“Elbow Room”: How the Reading Brain Informs the Teaching of Reading

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“*Blame no one. But set the record straight.”*
Marcus Aurelius

For half a century a divisive, Hydra-like debate continues to recur over the teaching of reading. Most recently this debate has become the subject of considerable public media attention, with parents, school boards, and policy-makers asking difficult questions about why so many children are ill-prepared in reading skills, with life-altering consequences for every aspect of their learning.

At its most basic the division lies between proponents of the explicit teaching of foundational skills like phonics in structured literacy approaches and advocates of inductive learning through reading authentic literature in balanced literacy and whole-language approaches. There are heavy emphases on systematic teaching of phoneme awareness, phonics, fluency, and decoding in the first approach; there are heavy emphases through implicit learning of vocabulary, meaning and comprehension of stories and literature in the latter approaches.

In the last years there is growing support across many states for what is now called the Science of Reading (SOR). This continuously

evolving body of knowledge is based on decades of empirical data, that among other things support the critical importance of the explicit teaching of phonics and multiple foundational skills for most readers. Unfortunately, for many educators SOR has become reduced simply to phonics, which is only part of the foundational skills that the science indicates. Indeed under the direction of leaders like Reid Lyon at the National Institute for Child Health and Human Development, years of rigorous, randomized control-treatment intervention studies illumine not only the efficacy of phonics approaches over inductive approaches like balanced literacy (McCardle et al., 2008), but also the increased efficacy of multi-componential approaches that emphasize an expanded view of all the foundational skills over phonics-only approaches (Morris et al., 2012; Lovett et al., 2017; Lovett et al., 2022).

These NICHD-funded programs have been, in Fletcher's description (2022), "underappreciated" and insufficiently known outside scholarly circles. The results of these studies could not be more important in this moment of time because they provide both a theoretical framework for bridging the divide between approaches and also rigorous evidence for improving the teaching of all teachers and the reading of children.

As a scholar of the reading brain and co-author of several of these studies, I wish to describe first an expanded conceptualization of foundational skills and fluency that underlies these multi-componential programs; and second, a developmental approach to sequencing these foundational, fluency-related skills alongside comprehension processes in a way that corresponds to the emerging reading brain circuit. In essence, such a re-conceptualization connects the various processes in the reading brain and, in the process, bridges the largely separated emphases in the different reading methods.

I'll begin much as Emily Dickinson might have responded, had she been a neuroscientist instead of a poet: "Tell all the truth, but tell it slant; Success in Circuit lies." In this paper, the *circuit* refers to the brain's circuit for reading. Unlike oral language and vision there is no genetic program for reading to unfold naturally in the child. Reading is, in fact, an invention that the brain learns due to a wonderful design principle that allows it to connect its original hardware like language and vision in new ways. In other words, in the case of reading, the brain learns how to *connect over development the multiple processes* that contribute to building a circuit that can decode and understand written language. It is one of the brain's too little-sung miracles every time an individual builds such a circuit that then elaborates over time with everything that is read.

Within this design there are multiple processes that contribute to the development of the circuit's ability to move from very basic decoding to a level of automaticity that allows it to add more and more sophisticated cognitive, linguistic, and affective processes. Attaining such a level of fluency is essential for the elaboration of the circuit over time. Indeed fluency represents the connective tissue between decoding and comprehension, but it is largely misunderstood as only speed or word recognition, rather than the rapid integrated sum of its underlying parts. These 'parts' include all manner of foundational skills and their development over time. In the rest of this paper I want to unpack this conceptualization so that it addresses both current issues around the critical role of phonics in structured literacy approaches and the critical role of word and text knowledge in balanced literacy approaches.

To begin, before any child learns to read, the major requirement for the first reading circuit is that all its parts are developing in the 0 to 5 period---that is, before any attempt to connect them in formal teaching. These essential parts are the precursors of the reading circuit.

