BRIDGING SCIENCES:

AN INTEGRATED APPROACH TO SUPPORTING STUDENT LITERACY DEVELOPMENT

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CASEL joins researchers across diverse disciplines to call for a comprehensive approach to support student literacy in the field of public education.

FOREWORD FROM THE AUTHORS

As a committed and vitally interested assemblage of education researchers and leaders with a background in the studies of reading and literacy, social and emotional health and well-being, and educational policy, we join together in this white paper to contribute to a comprehensive representation of learning broadly and reading in particular. Current research in the fields of human development, learning sciences, and neurosciences builds upon each other and demonstrates that learning environments and instruction must support students' social and emotional development and well-being to drive student literacy development. In this white paper, we synthesize research across this framework to inform a comprehensive approach to supporting student literacy development and instruction and put forward federal policy recommendations to support these efforts. Specifically, this white paper encompasses:

- What we have learned about the nature of reading, its development, and its pedagogy from a comprehensive understanding of the Science of Reading, and how that knowledge translates into legislation and policies that are being enacted in most if not all 50 states.

- How we can enhance the impact of education policies and practices by bridging the Science of Reading with the broader Science of Learning and Development. Current research in the neurosciences re-affirms and expands on longstanding findings in the field of human development that together inform more recent findings in research on reading comprehension.

- How federal agencies can assist in this process of building from across these synergies by providing resources and incentives that expand the reach of evidence-based curriculum, pedagogy, and teacher education—both pre-service and in-service—in alignment with the Science of Reading and the Science of Learning and Development.

- How federal agencies can develop policies that foster the development of a body of research, along with support for practice and teacher learning, that take into account all of the elements that enable strong reading development. This includes building teacher knowledge to make well-informed decisions on behalf of the full diversity of learners with whom they work.

THE IMPORTANCE OF SUPPORTING STUDENT LITERACY DEVELOPMENT

It is critical that we help educators—including those in the K-12 system and beyond—do everything in their power to make sure all of America's students possess the reading and literacy skills needed for school success in all subjects. These skills are also the gateway to a rich life after formal schooling because they contribute to students' civic reasoning and discourse, economic productivity, and personal fulfillment. In today's technology-centric world, there are fewer and fewer occupations that do not require strong reading skills. Preparing students to be lifelong readers and independent learners starts with promoting literacy in their formative years (pre-K-3) and requires supporting their progress throughout formal schooling so that students are equipped to navigate their everyday lives as citizens, workers, neighbors, parents, and community members throughout the lifespan.

Getting novice readers off to a good start in the first few years of schooling is a high priority for our education system. To meet this goal, educators across the nation must possess the knowledge and sense of professional responsibility required to engage a curriculum in which all students learn to read, write, and critique the ideas they encounter in print, digital texts, and conversations encountered in and out of school.

As important as a good start is, it is equally as important to provide a continuing pathway that supports the development of competent and knowledgeable citizens capable of critically analyzing the universe of information they encounter daily. That cannot be achieved without comprehensive and long-term literacy programs based on solid empirical evidence. This path to competence requires that students are able to comprehend written and spoken language that is increasingly more complex and specialized. Competent readers must develop the ability to distinguish accurate from inaccurate or misleading information and quality evidence from unsubstantiated claims. Further, competent readers must be willing and able to reach reasoned and reasonable conclusions. Advances in technology, especially the recent surge in artificial intelligence, press schools to prepare students with more advanced literacy skills than ever before. Yet, large proportions of U.S. students are ill-served by schools and by teachers who are themselves unsupported to provide effective evidence-based literacy instruction (NAEP, 2024).

We have made a good start as a nation in building a pathway to support student literacy development, but much remains to be done. To extend that pathway, we must complement the research and policies on early reading development, which have resulted from a surge of influential activity and legislation under the umbrella of the Science of Reading, with other equally important and relevant scholarship that documents factors that influence learning and development in all school subjects, including reading. This includes attention to learning to read across the full PreK-12 spectrum because the demands of texts and tasks increase in complexity across grade spans.

Furthermore, it is important to address the often narrow characterization of the Science of Reading in the public and social media as focusing almost exclusively on foundational phonics, decoding, and fluency skills (Pearson, 2004; Cervetti et al., 2020). In many states, legislation passed in the past few years has emphasized a comprehensive approach to improving reading and literacy (Neuman et al., 2023). Even so, phonics seems to capture the headlines. But to truly support student reading development, we must bring into focus a full understanding of comprehension, language, knowledge, social and emotional learning (SEL), and how these integrate with the development of foundational literacy skills.

Research has extensively demonstrated that a narrow focus on foundational skills results in students' literacy gains only in the short term. Without a comprehensive approach to literacy instruction (i.e., one that emphasizes knowledge expansion, language learning, and engagement with reading), a narrow set of foundational skills will be insufficient to prepare students with the meaning-making resources to comprehend the content area texts they encounter beginning around the fourth grade and in the subsequent years. Knowledge, language, and reading engagement need attention from early on so that readers are continuously supported over the elementary years and throughout their schooling in their expansion of the meaning-making skills and knowledge required to comprehend the more advanced texts and literacy tasks that await them in the upper grades and beyond.

There is no mistaking that the United States faces an urgent educational crisis. The awareness of this crisis and the political willingness to address it offer a window of opportunity to support students and their teachers by providing evidence-based insights that will enable practitioners to teach the skills students need to become independent readers and learners in an information-laden society. Developing students' abilities to navigate today's information demands a knowledgeable teaching force that can design learning environments that support students' social and emotional well-being alongside their reading competence. Learning to read, feel efficacious, and be goal-directed are all intimately and dynamically interconnected.

This white paper is organized into four sections, accompanied by an appendix:

- Reviewing relevant research from human development, the learning sciences, and the neurosciences to illustrate why learning environments and instruction must be organized to support social-emotional and cognitive development and well-being in order to achieve our learning goals for reading;

- Reviewing and extending the scope of the Science of Reading;

- Supporting teacher learning and professional development; and

- Offering suggestions for federal policy efforts.

Section 1: The Importance of Social-Emotional Processes and Development in Learning

Over the past two decades, we have learned much from both the neurosciences and research on the interconnectedness among cognitive, biological, emotional, and cultural factors that interact to shape the development of humans throughout their lifespan. This line of research, which embraces both the Science of Learning and Development and SEL, has much to offer researchers and educators who want to better understand and improve reading development because of its ubiquitous influence on the students' academic performance and the quality of their lives at every stage.

Below we synthesize research from across the neurosciences (Immordino-Yang et al., 2024, in press), human learning and development, and the learning sciences. Findings from this body of work document how cognitive processes, emotions, and perceptions work in tandem as we learn (Lee et al., 2020; Lee, 2017a, 2017b; Nasir et al., 2020). In an era when we hear daily reports in the press about chronic absenteeism, discipline problems, and the crisis in the mental health of our adolescents, delivering instruction that accounts for the social and emotional facets of learning alongside the cognitive is critical to the future of our children. Syntheses of new scientific evidence highlight the importance of the interconnectedness of cognitive, social, and emotional growth to support academic and other life outcomes. This evidence also highlights the importance of student motivations and their identities as learners, and of the social and emotional conditions for learning, including affirmative teacher-student relationships (Cantor et al., 2019; Darling-Hammond et al., 2020; Lee et al., 2020; Cantor et al., 2020). Accruing evidence from across fields makes clear that the best approaches to improving literacy outcomes work to embed building block skills into broader, wraparound approaches that attend to the development of the "whole child" (Darling-Hammond et al., 2020). From a neuroscientific perspective, we now know a great deal about achieving this goal (Damasio, 1995; Immordino-Yang, 2015; Immordino-Yang et al., 2019; Immordino-Yang & Gotlieb, 2017; Immordino-Yang & Damasio, 2007; Nadel et al., 2000):

- The enabling skills that contribute to reading, such as phonological decoding, are difficult tasks for the young brain. Neuroscience studies show that brains are not naturally built to phonologically decode, and there is no evolutionary precursor of this task. Instead, what is natural and fluent for the young person's brain is communication, storytelling, sharing ideas, and interacting with others and with the world through oral language and singing, gestures, and collaborative actions. While foundational skills such as decoding are essential and must be taught, effective teaching of these skills embeds them into rich and engaging learning opportunities that attend to children's interests, curiosities, and needs more broadly.

