/phonics skills should dominate reading instruction, she warned against coaching students to use "meaning in conjunction with print cues and having students 'problem-solve' with teacher guidance (e.g., Burkins & Croft, 2010)" (p. 205). Spear-Swerling cited two reports (Foorman et al., 2016; National Institute of Child Health and Human Development, 2000) to argue that "research on students' reading development… has conclusively disproven the multiple-cuing-systems model" (p. 206), although neither of these reports directly addressed or tested that model.

This rally against multiple-cueing systems models has been reiterated by scholars (Paige, 2020) and journalists (Hanford, 2018, 2019, 2020). Although it may be true that as readers become more proficient, they attend less to illustrations, this does not negate the role that illustrations play in helping young students learn to attend to meaning while reading. In short, drawing students' attention to illustrations is one means of helping them attend to the stories and information presented in texts. Learning to attend to meanings that emerge while reading is essential for understanding both the simple and increasingly complicated texts that students encounter as they become skilled readers. Describing multiple-cueing systems models as having students draw on "partial visual cues to guess at words (Adams, 1998; Rayner & Pollatsek, 1989; Solman & Stanovich, 1992; Stanovich, 1986)" (Paige, 2020, p. 13) misrepresents these models and ignores the important role of illustrations as tools for learning to access and monitor meaning construction.

Denying the importance of multiple-cueing systems models also ignores how individual students access and orchestrate various dimensions of reading. For some students who do not attend to letter sounds and patterns, a focus on phonics may be critical, but that does not make this practice appropriate for all students. Observations of other students have documented readers overrelying on phonics and trying to sequentially decode phonetically irregular words without attending to helpful semantic and syntactic information (Clay, 1991). Furthermore, the exclusive use of decodable text, including only previously taught letter/sound patterns, denies students opportunities to negotiate multiple dimensions of reading.

Problematically, structured literacy approaches have gained media attention and political clout. Partially driven by publishers that continue to create programs that format and prescribe sequential lessons and activities, teacher preparation programs are being required to prepare teachers to teach structured literacy (Gabriel, 2018) and abandon other approaches (Hurford et al., 2016; Spear-Swerling, 2019). Perhaps most problematic is how these claims have been taken up by journalists and others who have misrepresented and overstated research findings (e.g., Hanford, 2018, 2019, 2020; Pierson, n.d.). These blogs, media reports, podcasts, and news reports have not only reduced reading to phonetic decoding and recommended prescriptive and sequenced approaches but also provided anecdotal evidence and imprecise interpretations of research, ignoring fundamental understandings about reading. Furthermore, these texts have targeted audiences, such as parents, politicians, and community members, who may not have the expertise needed to adequately interpret and interrogate these claims.

## A Confluence of Complexity

Decisions related to students must attend to reading research. We present three bodies of scholarship that support the complex and multidimensional nature of reading: (1) research-based theoretical models of reading, (2) neuroimaging and reading, and (3) observational studies of readers. Our decision to review these three bodies of scholarship was not random. By analyzing research-based theoretical models of reading across time, we attend to the historical development of reading scholarship across time and point to significant theoretical directions of thought. Our focus on neuroimaging and reading brings us into the present, turning our attention to findings revealed through cutting-edge technologies providing previously inaccessible information. Finally, a focus on the observation of young readers places students at the center of our analysis and honors the individual nature of young readers, which includes their cultural, linguistic, and personal proclivities.

### *Theoretical Models of Reading and Complexity*

Over time, reading scholars and theorists have attended to an increasing range of topics and issues related to teaching reading. As part of this process, many scholars and professional organizations (e.g., International Literacy Association, formerly International Reading Association; Literacy Research Association, formerly National Reading Conference) have adopted the more inclusive term *literacy* rather than *reading* to describe their work. To track this evolution of reading/literacy scholarship, we review influential research-based theoretical models proposed by recognized leaders in the field of reading/literacy education and published across multiple editions of *Theoretical Models and Processes of Reading*/*Literacy* (*TMPR*/*L*). We draw on *TMPR*/*L* as a seminal text for tracking the study of reading to reveal a significant broadening of reading/literacy scholarship over the past 50 years.