They include multiple cognitive, linguistic, and affective processes, beginning with language processes from phonological and semantic processes to syntactic and morphological ones. Morphology, mind you, begins before a child enters preschool with twenty morphemes or more acquired in the first two to three years. Cognitive processes build both background knowledge and very important conceptual knowledge that leads to the child's emerging understanding about: 1) how words represent things and thoughts; 2) how words are made up of individual sounds in their language; and ultimately, 3) how these sounds are represented by letters, which when written together make words. These insights form the basis for the *alphabetic principle that is at the heart of learning to read*.

Like Carol Chomsky years ago, Jeannine Herron and her colleagues (2022) emphasize the importance of encoding (knowing that speech sounds can be represented by letters) as a portal to children's understanding of the alphabetic principle in early reading. Yet years before this happens, all the things that parents and early childhood educators provide by simply reading, talking and singing to their children will increase the child's knowledge about books, words, sounds, and letters. In other words, the richness of the child's language environment, whatever the first, second or third language in the home, can accelerate or impede the time when the alphabetic principle is gained. Inequities within our children's environments will, therefore, play an insidious role in ensuring that all of the early contributing parts of the first reading circuit are developing in the 0 to 5 period. The development of reading (regardless of approach and regardless of first or second language or dialect) begins before any child opens the Kindergarten door.

Within that context the first nascent circuit in the reading brain is based on both the early development of its unconnected individual parts and the gradual, dawning, conceptual epiphany of the alphabetic

principle. Helping young children to make that epiphany and to connect those parts is at the essence of teaching a child to read. I have used the acronym POSSUM as a mnemonic to encapsulate the parts in this first circuit: P(Phonology, Prosody, Polysemy, Pragmatics), O(Orthographic patterns), S(Semantics), S(Syntax), U(Understanding the alphabetic principle), M(Morphology). (Note that the Latin word *possem* means "I could" and *possum* means "I can.")

As the parts begin to connect more closely and rapidly to each other, the circuit begins to have time to allocate extra milliseconds to more sophisticated cognitive, linguistic, and affective processes. This process usually begins in approaches emphasizing decoding with connections taught between the visual representations of letters and the phoneme-based representations of the sounds of their language or vice versa in encoding emphases. In approaches like whole language and balanced literacy, these earliest connections between letter and sound are often insufficiently or unsystematically taught (sometimes not at all), because the assumption is that the child will induce these connections through exposure to the world of words and stories. Thus three of the key foundational skills go missing: phonology, orthography, and the explicit understanding of the alphabetic principle, the P, O, and U of POSSUM. It is estimated that a great percentage of early readers are never taught these three parts of the circuit.

By the same token, many early readers who are taught solely with phonics-based methods can have other parts of the circuit insufficiently learned and connected: specifically, the SSM of POSSUM. Moving to an increasingly elaborated reading circuit requires not only explicit emphases on phoneme representation (and its awareness), letter-sound knowledge (and its awareness), but also multiple aspects of word knowledge. The most typical definition of foundational skills (the focus of most phonics-based approaches) includes phoneme awareness, letter-sound correspondence rules, decoding, and fluency.

With the exception of some excellent structured literacy approaches, most phonics instruction does not give sufficiently explicit attention to connecting decoding processes to the various semantic, syntactic, and morphological aspects of word knowledge, all of which contribute to fluency at the word and connected text levels.

As noted forty years ago by Allington, fluency continues to be one of the most misunderstood and neglected aspects of reading development. It is not simply a matter of increasing the speed of word recognition, an assumption underlying the proponents of re-reading as a fluency builder (Orkin et al., 2022), but rather increasing both the amount of knowledge a child brings to bear to word recognition, as well as the multiple exposures to words and texts. As Connie Juel memorably opined years ago: The biggest mistake most early instructional approaches make is to assume that when children decode a word, they know the word. Semantic development and syntactic knowledge make critical contributions to the speed with which words are accurately and fluently recognized, whether at the word or text levels.

Another set of omissions concerns the importance of orthographic and morphological knowledge to fluency at the word and text levels. As Ehri over many years has described developmentally, the systematic learning of letters, letter-sound correspondence rules, common orthographic patterns, and early sight words provides the equivalent of visual chunks, whose multiple exposures over time become the basis for more proficient decoding. When taught from the start, morphemes further enhance rapid orthographic chunking. Simultaneously, morphemes provide syntactic information and semantic clarity that accelerate both accuracy and fluency at word and text levels.