- The brain mechanisms that become specialized for the building blocks essential for reading, such as the brain systems that come through experience and learning to support phonological decoding, also support social-emotional capacities. For example, the part of the brain that supports phonological decoding for most fluent readers, known as the gyrus, also supports recognizing emotional expressions on faces. This is another reason why separating the cognitive aspects of reading from the social-emotional aspects makes little sense from a neurobiological perspective. Learning to decode phonologically means reworking brain architecture and functioning to accomplish this new skill while simultaneously maintaining and growing social skills. This complex balancing act is best supported by a whole child approach that pays attention to the dynamic ways that children personally adapt simultaneously to both learning to decode phonologically and developing their social skills. Learning to read involves children negotiating the re-working of their brain systems through integrating their academic and social-emotional skills.

- The brain networks that support comprehension, conceptual development, autobiographical memory and a sense of self, and moral or ethical thinking are the same networks that support reading comprehension (Immordino-Yang et al., 2012). Again, learning to comprehend what one is reading, to read for information and ideas, and to follow, anticipate, and enjoy narratives, is an inherently social-emotional as well as cognitive process.

For these reasons, early literacy development is best supported by educational environments and curriculum that foster student engagement and learning to read in a manner that builds upon students' unique strengths and addresses their needs. This is equally true for older children and adolescents. There are many ways to do this well, and all of them integrate social-emotional and cognitive considerations into lessons in a way that focuses on the whole child. (Watch this video for a discussion of these relationships by neuroscientist Professor Mary Helen Immordino-Yang.)

From an education and pedagogical perspective, we know that relational factors and the social and emotional conditions for learning affect students' motivation to learn, their capacity to learn, how they learn, and their achievement (Darling-Hammond et al., 2024; Gómez & Suarez, 2020; Jansen et al. 2022; Cantor et al., 2020; Osher & Kendziora, 2010; Thapa et al., 2013; Wang et al., 2020) These conditions include the experience of physical, emotional, psychological, and identity safety; connectedness, belonging, care, and emotional support; academic challenge and support; emotional and cognitive engagement; cultural respect and fairness; and peer and teacher social and emotional and cultural congruences.

These conditions enable students to develop and sustain motivation, build their identities as learners, and experience and contribute to productive relationships with teachers (Oyserman et al., 2006; Oyserman & Destin, 2010). A robust body of evidence supports these conclusions, including systematic reviews, analyses of PISA and TIMSS background data, statistical analyses of these relationships, and analyses that examine the relationship between improvements in conditions for learning and achievement (Amsalu & Belay, 2024; Bakes et al., 2022; Berkowitz & Ben-Artzi, 2024; Baysu et al., 2023; Davis et al., 2019; Nilsen & Teig, 2022; Osher et al., 2014). Positive conditions for learning and effective SEL approaches are both essential components of safe, supportive, and academically productive schools. Positive conditions for learning reflect the social and emotional competencies of students and teachers and also provide conditions for enhancing student and teacher social, emotional, and academic competence (Berg et al., 2017; Berg et al., in press; Cipriano et al., 2023; Osher & Berg, 2017).

SEL is an evidence-based framework for providing learning conditions that lead to improved academic, social, and emotional outcomes for children and youth (Osher et al., 2016; Schonert-Reichl, 2019), including positive impacts on reading (Corcoran, et al., 2018; Jones et al., 2019; McCormick et al., 2015). SEL is most effective when routinely incorporated into teacher pedagogy in a manner that improves teacher-student relationships and supports students' abilities to understand and manage their learning-related emotions and relationships (Immordino-Yang et al., 2019). The challenge is that SELis often placed in a silo, often cut off from the mainstream school subjects like English language arts, mathematics, science and social studies. Hence there is the need to ensure that SEL insights and activities are well-integrated throughout mainstream school curricula, including reading instruction.

The research evidence for SEL comes from numerous sources, including studies using rigorous experimental designs, funded through federal agencies such as the Institute for Education Sciences, the National Institutes of Health, and the National Science Foundation and published in top-tier peer review journals. A 2023 meta-analysis that reviewed more than 400 such studies shows that students in classes where teachers created an environment reflective of SEL principles demonstrated decreases in aggression and bullying, anxiety, stress, depression, and suicidality; students felt safer at school and reported higher levels of inclusion, connectedness, and healthy relationships than non-participating classmates. Further, students in SEL programs had higher rates

of attendance and homework completion, greater school engagement, and improved grades and test scores (Cipriano et al., 2023). An additional meta-analysis further examines the impacts of students' SEL experiences on academic achievement. The study reaffirms that K-12 students who participated in SEL programs demonstrated greater academic achievement than those who did not. It also determined that SEL promoted improvements in student grade point averages and standardized test scores. Importantly, students' participating in SEL programs had significant improvements in both literacy and math achievement, indicating SEL's positive impact on learning outcomes in core academic disciplines (Ha et al., under review).

The research indicates that these positive student outcomes are most likely when their teachers and schools are ready to do this work (Osher, 2018; Jennings et al., 2021; Newman et al., in press) and when SEL programs are implemented with fidelity to the specified model. In addition, when SEL principles and tools are embedded in instruction to support learning and build conditions for learning (Berg, et al., 2017; Jones & Kahn, 2017), students experience positive outcomes. Research indicates that variation in school-based implementation can occur due to the broader context (e.g., district, state, and national policy, community capacity), at the level of the school and classroom (e.g., classroom and school climate/culture/conditions for learning), and at the level of the individual (e.g., implementer well-being, skills, or attitudes toward the program and its underlying principles) (Barnes et al., 2023; Dymnicki et al., 2017). Given SEL's demonstrated positive impacts, research has begun to document the strategies for designing and continuously improving implementation supports within and across each of these levels. Investment in this type of applied research is essential to ensuring that all students and adults experience high-quality SEL that is developmentally and contextually appropriate.

Section 2: Reviewing and Extending the Scope of the Science of Reading

Over the past few decades we have, under the rubric of the Science of Reading and other initiatives (see Reading Research Quarterly, 2020; 2021), learned a great deal about the reading process as well as reading development and pedagogy. That knowledge can be enhanced and extended to achieve even better insights about all facets of reading by reaching outward to the Science of Learning and Development and reaching inward to additional areas of reading research that are ready to make the journey to policy and practice.

In this section, we offer a portfolio of complementary lines of research that can further expand the science of reading to inform federal policy efforts (Duke & Cartwright, 2021; Duke et al., 2021).