The inaugural volume of *TMPR* (Singer & Ruddell, 1970b) addressed "linguistic, perceptual, and cognitive components involved in reading,…[as well as] the variables that influence the perception, recognition, comprehension, and utilization of printed stimuli" (Singer & Ruddell, 1970a, p. xi). Since then, editions have attended to an expanding range of issues and factors. This complexity was evident in the decision to reference *literacy* rather than *reading* in the seventh edition's title (Alvermann, Unrau, Sailors, & Ruddell, 2019b), the range of issues addressed, and the editors' stated intent to highlight how literacy "components function and interact with one another" (Unrau, Alvermann, & Sailors, 2019, p. 7). Whereas particular models have been critiqued, challenged, debated, extended, and debunked over time, the multidimensional nature of reading has been increasingly recognized.

Complexity was explicit in the third edition of *TMPR* (Singer & Ruddell, 1985), in which Rumelhart (1985) proposed an interactive model of reading that addresses "not only bottom-up graphemic input but also orthographic, syntactical, semantic, and lexical knowledge" (Unrau et al., 2019, p. 15). In arguing for the model, he described reading as both "a 'perceptual' and a 'cognitive' process…that bridges and blurs these two traditional distinctions…[, enabling] a skilled reader…to make use of sensory, syntactic, semantic, and pragmatic information" (p. 719). Rumelhart based this interactive model on research findings that challenged linear models of reading, including research that revealed how perceptions of letters were dependent on surrounding letters (Huey, 1908/1968; Reicher, 1969) and word perception as contingent on syntactic and semantic environments (Kolers, 1970; Meyer & Schvaneveldt, 1971; Weber, 1970).

Rumelhart's (1985) interactive model invited scholars to examine an expanding range of considerations and contingencies affecting reading. For example, Kintsch (2004) highlighted the significance of situation models that recognize readers' goals, backgrounds, and prior knowledge. Rapp and van den Broek (2005) proposed a dynamic model of text comprehension that integrates multiple factors, including "concept activation, inference construction, individual differences, text properties, [and] characteristics of memory representations," noting that reading theory must account for "dynamic fluctuations in activation of concepts during moment-by-moment comprehension of the entire text" (p. 227). Floyd, Meisinger, Gregg, and Keith (2012) argued that "information stores (i.e., semantic, syntactic, lexical, and orthographic knowledge) interact with one another throughout the reading process" (p. 726). Mangen and van der Weel (2016) advocated for expanded notions of reading that address the particular demands of digital texts and the significance of physical and multimodal dimensions; the researchers identified attentional/perceptual, cognitive, emotional, phenomenological, sociocultural, and cultural aspects of digital texts.

The most recent edition of *TMPL* (Alvermann et al., 2019b) specifically extended the scope of literacy. In that volume, Ruddell, Unrau, and McCormick (2019) supported a sociocognitive model of meaning construction, arguing that multiple factors—motivation, knowledge of language, metacognitive strategies, sociocultural values and beliefs, and interactions with teachers and peers—contribute to reading. Duke and Cartwright (2019) presented a "complex but accessible model for reading, with particular attention to the roles that oft-neglected textual and contextual factors play in the reading process" (p. 119). The researchers addressed purpose, motivation, text type, text structures, and content and argued for teachers

understanding how texts work alongside awareness of students' cultural backgrounds, prior knowledge, decoding abilities, comprehension-monitoring skills, reading strategies, and critical reading practices. Duke and Cartwright compared the reader to a "multi-tasking driver" who negotiates multiple sources of information and proposed a "considerably more complex and inclusive" (p. 129) depiction of reading.

The 2019 volume of *TMPL* includes a chapter dedicated to neuroscience and reading (Hruby & Goswami, 2019) and three chapters dedicated to sociocultural aspects of reading, including race/culture (Tatum, 2019), New Literacies (Leu, Kinzer, Coiro, Castek, & Henry, 2019), and multimodal/embodied literacies (Wohlwend, 2019). Literacy is presented as multimodal and multidimensional and always in conversation with social practices and lived experiences. Chapters dedicated to critical perspectives (Alvermann & Moje, 2019; Brooks, 2019; Luke, 2019; McVee, Silvestri, Barrett, & Haq, 2019; Miller, 2019; Sailors, 2019) explore tensions between culturally constructed systems of representation and social, economic, material, and environmental dimensions of people's lives. These chapters disrupt politically and ideologically neutral conceptualizations of literacy learning and recognize the experiences and perspectives of students who have not been adequately served by schools. Across the 2019 volume, chapter authors recognize the significance of culture, opportunity, and material inequities. Whereas privileged groups of students often excel in literacy learning, underserved students have historically been disproportionately subjected to culturally unresponsive literacy instruction (Tatum, 2019), presenting a pressing challenge for contemporary literacy educators.