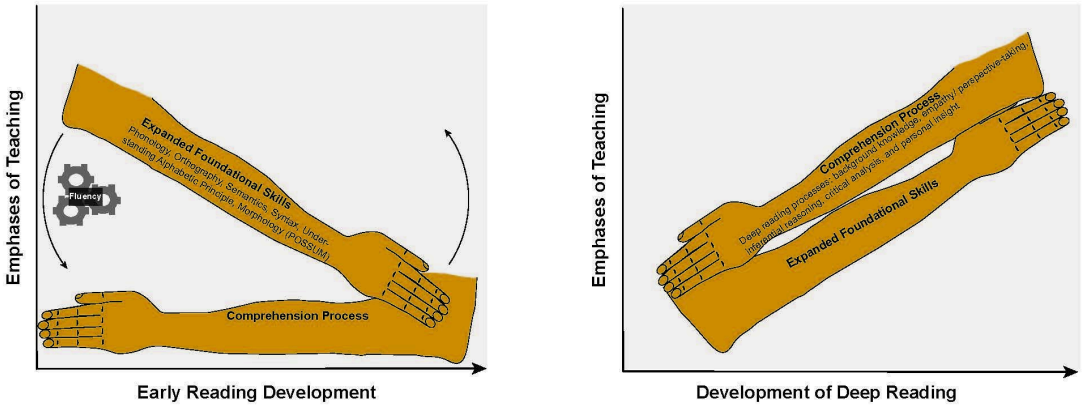
Understanding the full array of multiple processes that comprise the first reading brain circuit has the potential to change the conceptualization and the teaching of foundational skills in early reading. The reality, however, is that few teachers (and few publishers) are aware of this larger set of contributions from SOR: specifically, that all the early circuit processes are contributing to decoding a word, as well as to understanding it. As alluded to in the introduction, compelling data on multi-componential intervention approaches from randomized-control- treatment studies--- the most rigorous, gold standard of research methods--- illustrate that the more we know about a word before we decode it, the more accurately and fluently the child will decode and understand it (see Lovett et al., 2017, 2022; Morris et al., 2012). The all too often missing links, therefore, are the omission to connect explicit knowledge about decoding principles to explicit knowledge about what words mean, how they are used grammatically, and how morphemes change their meaning and use.

This expanded view of foundational skills reflects a broader, still evolving view of the science of reading that has inaccurately been understood by many to be a uni-dimensional emphasis on phonics and phoneme awareness. In no way does this diminish the importance of either; rather, it expands and connects these crucial emphases to our current understanding of how more comprehensive, *multi-component instruction and intervention* aligns with the first reading circuit (see examples of multi-component interventions like Empower and RAVE-O in Lovett et al., 2017, 2022; Morris et al., 2012; Wolf et al., 2023)).

All of this leads us back to another recurrently asked question about the sequencing of phonics and comprehension processes: e.g., whether early instruction should be phonics first or phonics only in the beginning. It is here that an expanded view of foundational skills and of the first reading circuit change the question and contribute most to our teaching. In a diagram inspired by my intervention colleague, Maureen

Lovett, I want to provide a visualization of a developmental, dynamic teaching sequence of the multiple foundational skills and comprehension processes. Imagine your two elbows raised. First, lift the left elbow in a diagonal with the right arm now straight below it like an isosceles triangle. Next, raise the right elbow in a diagonal with the left arm directly underneath it. This is the visual depiction of the dynamic between the early emphases on foundational skills and fluency and the developmentally later emphases on ever more sophisticated comprehension processes. It is a visual mnemonic for the way the skills and processes change their emphases over time while always leaving room for the other to develop with the increasing demands of text content. By incorporating the different emphases of the major methods, this visual mnemonic gives new meaning to the term “elbow room,” which, in turn, illustrates one of the many Ps in POSSUM, polysemy.