EXTENDING THE SCIENCE OF READING

A good starting point for scientific evidence about reading is the 140-year trajectory of basic research on the cognitive processes involved in reading that is now being expanded by more recent studies in the neurosciences, human development, and synthesized in the Science of Learning and Development. When it comes to early reading pedagogy and policies, the major sources of influence have been research syntheses, from Jeanne Chall's classic 1967 book, Learning to Read: The Great Debate, to the 2000 National Institute of Child Health and Human Development (NICHD)-sponsored National Reading Panel (NRP). Since then, a number of syntheses were conducted, many ending with the same conclusions as the NRP. Despite claims by pundits in the popular press and social media that the NRP settled the matter once and for all in asserting a reliable advantage for systematic phonics in getting students off to a good start, the actual conclusions were

more nuanced. Phonics, says the NRP, is a necessary but not a sufficient condition for early success. It yields a reliable advantage on word reading (and a smaller advantage on comprehension measures) if certain conditions are met. The instruction should be:

- Systematic, not opportunistic;
- Ideally delivered in the early (K-2) grades; and
- A part of a comprehensive curriculum that attends to other important program features such as comprehension, language, and knowledge development.

Moreover, there was little evidence supporting later phonics instruction (past grade 2) or the use of specialized decodable texts (such as Dan can fan Nan-like texts). Nor was there any evidence that synthetic (the sequential decoding of buh-ah-tuh) approaches were superior to other more analytic approaches (such as word family approaches); what mattered was that the approaches were systematic. In the words of the NRP (NICHD, 2000):

> It is important to emphasize that systematic phonics instruction should be integrated with other reading instruction to create a balanced reading program. Phonics instruction is never a total reading program. In 1st grade, teachers can provide controlled vocabulary texts that allow students to practice decoding, and they can also read quality literature to students to build a sense of story and to develop vocabulary and comprehension. Phonics should not become the dominant component in a reading program, neither in the amount of time devoted to it nor in the significance attached. It is important to evaluate children's reading competence in many ways, not only their phonics skills but also their interest in books and their ability to understand information that is read to them. By emphasizing all of the processes that contribute to growth in reading, teachers will have the best chance of making every child a reader. (2-97)

The NRP also implicated four additional "pillars" of effective pedagogy: phonemic awareness, fluency, vocabulary, and comprehension. In the nearly 25 years since the publication of the NRP, we have, as a profession, deepened our knowledge of these pillars (see, for example, Duke et al., 2021), and replicated the NRP finding of "necessary but not sufficient" in many new studies and syntheses.

Since the National Reading Panel, there have been other efforts to synthesize research on reading. These include the RAND report of 2002 along with the IES' most recent initiative Reading for Understanding. The RAND report focused on the ecological infrastructure needed, including teacher learning and development and assessments, consistent with recommendations in this white paper. The RAND report also articulated an understanding of comprehension as an outgrowth of what the text demands, what the reader brings, and the activity in which the comprehension takes place. These findings are consistent with the more recent findings we have summarized in Section 1 of this white paper. The National Academy of Education has published a recent synthesis of findings from the Reading for Understanding IES initiative (Pearson et al., 2020).

A complete evidence-based curriculum (see Tierney & Pearson, 2024) for teaching reading should include additional areas that research has demonstrated to be crucial to support students' literacy, such as:

- ***Attention to how students' brains engage in cognitive, social, and emotional processes to learn.*** Brain activity studies of learning emerging from neuroscience research in tandem with the work in the Science of Learning and Development, as well as SEL, enhance insights from the Science of Reading. As set out in Section 1 of this white paper, this set of processes, which have been variously labeled conative factors, non-cognitive factors, SEL, or, more recently, literate dispositions (Aukerman & Chambers Schuldt, 2021), interact to shape all facets of reading development, including word-level and text-level

processes. These include motivation, engagement, interest, self-efficacy, agency, identity, growth mindset, dispositions, SEL, and empathy. The challenge in differentiating these factors as distinct from cognition is that current findings in the neurosciences document that these capacities are directly in dialogue with cognition; this research documents how perceptions of relevance and self-efficacy influence goals, motivation, and engagement (Lee et al., 2020; Lee, 2006; Lee, 2016).

- ***Knowledge, vocabulary, and language that shape all facets of learning to read.*** The words and language structures we use to express knowledge and understandings operate together to facilitate comprehension (Snow & Uccelli, 2009; Uccelli, Barr, et al., 2015; Uccelli, Galloway, et al., 2015). They shape both reading performance and our capacity to use the insights gained in reading to address issues and take action in our natural and cultural worlds. In Appendix 1, we provide a more extensive discussion of what students need to learn with regard to language to support comprehension, including specialized demands with regard to English Language Learners.

- ***Expansive opportunities to read widely contribute to reading comprehension skills and toward developing a love of reading.*** Availability and access to expansive library collections are important resources to support the development of a love of reading and independent reading not dictated by others. These book collection resources should present a wide range of topics to address the diverse and individualized interests of children and adolescents. These collections should be classroom-based, school-based and community-based. Unfortunately there are substantive differences in the availability of such resources based on the income levels of communities. It is equally important that such collections have supports built into them to help students learn how to access texts based on their interests and to help both parents and teachers to understand and access these resources. The American Library Association has produced reports over the years documenting the impacts of robust and comprehensive access to libraries on opportunity to learn to read:

    - "Library reading programs encourage reading achievement," American Library Association, February 28, 2012 http://www.ala.org/tools/research/librariesmatter/library-reading-programs-encourage-reading-achievement (Accessed April 1, 2024)

    - "Library Media Program Activities Associated With Higher Reading Scores," American Library Association, February 28, 2012. http://www.ala.org/tools/research/librariesmatter/library-media-program-activities-associated-higher-reading-scores (Accessed April 1, 2024)

    - "Strong correlation between children's services in public libraries and fourth-grade reading scores," American Library Association, June 20, 2011. http://www.ala.org/tools/research/librariesmatter/strong-correlation-between-childrens-services-public-libraries-and-fourth-grade-reading-scores (Accessed April 1, 2024)

- ***Expertise in disciplinary literacy to enhance development at every age.*** Learners require this expertise to both use and gain knowledge as they read, write, and reason within the schools, including the humanities (including history and literature), the natural and social sciences, and the arts. Students' knowledge, vocabulary, understanding of structures, and modes of reasoning are vitally important as they venture into reading in these disciplines (Barton et al., 2002; Fang, 2013; Goldman et al., 2016; Lee, 2004, 2011; Lee et al., 2016; Lee & Spratley, 2009; Wineburg & Reisman, 2015). Expanding knowledge and understanding in academic disciplines requires that developing readers learn to tailor their reading skills and strategies to the demands of text and knowledge in each content area.

- ***General reading comprehension that increases in complexity across the grade span.*** Basic comprehension skills—finding main ideas, making inferences, summarizing—are generic skills that can and should be taught from early childhood on (Afflerbach et al., 2008). Children can learn to comprehend texts even when they do not have the phonics and decoding skills to read the texts themselves. When parents read storybooks to their children or when children watch programs on the television—Daniel Tiger's Neighborhood or Sesame Street, for example—they are learning to comprehend. However, these basic comprehension skills increase in complexity as texts become more challenging (Goldman & Lee, 2014; Hiebert & Mesmer, 2013; Lee, 2014; Lee, 2023; Pearson & Hiebert, 2014; Valencia et al., 2014). Text complexity is affected by the vocabulary needed to understand the ideas, structure, and length of sentences in informational texts; whether main ideas are directly stated or must be inferred and the function of words that connect ideas (e.g. if, although, and, because); and the overall structure of texts that convey relationships among ideas. Additional sources of text complexity exist in discipline-specific texts, including the different genres of literary texts, primary source documents in history, causality in science texts, etc. Issues of prior knowledge, opportunities to build requisite knowledge that texts and text sets require, issues of language structures, and technical vocabulary all increase in complexity across the grades. Thus competencies developed through early literacy instruction are essential, but attention to learning to comprehend across the grades is also essential.