Our analysis of *TMPR/L* and related scholarship reveals expanding conceptualizations of reading/literacy and how they are situated within people's lives. As Alvermann and colleagues (2019a) noted, in the most recent volume, they intentionally sought to "extend, enhance, or even break with earlier theories of reading and writing processes" (p. xiii) to reveal reading/literacy as a complex and multidimensional process. This increasing attention to the complexity of reading has been echoed in neuroimaging research using technology to provide insight into the distributed nature of reading processes within the brain.

## *Neuroimaging Studies of Reading*

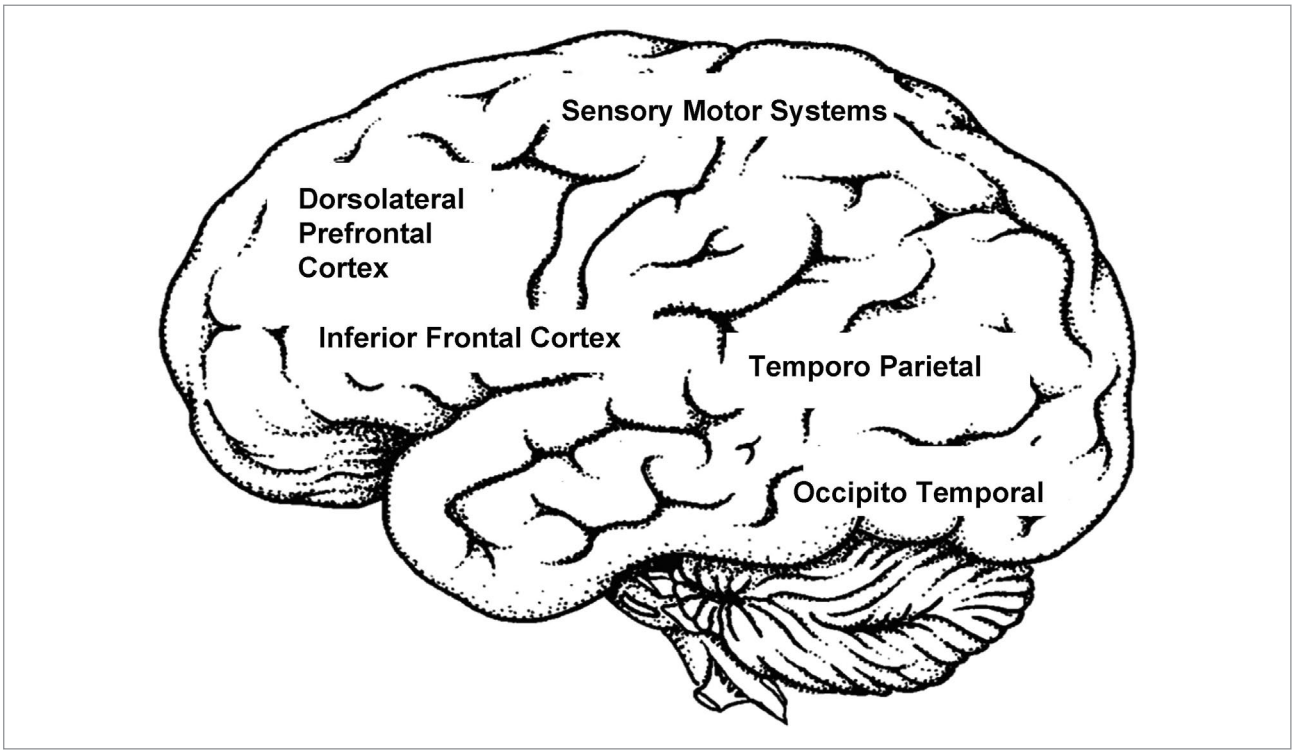
Although neurological studies have certainly explored particular reading processes, we present studies that referenced distributed processes and neural networks. Neurological models of reading continue to be tested and expanded, including the dual-route (Coltheart, 2000), connectionist (Harm & Seidenberg, 1999), and interactive models (Twomey, Duncan, Price, & Devlin, 2011). Neuroscience has not yet provided a complete account of brain activity while reading (Hruby & Goswami, 2019), yet emerging accounts point to the multidimensional nature of reading. Here, we focus on three processes that have been studied through neuroimaging and support the distributed and networked nature of reading: semantic comprehension processes, embodied processes, and the most developed areas of study: phonological processing and word reading.