Developmental Sequence of Foundational Skills & Comprehension Process



Pace and sequence of instruction for each student is determined by individual characteristics, language variation, development, and cultural background knowledge

The above diagrams depict the duration or amount of time needed for the various skills and their intensity in any area according to both the learner's Development X Individual Characteristics and their particular language backgrounds. It cannot be emphasized enough that the language environment, whatever the home language or language variations, plays a crucial role in the development of the parts of the reading circuit. The early linguistic input from every language provides, along with conceptual knowledge, two halves of the platform of background knowledge that every child either brings or doesn't bring to the acquisition of reading.

Although all children should receive instruction that explicitly **connects** all the foundational skills to each other from the outset, some individuals (e.g., children with dyslexia and other language-based

learning issues) will need more intensive emphases and longer duration in specific areas of foundational skills (e.g., phoneme awareness and/or fluency) than other learners. By the same token, other learners (e.g., children with varied differences in the development of standard American English language skills) may require more emphases on a different set of foundational skills, depending on their particular background. For example, some children with rich linguistic backgrounds in several languages can move quickly from an emphasis on the various foundational skills to a level of automaticity or fluency that supports growing comprehension processes. It is essential, therefore, to utilize our various multi-dimensional screeners (e.g., California's new readiness screener) along with teacher and parent knowledge to determine the particular mix of strengths and weaknesses of each individual student. These collective data are what is needed to provide the appropriate emphases in instruction for an individual child, particularly in the various foundational skills depicted on the left "elbow" of the diagram.

On the right side of the diagram are the higher-order comprehension skills. Although a full description of the multiple *deep reading processes* underlying comprehension is outside the scope of this brief, it is important to note that these processes begin with connecting the child's particular background knowledge to the new information in the text. Such connections require building analogical skills that lead to a far more elaborate set of inferential, affective, and analytic capacities.

Just as we need to think in terms of an expanded view of foundational skills and their connections to each other and to fluency and comprehension, it is important to think similarly in terms of an expanded view of comprehension skills. For, in this cultural hinge moment when information needs critical evaluation by all our citizens, it is imperative that the development of empathy/ perspective-taking,

inferential reasoning, critical analysis, and personal insight are seen as the essential components of a deep reading brain circuit (see Wolf, 2018, for detailed description of deep reading processes). And, just as for the foundational skills, the intensity and duration of emphases on all of these specific comprehension-related processes will be dependent on the individual's development, background knowledge, cultural and language variation, and diverse learning characteristics.

A mutually expanded view of both foundational skills and deep reading comprehension processes is the first take-away of this Lovett-Wolf Elbow Room mnemonic. Every teacher has something to give from their expertise and something to expand. The key, however, is systematic, knowledge-based expansion, never cherry-picking.

The second take-away is that this diagram illustrates how there is never a time when comprehension skills (even through the simplest forms of connected text like two -word sentences) are neglected in the acquisition process and how there is never a time when some emphases on more advanced foundational skills --- from decoding multi-syllabic words (see Sears' "Word-Builder" app) to understanding syntactic complexity--- enhances deep reading across the various stages of its development. Think back to how you shifted your own crossed elbows. In the beginning your left elbow is raised high with your right arm horizontal below it. As fluency and the automaticity that underlies it increases, the right elbow with its deep reading, comprehension processes ascends ever more, with the left arm below it in support. This is a dynamic that incorporates all processes and neglects none.

The third take-away is the great importance of matching individual characteristics with instructional emphases in both foundational and comprehension processes. Equity matters at every year of a child's life, beginning before school ever begins. Knowledge matters at every year of a child's learning and a teacher's teaching and

learning. We need teachers who know what they need to know to match every child to instruction that will lead to the unleashing of that child's untold potential for the future of our society.

I would like to summarize this brief by placing this dynamic, expanded view of foundational skills and their connections to multiple deep reading processes within the context of a larger view of the science of reading. The beautiful complexity of an ever elaborating reading brain illumines how all the processes in the circuit and their connections are important to teach *explicitly and systematically* with emphases that differ according to development and individual needs. Such a view excludes the expertise of no teacher devoted to a particular approach, but rather invites the expansion of everyone's knowledge. Such a view connects not only the parts of the reading brain, it connects the non-exclusive areas of expertise of our teachers. Such a view helps increase every learner's move from *possem* to *possum*.