- ***Conversation, which is pivotal in learning to read.*** School, home, and community settings in which children and adolescents participate with teachers, parents, more knowledgeable others and peers in back-and-forth conversations contribute to the language and literacy learning of children and adolescents (Michaels & O'Connor, 2015; Michaels et al., 2008; Romeo et al., 2018; Rowe & Snow, 2020; Uccelli, et al., 2018). As a social practice, it pervades a wide range of classroom practices: talk about text, both content and structure (Murphy et al., 2009); talk about words, including semantic networks, morphological families, and contextually nuanced meanings (Cervetti et al., 2016); talk about solving problems and applying what we learn from reading to everyday-world problems in classrooms and community projects (Alexander & the Disciplined Reading and Learning Research Laboratory, 2012; Cervetti & Pearson, 2023).

- ***Asset-based and culturally sustaining pedagogical practices.*** These pedagogical approaches allow all students to "see themselves" and their cultural practices in the curriculum, providing "hooks" for making personal connections to ideas in the texts they encounter (López, 2023). Understanding how repertoires that students construct from their experiences in the world is essential for the design of robust literacy instruction (Gutierrez et al., 1999; Gutierrez & Rogoff, 2003; Lee, 1995; Lee, 2007). These fundamental practices apply to all learners, not just learners from marginalized or minority backgrounds. Again, research examining the physiological processes through which human learning and development unfold document the interaction of cognitive processes with cultural practices in our experiences in the world.

- ***Writing, which enhances reading development*** (e.g., Graham, et al., 2018; Pearson et al., 2010). Both at the word level (spelling and meaning vocabulary) and at the text level (the comprehension and critique of text-based ideas, explanations, and arguments), writing increases reading competence. When students try to find letters to match the sounds they are trying to spell, they engage phonemic awareness as they search for letters to represent the sounds they hear. As they compose arguments, explanations, and stories, they learn more about text structures and genres, knowledge they will need to employ as they read, understand, and critique texts.

- ***Effective instruction that employs multiple practices.*** We have stressed the importance of knowledge use, language, writing, and discussion. But it is the simultaneous integration of all four practices that matters most. While perhaps counterintuitive, it is precisely in the context of discussing, reading, and writing about

rich content with demanding reasoning skills that language is learned more effectively. Yet, this practice requires intentional scaffolding to expand students' knowledge of the language of texts through content-rich instruction. Recent successful interventions call for students' authentic participation in content-rich literacy instruction: the "sustained and thematic content literacy" approach (Kim et al., 2023) and the use of "informational texts that cohere around a set of concepts related to [a] topic" (Cervetti et al., 2016) are two recent examples of successful literacy instruction shown to improve students' content knowledge, knowledge of the language of texts, and reading-to-learn abilities.

- ***Assessments that shape instruction and learning.*** Assessments matter—both large-scale summative assessments used to evaluate student achievement, broad trends over time and formative assessments that are internal to schools and classrooms and are used to provide feedback about the day-to-day progress of students and the relevance and impact of daily curricular experiences (Black & Wiliam, 1998; Fuchs, L. S., & Fuchs, D., 1986; Klute et al., 2017). Some assessments should evaluate how well students are able to orchestrate all of the important word-level and comprehension practices that are a part of skilled reading (reading and responding to questions about literary and informational texts offer the best current option). Others will dig deeper into students' skill repertoire and provide a profile of important enabling skills for word reading, vocabulary, fluency, and comprehension. These are usually formative assessments that look "under the hood" of reading. Especially important when it comes to reading development are early screening tests to identify vulnerable students in need of targeted early intervention and formative assessments that closely monitor student development with regard to targeted skills. We should strive for better and more nuanced uses of both forms of assessments.

Finally, we need to better understand and address contributors to low reading comprehension, particularly that of students in grades 4-12. While inadequate understanding of phonics can be a contributor to problems that older students present in comprehending texts, it is not the only contributor. Riddle Buly and Valencia (2002) studied this problem in the state of Washington:

> "In this study, we probed beneath students' failing scores on a state reading assessment to investigate the needs of struggling students and implications for policy. We found that scores on state tests mask distinctive and multifaceted patterns of students' reading abilities that require dramatically different instructional emphases … In the field of reading, concerns about student performance, and indeed, student learning, have prompted policymakers and school administrators to continue to search for the "silver bullet," the program or instructional strategy that will improve student achievement. The assumption is that underlying students' poor performance on state reading assessments is a monolithic reading problem—that most students need a similar "fix" (Allington, 2001; Allington & Walmsley, 1995; Duffy & Hoffman, 1999). Yet, we have little empirical evidence about the nature of the reading difficulties of these failing students … We found that simple percentages of students failing the test masked empirically derived components of reading ability: meaning (comprehension and vocabulary), fluency (rate and expression), and word identification. Furthermore, even average group scores in each of these components did not tell the real story. Instead, we found that students exhibited several distinctive patterns of performance that contributed to their poor showing on the state reading assessment. Reading failure is multifaceted and it is individual. In short, beneath each failing score is a pattern of performance that holds the key to improved reading instruction and, consequently, improved reading ability"

And if we take seriously what we are learning from the Science of Learning and Development, these contributors are not limited to cognitive knowledge; equally important is how students experience their environments of learning.

This comprehensive understanding of the Science of Reading has taught us much about the nature and development of reading as well as effective pedagogical practices to support learning to read in the fullest sense. If that knowledge base can be expanded to account for what we are learning from the Science of Learning and Development, we will be better positioned to meet the challenges in achieving high levels of performance. As important as it is to focus on what these principles mean for student learning, it is equally important to address their implications for teacher learning and practice and the full ecological supports needed for learning.

INTERACTIONS BETWEEN TEACHING AND LEARNING

Teachers, like doctors, must use both generic and situated knowledge. We want teachers, just as we want doctors, to be equipped with the most relevant and up-to-date knowledge of the very best practices to use in serving their clientele. No medical treatment, however generally effective it might be, should be administered to all people under all conditions. Rather, practice in medicine and in instruction require the practitioner, be they the doctor or teacher, to administer the right treatment in the right dosage to the right individuals. The point for guiding reading practice by mandating or incentivizing particular policies is that no matter how strong a particular finding is, the application of those ideas is always situated, not generic. In short, individual differences are real and must be accounted for (Afflerbach, 2016; Connor, 2011, 2014). The bargain teachers make for the prerogative granted by society should be to understand—and use—the very best, most valid research-based knowledge they can to guide learning, development, and teaching; and to test their application of that knowledge in terms of learning outcomes for the students before them.

That goes for all disciplines in the school curriculum, not only reading. And that is one reason why insisting that teachers possess evidence-based knowledge of reading and how to teach it is so important. In doing so it is important to recognize that basic research findings inform but do not equate to pedagogical practices. The professional knowledge of individual teachers and the shared knowledge of their learning communities enable teachers to figure out how to apply basic research findings in their classrooms and select from commercial curricula those specific pedagogical practices that will work for their children. For example, one program, Touching the Spirit, explicitly teaches phonics and decoding, but engages African American students who are speakers of African American English in pedagogical practices that recruit African American English speech patterns valuing rhyme, rhythm, and performance. (https://successfulteachers.com/touching-the-spirit/).

The representation of the phrase Science of Reading in popular media captures only one thread of the existing body of research that forms the foundation of a science of reading (Duke & Cartwright, 2021). As commonly described and enacted, it is not a panacea for all students' literacy woes. It is important to distinguish between basic scientific findings and how such findings are and should be taken up in specific pedagogical practices. Those concerned with different populations—variously labeled as special, non-mainstream, marginalized, or neuro-divergent—are often at the forefront of pedagogical inquiry because researchers are constantly searching for approaches that are particularly effective for these students. The synthesis of individual difference perspectives by Afflerbach (2016) and the exemplary work of Connor (2013, 2014) attest to this quest in the area of reading and literacy. Moreover, finding aptitude by treatment interactions (methods that work especially well for some, but not other, groups) has been a quest of educators for over a century (Connor, 2011; Snow, 1989). In short, individual differences are real and must be accounted for (Afflerbach, 2016; Connor, 2011, 2014).