### Semantic Comprehension Processes

Semantic processing is a reader's ability to access stored information about the world. Semantic systems are distributed across the brain and occupy a large portion of the cortex. Each cortical region receives extensively processed, multimodal input (Binder, Desai, Graves, & Conant, 2009). To comprehend text, the reader must form abstract semantic and syntactic representations from orthographic symbols. Word parts and whole words hold meanings, which are activated while reading. As the reader encounters letter patterns and words, semantic and syntactic activation occurs, along with phonemic processing and word recognition. Scientists have mapped a reading network involving information transfer across brain regions (Friederici & Gierhan, 2013). Yu et al. (2018) identified an anatomical overlap between semantic and phonological subnetworks involving activation of phonological processing, word recognition, and semantic processing through continuous bidirectional interactions between phonological and semantic representations.

The left dorsolateral prefrontal cortex is critical for memory and cognitive control, enabling readers to develop and revise plans for reading (see Figure 1). Within this cerebral cortex, memory and cognitive control enable readers to integrate incoming information with prior knowledge to support inferencing and attention to textually relevant, versus nonrelevant, information. Illustrating the importance of memory and cognitive control, Patael et al. (2018) studied students with discrepantly high reading comprehension relative to their decoding abilities. The left dorsolateral prefrontal cortex was implicated, providing insight into why some students comprehend texts even when decoding is delayed. Although phonemic awareness and decoding are important, the mind is capable of comprehending text despite low decoding skills, due to semantic subprocesses. Phonological processing is important but does not always precede comprehension, which is supported by word recognition, integration of prior knowledge, preparation for reading, and holding unfolding meaning in memory. Hence, phonological processing and word reading combine with semantic processes to support comprehension.

**FIGURE 1**
**Brain Areas Relevant to Reading**




## Embodied Processes

Neuroscientists have also explored reading through embodied cognition models that reveal how learning to read and write letters supports the development of a complex neural network across brain regions (James & Gauthier, 2006). In addition to decoding letters and words, reading involves readers' experiences, including multimodal integration of linguistic and nonlinguistic knowledge involved in meaning construction. Early evidence suggests that "experiential and linguistically acquired knowledge can be detected in brain activity elicited in reading natural sentences" (Anderson et al., 2019, p. 8969), in contrast to reading lists of words or pseudowords (Desai, Choi, Lai, & Henderson, 2016). In short, naturalistic reading activates the same sensorimotor systems as nonlinguistic experiences. Ziegler et al. (2018) described how portions of the same primary emotion network involved in a lived experience is activated while processing emotive text. Research on embodied processes is an emerging area of reading neuroimaging that reinforces how reading processes are distributed across the brain.

## Phonological Processing and Word Reading

Research on phonological processing and word reading is technically less complicated than studying semantic and embodied processes, so the research findings are better established. Neuroscientists have associated phonological analysis and recoding with several regions of the brain, including the visual word form area (left occipitotemporal cortex), the temporoparietal cortex, and the dorsal part of the inferior frontal cortex (see Figure 1). These areas work together as readers map sounds onto text. Thus, readers activate multiple regions of the brain to operationalize the most efficient process for reading a particular text. When phonological processing is needed, such as encountering an unknown word in an unfamiliar context, readers activate phonological processing. When the word is familiar, the visual word form area and semantic processes are activated. Phonological processing, visual word form processing, and semantic processing are integral to the reading network, involving areas of the brain responsive to semantic, phonological, grapheme, and morpheme structures. A skilled reader gradually builds this neuronal network to integrate print processing with speech.

Phonology and whole-word processing have been linked to age and experiential differences. Studies have shown that whereas beginning readers use more of the left temporoparietal circuit involved with phonology-based reading, adults use more whole-word recognition processes (Martin, Schurz, Kronbichler, & Richlan, 2015). Both groups of readers activate multiple brain areas. Consequently, older readers, whose reading is

more automatized, rely less on phonological processing and more on word recognition. Their prior experience with print supports increased brain activation (Sela, Izzetoglu, Izzetoglu, & Onaral, 2014). Thus, readers draw on prior print experiences for orthographic processing, involving the visual representation of words or groups of letters (Dehaene & Cohen, 2011; Fischer-Baum, Bruggemann, Gallego, Li, & Tamez, 2017) to support rapid identification of familiar words without phonological processing (Glezer et al., 2016), facilitating fluent reading and comprehension.