Teaching-learning relations promote different kinds of learning and require different teacher roles. Students acquire reading competence through both explicit teaching and tacit learning, for both words and texts. The message about decoding and comprehension coming from the studies within the Science of Reading document the important role of explicit teaching of strategies for both word reading and comprehension (NRP & NICHD, 2000). However, explicit teaching is not the only pathway to student learning and reading competence. Many students engage in tacit learning, or what Seidenberg (2017, 2023) refers to as statistical learning. By that, he means that as students engage in a practice, like reading, they draw inferences about how the practice works, and they begin to use that skill on their own in new settings and tasks. For example, after hearing and seeing many words that start with t, students might learn to segment both the sound and the letter, acquiring both letter-sound and phonemic segmentation knowledge.

Phonemic awareness offers a good illustration of the distinction between explicit teaching and tacit learning. From the NRP (NRP & NICHD, 2000) and the National Early Literacy Panel (NELP, 2008), we know that (a) phonemic awareness scores in kindergarten, along with alphabet knowledge and concepts of print, predict first-grade reading achievement, and (b) a modest amount of explicit instruction in phonemic awareness enhances achievement in the early grades. We also know that students who learn to read or engage regularly in invented spelling activities without any explicit attention to phonemic awareness (Adams, 1990; Allington & Woodside-Jiron, 1999) improve their scores on tests of phonemic awareness across time (Seidenberg, 2023). In other words, phonemic awareness expertise is both cause and consequence of learning to crack the code.

Educators and policymakers need to be reminded that there are many pathways to learning. That is why individual differences are so central to all discussions of teaching and learning any school subject or skill, including reading. It is no accident that there is a separate field, differential psychology (Revelle et al., 2011), dedicated to understanding and accommodating differences in human attributes, behaviors, and performance. It is equally important to understand that the recruitment of knowledge to inform instruction should not be siloed as responsibilities solely of individual teachers. Rather, schools must be organized as learning communities in which there are multiple categories of expertise that work in collaboration to design robust learning environments and monitor the impacts of their instructional designs. These include teachers, reading specialists, interventionists, staff specialized in students' special needs, staff who can manage data systems that support ongoing analyses and documentation of impacts of instruction and broader supports, as well as social workers and healthcare workers.

The central role for teacher knowledge and development. Where will teachers and other relevant school staff gain the knowledge required to meet their part of the bargain; that is, how will they come to possess and use the very best, most valid research-based knowledge they can to guide students' reading development in tandem with broader social and emotional development and well-being? Ideally this process will begin in their pre-service teacher preparation programs and continue in professional development taking place in school-based communities of practice. There are not many other options, but these two will suffice if we can marshal the resources and motivation to make it happen.

Section 3: Teacher Learning and Professional Development—Developing the Infrastructure to Support Teacher Well-Being as a Contributor to Student Learning and Well-Being

Teachers' pedagogical knowledge and instructional skills are critical levers shaping students' ability to read and develop other literacy skills (Lyon & Weiser, 2009). By extension, teacher education is viewed as a crucial strategy for improving students' reading instruction and reading outcomes. According to Lane and Contessa (2023), "Improved reading instruction also depends on teachers' knowledge of evidence-based instructional practices that support the delivery of effective teaching" (p. 10). Experts in teacher education have conceptualized teacher knowledge (like student knowledge) from a developmental perspective where knowledge is differentiated, preparatory to the next phase, and progressive (Snow et al., 2005). In this way, teacher knowledge is contextual, evolving and adapting to students' skill levels. Lane and Contessa (2023) assert that "conceptualizing teacher knowledge from a developmental perspective aligns with views of knowledge in other professions, such as medicine" (p. 10).

Effective teacher education equips teacher candidates with the theoretical and scientific foundation of literacy development, instruction in reading content, child and adolescent development,and cognition, while also providing clinical/practicum experiences for observing and teaching reading (under expert supervision of a practicing teacher), and "feedback that is immediate, positive, corrective, and specific (Scheeler et al., 2004). The role of initial teacher preparation in literacy is to develop solid declarative knowledge through coursework and guide candidates in their development of situated, can-do procedural knowledge during field experiences. Teacher preparation should provide learning experiences that support teacher candidates' knowledge-building within different instructional contexts.

It is important that teachers be able to teach students from across diverse backgrounds and life experiences, even when the teachers themselves do not share such backgrounds and life experiences. There are useful lessons to be gleaned from NAEP studies of positive learning outcomes for Black students taught by Black teachers. It may be that these findings are not about a melanin match, but about an affirming philosophy of teaching that views all children as capable and that respects and recruits the multiple repertoires that students bring to classrooms from their multiple experiences in the world, in family and community life.

In studies that examined NAEP elementary school reading scores for 2013, 2015, 2017, and 2019, Yarnell, Bohrnstedt, Osher, and Broer (forthcoming) replicated an earlier study (Yarnell & Bohrnstedt, 2018) that found that the gap in Black versus "other student" performance was reduced or even reversed for both Black males and Black females in contexts where they were taught by a Black teacher. Other studies have found that being paired with a Black teacher is associated with more positive achievement-related outcomes for Black students, including higher scores on end-of-year exams, greater probability of assignment to gifted and talented programs, and lower rates of suspension, absenteeism, and special education placement (Gershenson et al., 2021; Hart & Lindsay, 2024; Holt & Gershenson; 2019; Osher et al., 2012; Redding, 2019). Other studies have suggested longer-term benefits for teacher racial match, including a higher probability of graduating from high school and attending college (Gershenson, 2019).

The factors that produce these results are not just a product of teacher skin color or representation. For example, the NAEP study also found that the Black teachers were more likely to have graduate degrees than other teachers (Yarnell et al., forthcoming) and other studies have demonstrated that with the right preparation and support, white teachers can successfully teach Black students (Gay, 2021; Ladson-Billings, 2022). The point—consistent with our

earlier discussions of the role of the importance of students feeling connected, of the importance of meaningful and affirming social relationships, and of the emotional salience students attribute to learning experiences—is that these are essential dimensions of positive learning environments. Teacher effectiveness is a product of teacher pedagogical skills, teacher social and emotional competencies, teacher well-being, and the conditions for teaching. For example, teacher depression has been linked to lower levels of student engagement, and high levels of teacher stress and depression have been related to poor student relationships, behavioral problems, poorer student adjustment, and lower academic performance (Greenberg et al., 2016; McLean & Connor, 2015; McLean et al., 2023; Hoglund et al., 2015). Additionally, research has shown that teachers' occupational stress is linked to students' physiological stress regulation (Oberle & Schonert-Reichl, 2016). Teacher working conditions and job satisfaction affect teacher retention, student achievement, and teacher effectiveness (Harrison et al., 2023; Jennings et al., 2019; Johnson et al., 2012; Madigan & Kim, 2021). Positive working conditions include the availability of professional development and support, open communication, relational trust with colleagues and administrators, supportive principal leadership, and time for planning and collaboration with other teachers (Yoder et al., 2018).

Growing acknowledgement of the negative effects of teaching-related stress on teacher burnout, instructional quality, and retention has contributed to increased attention to teacher SEL. Research evidence from student-focused SEL programs reveals the positive impact of professional development on educators' sense of connectedness with students and fellow teachers, individual and collective teaching efficacy, and perceptions of overall school climate (Bos et al., 2022; Corsello & Sharma, 2015; Rimm-Kaufman & Sandilos, 2023). Further, there has been rapid growth of systematic research on SEL interventions targeting teachers. For example, an analysis of 43 empirical studies found that, compared to their non-participating peers, K-12 teachers participating in SEL programs interventions had reduced psychological distress, greater social and emotional competence, and improved well-being (Oliveira et al., 2021), Importantly, a recent study demonstrated that the students of elementary school teachers in a teacher SEL program had greater classroom engagement, motivation to learn, and reading proficiency relative to students of teachers in the control condition (Brown et al., 2023). Thus, attending directly to teacher SEL as well as teacher well-being and job satisfaction improves outcomes for teachers as well as those of their students.

Section 4: Policy Considerations

There are many opportunities for governmental agencies at all levels to accomplish the goal of improving student reading performance by ensuring that reading instruction is based on the best available evidence. In this section, we point to several ways the federal government can build on state efforts to support comprehensive approaches to student literacy development.

STRENGTHEN EDUCATION RESEARCH

Policy Recommendation #1: Congress could commission an updated National Reading Panel Report.

The last National Reading Panel (NRP) was commissioned 26 years ago by Congress in 1997. The directive from Congress derived from then-U.S. Senator Thad Cochran's bill entitled the Successful Reading Research and Instruction Act. The goal of the legislation was to establish a National Panel on Early Reading Research and Effective Reading Instruction to evaluate and synthesize existing research and evidence to improve reading instruction. Specifically, Congress directed the director of the NICHD, in consultation with the Secretary of Education, to

convene a national panel to assess the status of research-based knowledge, including the effectiveness of various approaches to teaching children to read." We have learned a great deal about both the basic Science of Reading and how to teach it since 2000. Yet there has not been an authoritative synthesis of this work, as evidenced by the fact that the 2000 NRP report is still the most cited source for documenting the important role of foundational skills. Fletcher, Savage, and Vaughn (2021), all scholars who work under the umbrella of the Science of Reading, recently framed the work to be done in a way that suggests a more comprehensive emerging consensus:

> We conclude that there is consistent evidence in support of explicitly teaching phonics as part of a comprehensive approach to reading instruction that should be differentiated to individual learner needs. The appropriate question to ask of a twenty-first century science of teaching is not the superiority of phonic versus alternative reading methods, including whole language and balanced literacy, but how best to combine different components of evidence-based reading instruction into an integrated and customized approach that addresses the learning needs of each child. (p. 1249)

To conduct this work, we recommend a consensus panel of experts appointed by the Institute of Education Sciences (IES) and NICHD across the range of reading-relevant research coordinated with relevant research in human development, the learning sciences and the neurosciences to update the work of the original NRP. The charge of the panel would be to identify research-based practices upon which experts can agree and to craft a plan to understand and resolve disagreements that can be settled with better research.

It is important that any such panel be constituted to reflect recent advances in both core research on the nature, development, and instruction of reading, as well as the broader scope of relevant research related to the integration of cognitive, social, biological, and emotional systems outlined in Section 1. Within the reading field, the areas of inquiry identified in section 2 should be represented.

Unlike the 2000 NRP, a New Generation Research (NGR) NRP might reconvene periodically (five-year intervals seem plausible) to revisit the unsettled issues in light of more recent research. We might even think of it as an NRP 2.0. And we have learned enough about the politics of using research to guide policy to insist on a role for end-users in the process. Perhaps NAGB's use of Visioning Panels, in which a percentage of the panel must be practitioners with classroom experience, could serve as a model.

Policy Recommendation #2: Congress could direct IES to identify and address research needs to support stronger understandings of literacy development.

NGR refers to research that stimulates new policy solutions to longstanding challenges in education practice. This idea is informed by the National Institutes for Health Next Generation Research Initiative. New generation research is a novel set of interdisciplinary grounding assumptions about the seemingly intractable problems of education and other social disparities. NGR affirms that the disparity problems we see before us result from causes of poverty that can be addressed—as well as neglected by limited understanding about the historical antecedents of contemporary problems. NGR seeks to tighten the translation of research into practice and to better use practice to inform research design. It can enable us to learn from the mistakes of our past and ensure that new education research and policy interventions are guided by a broader and more representative group of researchers representing different institutional types, missions, and regions.

Congress could direct IES to conduct NGR to address (among other issues) the following research gaps: (a) the comprehensive study of teachers who achieve positive outcomes on national reading assessments with students of color, those who are from families experiencing poverty, and ELL students; (b) engagement with scholars from Historically Black Colleges and Universities, Hispanic-Serving Institutions, and Tribal Colleges and Universities in the design and conduct of studies; mining data from NAEP and other assessments to find reading skill subsets in which Black, Latine, particular Asian American communities and Indigenous students, English Language Learners, and students from families experiencing poverty are scoring comparably to their more affluent white peers; and

(c) contributing factors to low reading comprehension, particularly for students in grades 4-12. Use of these data should inform a strategy infrastructure to reverse reading achievement deficits.

An expanded research base on the nature of reading development and the conditions that support that development should focus not just on the early years of life and the first years of formal schooling, but on the later years of formal education and transitions into early and later adulthood. For this reason, longitudinal investigations over the lifespan that complement cross-sectional studies are essential. Longitudinal databases serve as invaluable reservoirs of knowledge for mapping critical relations between individuals' linguistic development and major neurocognitive, biophysiological, sociocultural, economic, and environmental conditions that occur across the lifespan. Further, longitudinal research is essential for recognizing how significant large-scale events such as increases in life expectancy, climatic and health crises, or the rapid advancement of technologies transform the form, complexity, and mode of texts that individuals are required to read, alter the purposes for reading, and reshape how and when literacy supports are required for continued growth and optimal performance.
The IES' most recent broad investment in research on reading comprehension was the Reading for Understanding Research Initiative, which supported five longitudinal projects, across them examining the multiple pillars of reading comprehension. The National Academy of Education organized an analysis of the findings across the multiple projects (Pearson et al., 2020), identifying both congruent big ideas as well as new lines for further research.

Policy Recommendation #3: Congress could commission an interagency study on reading development across the age span.

Such a study would build on its efforts to address children's literacy by commissioning an interagency longitudinal study led by IES on reading development across the age span. Based on the findings in the longitudinal study, Congress could direct IES to plan for additional research. The findings would also inform congressional legislative action as well as administrative efforts by the U.S. Department of Education.

Policy Recommendation #4: Congress could commission the National Academy of Sciences, Engineering, and Medicine to synthesize research to strengthen literacy development.

Specifically, this undertaking would involve researching, synthesizing, and identifying gaps in the science of literacy research, including the integration of human development and neurosciences findings that inform how we understand human learning, and share the information with states, districts, schools, teachers, parents, and institutions of higher education.

STRENGTHEN TEACHER PREPARATION AND PROFESSIONAL DEVELOPMENT

National Center for Education Statistics (NCES) surveys of Pre-K-12 teachers indicate that they believe that reading is one of the most difficult subjects to teach. Additionally, students of color and those from families experiencing poverty are the least likely (when compared to their white more affluent peers) to have a teacher certified in reading/language arts teaching them. Teacher pedagogical knowledge and instructional skills are critical levers shaping students' ability to read and develop other literacy skills.
There is evidence to support enhancing pre- and in-service teacher coursework and professional development in strong evidence practices. This could be accomplished by synthesizing the research on essential relationships between human development/neurosciences research and reading and literacy skills development so that the research is accessible and able to inform and be used by preK-12 teachers and school administrators.