In sum, neuroscience has revealed that reading processes appear to involve bidirectional interactions within neural networks and information transfer across brain regions. Although phonological processing has an important role in early reading, reading at all levels is supported by semantic and embodied processes that contribute to comprehension. Neuroscience adds to our knowledge of the reading process, specifically the complex and multidimensional nature of reading. Reading neuroscience models align with observations of young readers, as they have demonstrated increasing abilities to orchestrate multiple sources of information as they read.

## Observational Studies of Readers

Many scholars (e.g., Clay, 1991, 2005; K.S. Goodman, 1976; K.S. Goodman & Goodman, 2014; Y.M. Goodman & Marek, 1996) have used observation to understand how young students learn to read, what readers do, and how readers solve textual challenges. We focus here on Clay's (1991, 2005) observational research and the documented success of Reading Recovery, an intervention that serves first-grade students by accelerating reading and writing achievement through one-on-one teaching over 16–20 weeks of daily instruction. The What Works Clearinghouse cites multiple random control group studies (Pinnell, DeFord, & Lyons, 1988; Pinnell, Lyons, & DeFord, 1994; Schwartz, 2005) documenting the positive effects of Reading Recovery on alphabetics and general reading achievement, as well as potentially positive effects on fluency and comprehension.

Clay (1991) used empirical evidence gathered from systematic observation of students to better understand the reading behaviors of readers, including rereading, substitutions, omissions, and insertions as proxies for cognitive and perceptual processes. Specifically, she recorded students' problem-solving actions as they encountered unknown words and self-corrected errors. Clay observed that students employed phonological, orthographic, syntactic, and semantic resources with varying degrees of sophistication over time to negotiate texts. Her theory of reading, which she described as complex (Clay, 2005), recognizes the range of abilities, experiences, and strategic actions that students bring to text. She argued that students assemble systems of perceptual and cognitive competencies that enable them to solve textual challenges.

Clay (2005) used the term *working systems* to describe increased orchestration of multiple sources of information. Working systems were observed as students accessed semantic, syntactic, and phonetic information. These working systems became increasingly robust and agile over time, with increased reading and exposure to various types of text. Clay found that students read with the intention of making meaning and became adept at attending to letters, sounds, semantic clues, and orthographic patterns in words and more efficient at orchestrating these sources of information.

Clay's findings echo those of other scholars who have also drawn on observations of students, including K.S. Goodman (1976), who argued that active readers use both nonvisual (e.g., knowledge of oral language, knowledge of the world) and visual information (e.g., phonetic patters, letter–sound correspondences) to process, predict, sample, and test textual meaning. Observation was key to retrospective miscue analysis (Y.M. Goodman & Marek, 1996), an instructional process that involves the analysis of observations and audio recordings of readers, and engaging readers in conversations about their own reading processes. Scholars (K.S. Goodman, 1976; Vellutino & Scanlon, 2002) have agreed that as students become more efficient and effective readers, they begin self-teaching (Share & Shalev, 2004) and constructing self-extending systems (Clay, 2005) that involve the active use of multiple sources of information.

Drawing on Clay, Schwartz (2005) revealed how young learners' response histories and use of various cues and strategies provided information that teachers could use to target the strengths and needs of developing readers. Based on close observation, teachers learned to prompt students to attend to previously ignored aspects of texts. Rodgers and Rodgers (2007) focused on using observation to help teachers determine how much support, what types of support, and when support was needed for particular students. Students made accelerated progress when teachers were adept at observing and responding to their reading efforts. Observation of readers can also inform the preparation of teachers. All Reading Recovery teachers participate in regular behind-the-glass lessons, in which teachers observe their peers working with students while an experienced Reading Recovery teacher facilitates reflective conversations, directing teachers to observe particular practices. Collaborative discussions focused on individual students support the development of responsive teaching.

Observations of learners and teachers have revealed not only important insights about how students become readers but also possibilities for teacher professional development. Although observational research has focused on the various reading processes that students bring to texts, how students interact with text is always situated within

larger social, cultural, and experiential contexts that further complicate the confluence of complexity operating at the intersection of theoretical models, neuroimaging, and observations of readers.