Finally, reading proficiency depends on an extensive array of school and community conditions. Thus, in- and out-of-school supports are needed to spur and sustain pre-K-12 students' reading achievement and literacy skills.

According to a number of NCES studies, self-reported information from early childhood and elementary school teachers about the amount of coursework in methods of teaching reading that they took during their preparation programs are positively related to the frequency of various instructional practices that, in turn, are associated with higher student achievement. In these studies, completion of coursework in methods of teaching reading was positively associated with the use of phonics instruction, mixed-achievement grouping, student-centered instruction, and reading and writing activities (IES, 2006). Additionally, teachers who report taking two or more courses in pedagogy related to reading reported placing a greater emphasis on mixed achievement grouping than teachers who did not take any reading methods coursework. Taking four or six or more such courses was also associated with a greater emphasis on student-centered instruction than taking no reading methods coursework. Taking six or more courses was associated with a greater emphasis on phonics and reading and writing activities compared with no coursework. Additionally, studies show that urban school students of color receive more reading instruction that focuses on phonics/phonemic awareness but continue to underperform their suburban and rural peers on NAEP and other reading assessments (IES, 2006).

Policy Recommendation #1: Congress could direct the U.S. Department of Education to conduct a study on educator preparation programs.

Such a study would examine how educators are receiving preparation on the science of literacy and training on reading pedagogy, including through the connections to human development, the Science of Learning and Development more broadly and the neurosciences. This study can include investigating how to support students most affected by the reading crisis, particularly children with disabilities, English Language Learners, students of color, and students from low-income families. This study, which is required annually under Title II of the Higher Education Act, would also build on congressional efforts to reauthorize the Education Sciences and Reform Act through the Advancing Research in Education Act (S. 3392), which proposes to collect data on the availability of teacher and school leader preparation programs specific to core academic content areas through the NCES.

Policy Recommendation #2: Congress could provide funding to support expanding educator preparation programs' reading instruction coursework for early childhood as well as elementary and high school teacher candidates.

Such investments could include programs such as the Teacher Quality Partnership program and the Augustus Hawkins Centers for Excellence Program that support educator preparation as well as expansion of a diverse teacher workforce to facilitate greater student achievement. This investment would help ensure pre-service teachers have more reading instruction coursework and exposure to human development and neurosciences research that is tied to evidence-based reading and literacy skill development; and receive preparation about how to teach and support students most affected by the reading crisis, particularly children with disabilities, English Language Learners, students of color, and children from low-income families.

Policy Recommendation #3: Congress could sustain and improve educators' knowledge and skills to effectively implement the evidence-based Science of Reading.

Congress could call on the U.S. Department of Education to require the What Works Clearinghouse to issue practice guidance on literacy instruction that integrates research-based strategies across literacy, human development, learning science and neuroscience to help support students' reading development. In addition, Congress could support developing and enhancing classroom instruction that fosters students' literacy skills with attention to students' SEL through programs such as the Supporting Effective Instruction State Grants and the Supporting Effective Educator Development program.

Policy Recommendation #4: Congress could ensure that students have access to qualified and effective teachers, as required under the Elementary and Secondary Education Act (ESEA)..

Under ESEA, states are required to report and collect data on the equitable distribution of qualified and effective teachers among schools. Congress could work with the U.S. Department of Education to provide clear guidance for states around the monitoring and reporting of these data. In addition to student access to qualified and effective teachers, Congress could work with the U.S. Department of Education to ensure that schools, particularly urban and rural schools serving students living in poverty, have as essential members of the school's support team highly qualified reading specialists and interventionists to support teachers and students with the greatest needs; and to include social service and health support teams because the conditions contributing to strong academic achievement and holistic well-being are not limited to classrooms.

EXPAND ACCESS TO READING SUPPORTS IN THE CLASSROOM, SCHOOL, AND COMMUNITY LIBRARIES

While teachers are the most integral part of a basic education, no public education system can effectively teach students basic and advanced literacy skills without adequate facilities and resources. Urban schools—particularly those serving students of color, students from families experiencing poverty, and English Language Learners—and rural schools are markedly less likely to have a reading or language arts teacher certified or with a college major or minor specialized in literacy. Additionally, these students are less likely to have access to classroom, school, and neighborhood libraries. Even in those instances where libraries do exist in under-resourced communities, staffing and book holdings are far less than those in wealthier communities. The American Library Association reports that a series of state-based research studies found that the percentage of students scoring proficient or above on reading tests was higher for schools with more hours per typical week of professional librarian staffing, more staff time spent weekly delivering information literacy instruction to students, cooperative planning with teachers and in-service training for teachers, and collection development policies that address challenges to library materials. Additionally, summer reading programs especially for preschool students support school transition and, in later elementary school grades, students' love of reading.

Policy Recommendation #1: Congress could expand access to high-quality library materials and librarian training through the Innovative Approaches to Literacy Program (IAL).

Research shows that reading laws across states lack a comprehensive focus on supporting teachers and students beyond the classroom setting (Neuman et al., 2003). Congress can support the professional development of school librarians, expand access to high-quality hard copy and digital books, and other instructional materials and resources for classroom and school libraries, especially in urban and rural school districts and for schools with large percentages of students from low-income families.

Policy Recommendation #2: Congress could support literacy development by providing support for state literacy grants and out-of-school time programming.

Further, Congress could also strengthen literacy development and enhance literacy instruction through Comprehensive Literacy State Development Grants. This program, which supports both birth through kindergarten early literacy as well as kindergarten through grade 12 literacy, is vital to addressing gaps in resources and staff capacity by strengthening pre-service reading courses, providing literacy coaches, enhancing licensure requirements, and making promising instructional practices to improve literacy achievement widely available, including through national evaluation and information dissemination conducted by the IES. In addition, out-of-school time programming through the 21st Century Community Learning Centers is vital to literacy

development, fostering a love of reading and writing, and SEL. States like Oregon have established a K-5 literacy initiative using funds from the 21st Century Community Learning Centers grant program (Oregon Department of Education press release).

Policy Recommendation #3: Congress could provide literacy support to educators, library workforce, students, and families and improve coordination of high-quality materials and resources between schools and libraries through the Library Services and Technology Act.

Libraries are a critical component to promoting literacy in communities and enhancing the support and resources to improve reading achievement. Congress could also provide support for the Institute for Museum and Library Services to further improve the evaluation and dissemination of evidence-based best practices.

CONCLUSION

There is a dire need to improve literacy outcomes for our children, adolescents, and adults. Developing civic individuals who are capable and committed readers, who also see reading as a resource for lifelong internal and personal development, are essential to our democracy.

As states take on this consequential challenge and the federal government considers actions it can take, it is essential that efforts at all levels be informed by the fullness of the Science of Reading, including the breadth of well-established research on the multiple dimensions of comprehension that rigorous teaching must encompass. As we have seen, states implementing the Science of Reading approach especially well are supporting the implementation by deploying literacy coaches, updating teacher-preparation programs, and providing explicit training for current teachers in the Science of Reading. These states are also supporting all educators—not just reading teachers—in learning evidence-based reading practices. It is crucial that improving student literacy be an all-hands-on-deck effort.

It is equally important that such efforts moving forward focus on a comprehensive approach to reading development and literacy instruction. The current research from the neurosciences, human development as well as the Science of Learning and Development more broadly, and the learning sciences make it unequivocally clear that human learning is not purely a cognitive experience, that learning unfolds in dynamic ways as humans experience the social, the emotional, and the relational dimensions of their participation in routine and unexpected practices in the world, including classrooms (Spencer, 2006). It is also important that we take a broad ecological focus to support children's literacy development; we must understand that learning, and most certainly learning to comprehend a wide variety of kinds of texts, is not constrained to classrooms and should not be viewed as the sole responsibility of individual teachers. There is much we can learn from examining the ecological infrastructures that other nations around the world who outscore the U.S. on international assessments create to support children, families, teachers, the broad staffing needs for schools and schools as learning communities (OECD, 2010).