## Discussion

These three bodies of scholarship present a confluence of evidence suggesting that reading is complex and multidimensional. Across these three bodies of research, scholars have agreed on the following:

- Reading is multidimensional and involves coordinated, networked, and orchestrated processes/actions.
- Students bring unique cultural practices, cognitive strengths, and literacy experiences to becoming literate.
- Students' attention to various dimensions of reading changes over time.

Complexities that affect reading include students' diverse cultural, educational, familial, and experiential backgrounds, which are often affected by economic, social, and nutritional inequities. In addition, students from different backgrounds are treated differently in schools, and schools are differentially funded, resulting in inequities in resources and opportunities across communities. We must consider the effects of these differences and the emotional toll that inequity exerts on students and families over time (Compton-Lilly, 2019). In short, the human factor (Pearson, 2004)—differences among individuals and groups, their practices, their interactions, and the unpredictability that accompanies being human—disrupts the possibility of narrow and universally applicable solutions for helping all students become readers.

Given the complexity of reading, it is impossible to justify a single approach, even for a group of students who share certain characteristics or challenges. Even some scholars who draw on the IDA (2018) standards have recognized the multidimensional nature of reading. For example, Johnston (2019) cited the IDA standards, arguing for a multisensory approach that "integrates visual, auditory, tactile, and kinesthetic learning elements" (p. 340). This approach "emphasizes the structure of language across the speech sound system (phonology), the writing system (orthography), the structure of sentences (syntax), the meaningful parts of words (morphology), the relationships among words (semantics), and the organization of spoken and written discourse" (p. 341; see also IDA, 2018, 2019; Pierson, n.d.). Ironically, this approach, with its focus on phonology, orthography, syntax, and semantics, echoes three-cueing system approaches (Clay, 1991; K.S. Goodman, 1976) that have been critiqued by structured literacy advocates (Hanford, 2018, 2019, 2020; IDA, 2019; Spear-Swerling, 2019). Furthermore a vast majority of exemplary instructional strategies advocated by Johnston (2019)—clapping syllables, manipulating letters, rhyming activities, Elkonin boxes, writing letters on multiple surfaces, and attending to spelling patterns—are typical practices in Reading Recovery lessons (Clay, 2005).

Notably, the IDA (2018) standards state, "different kinds of reading and writing difficulties require different approaches to instruction. One program or approach will not meet the needs of all students" (p. 7). However, a few pages earlier, this document notes that "Structured Literacy is an approach to reading instruction that is beneficial for both general education students at risk for reading difficulties due to a variety of factors (e.g., low socioeconomic status, English learner status, *and* for students with disabilities" (p. 4). Although it could be argued that different communities are using similar language to talk about different types of phenomena, both perspectives recognize the multidimensional and individualized nature of reading.

### *A Confluence of Evidence*

As Moje (NEPC, 2018) noted, "there will always be people who are going to focus on one portion of what it means to teach and learn to read" (p. 10). Although it could be argued that we have assembled disparate ideas that are epistemologically incompatible, we maintain that we are honoring an overriding and compelling confluence of evidence that draws on complex models of reading, neuroscience, and close observations of readers. This confluence of complexity has complex implications for teaching reading. As educators, we must attend to a full range of considerations. Some of these relate to teacher expertise and the need for all teachers to master a broad range of teaching strategies to serve all students. However, this complexity also demands systemic changes. Professional development must engage teachers as capable intellectuals who have the capacity to make decisions about teaching their students. Teachers must be trusted to use assessments that provide them with useful information and be given the time and resources that are needed to design and refine instruction for students. The complexity of reading also has important implications for communities. Families need well-funded schools, safe communities, and accessible libraries. Students need schools that are responsive to and respectful of multiple cultural, linguistic, and religious backgrounds. These complex solutions challenge the very fabric of U.S. society involving how teachers are positioned and treated and inequities related to school and community resources. We argue that the scope of what is needed to truly improve reading/literacy instruction contributes to the appeal of simple models of reading; it allows politicians and the public to ignore systemic inequities in society.

Empirical studies in reading, neuroscience, and observational studies of readers have highlighted the multidimensional and networked processes involved in reading. We pose this research-based confluence, from across a range of literacy scholarship, to reveal the limitations of narrow and assumedly universal approaches for teaching reading. In short, we argue for complex solutions that honor the complexity of reading.

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