In closing, we recommend policymakers consider the full breadth of research on literacy to enable strong reading development and to improve teacher knowledge and their ability to deliver rigorous instruction, including through an integrated approach to building foundational reading skills that also focus on comprehension, language, knowledge, and SEL.

For a robust summary of the above key strategies and policy recommendations, please see the forthcoming executive summary.

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APPENDIX 1

THE ROLE OF LANGUAGE IN LITERACY

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Transforming how we support students' literacy learning in public schools is at the core of educational equity and excellence today. In a world where knowledge is updated at ever greater speed, where collaboration across differences is ubiquitously required to find solutions to complex problems, and where distant communication via text is ever more prevalent in learning, working, and civic participation, preparing students to be skilled independent readers is of utmost importance. This means that preparing students to be successful readers entails not only teaching them how to read aloud the words in a text, but preparing them to comprehend what they read in ways that allow them to learn from texts; in other words, preparing students to be able to "read to learn".

In this current world, which presses schools to prepare students with more advanced literacy skills than ever before, large proportions of U.S. students are ill-served by schools and teachers which are themselves unsupported to provide effective evidence-based literacy instruction (NAEP, 2024). Yet, the awareness of this crisis and the political willingness to address it offer a window of opportunity to create the conditions for schools and teachers to be optimally supported through evidence-based insights in their efforts to prepare students to become independent readers and learners.

Which evidence has the language-in-education field generated so far to inform what constitutes effective and viable literacy instruction? Specifically, what does educational research --conducted in partnership with educators, students, and school leaders-- reveal about what areas are important in preparing students to "read to learn"? One area that the latest research has highlighted as a crucial, yet often overlooked, component of literacy instruction is **students' knowledge of vocabulary and language structures**. As defined in the 2026 NAEP Reading framework, knowledge of vocabulary and language structures refers to "the application of the reader's understanding of individual words, grammatical structures, and discourse structures characteristic of grade-appropriate texts to text comprehension." Research highlights the need to expand students' knowledge of vocabulary and language structures to support reading comprehension from early on (as early as pre-K), during the early primary grades, and all the way throughout adolescence.

Overall, developmental and intervention literacy research has produced strong evidence in support of explicit instruction of code-based skills (phonics, sight word recognition) as beneficial for early readers and struggling readers; and has also generated robust evidence in support of the intentional **expansion of students' vocabulary and language structures in the service of amplifying content knowledge, strategic text comprehension, and conceptual understanding** for all students throughout schooling. Importantly, knowledge of vocabulary and language supports not only text comprehension, but also facilitates word recognition (Perfetti & Stafura, 2014). Extensive developmental research reveals that code-based skills are sources of variation early in development, while meaning-based skills (vocabulary and language structures, background knowledge) are sources of individual variation throughout development (RAND, 2002; Stanovich, 1986). Rigorous intervention research shows that to support meaning-making skills, successful instruction entails content-rich literacy approaches that expand students' background knowledge, as well as their knowledge of vocabulary and language structures characteristic of school texts, through active participation in the service of conceptual understanding and learning (Cervetti, et al., 2020; Duke, et al., 2021).

Evidence from numerous studies with both monolingual and multilingual students reveals that without understanding individual differences in the language resources that students bring to school and without attending to the language demands for reading, writing, and learning, "schools run the risk of maintaining and even exacerbating the inequalities present in the larger society" (Uccelli, 2023, p. 192). Below, we summarize five key findings on the role of language knowledge for reading development and instruction.

1. **Students differ widely in their knowledge of vocabulary and language structures characteristic of school texts.** Variability in vocabulary knowledge from early on and throughout development has been extensively documented and identified as one of the most significant predictors of reading comprehension (e.g., Anderson & Freebody, 1981; Biemiller & Slonim, 2001; Justice & Jiang, 2023; Hemphill & Tivnan, 2008; Perfetti & Stafura, 2014; Silverman et al., 2015; Snow, et al., 1998; Stahl & Nagy, 2006). In their empirical study with a sample of several hundred low-income children in 16 urban schools, Hemphill & Tivnan (2008) conclude: "Beginning-of-1st-grade letter-word identification and word attack skills were the strongest predictors of reading comprehension at the end of 1st grade. However, **vocabulary was the best predictor of reading comprehension at the end of 2nd and 3rd grades.** The predictive power of early print-related and phonemic-awareness skills diminished over time, yet vocabulary scores remained an important predictor. Results support an early **emphasis on developing meaning skills to prepare low-income children for success in literacy**." (p. 426) These findings are consistent with extensive research that shows that some skills are sources of variation early in development (phonological skills, word recognition) but not later, while others are sources of individual variation throughout development (vocabulary, background knowledge) (RAND, 2002; Stanovich, 1986; Pearson et al., 2020).

More recently, research has shown that large proportions of adolescents (grades 4 to 8) have not been supported to be able to understand the vocabulary and language structures characteristic of school texts within and across content areas (Bailey, 2007; Schleppegrell, 2004). Thus, throughout adolescence, students continue to need support, not only with technical terms and discipline-specific language structures (Schleppegrell & Fang, 2008), but also with the general language of academic texts. This includes general academic vocabulary (e.g., hypothesis, structures, contradictory); words that connect ideas (e.g., nevertheless; consequently); complex words and sentences; and the structures of content area texts (e.g., structure of expository texts, scientific explanations) (Kieffer & Lesaux, 2012; Barr et al., 2019; Meyer, 2017; Uccelli, et al., 2015). Research shows that this is an area of growth for many monolingual as well as multilingual students, many of whom are already skilled in word recognition, and are sophisticated language users and communicators in many other non-academic contexts (Phillips Galloway & Uccelli, 2019; Silverman et al., 2015; Uccelli & Phillips Galloway, 2017). These results reveal that for large proportions of students, the language of content-area texts functions as a gatekeeper, highlighting the urgent need for pedagogical attention to language to support students' progress in reading to learn.

2. **Instruction needs to attend to meaning-making skills.** Intervention research is consistent with the findings from developmental studies summarized above. Even though readers are able to learn new vocabulary incidentally from reading (Nagy et al., 1985), the striking individual differences in students' language knowledge --which in turn compromise their ability to read with comprehension-- make the expectation of having students learn new vocabulary independently from text unrealistic for large numbers of developing readers. Consistent evidence has led to wide consensus in the field for the need of instructional practices that intentionally and explicitly scaffold vocabulary and language structures. Instructional approaches designed to attend to the language of text have shown to lead to significant gains in students' learning as early as preschool, during the primary grades, and throughout adolescence (Wasik, et al., 2011, Jones, et al., 2019; Pearson, et al., 2020; Proctor et al., 2020; Snow, et al., 1998; Snow et al., 2009; Wijekumar, et al., 2017).

3. **Discussion-based instruction as an important component of reading instruction.** Rigorous developmental and intervention studies reveal the importance of expanding students' language and literacy through discussion. School and home environments in which young children and adolescents participate with teachers or parents in back-and-forth conversations contribute to children's language and literacy learning (Michaels, & O'Connor, 2015; Michaels, et al., 2008; Romeo, et al., 2018; Rowe & Snow, 2020; Uccelli, et al., 2018). Back-and-forth conversations refer to interactive extended conversations, such as narratives, explanations, text-based discussions, discussions of emotions and perspectives, or debates. Through discussion with others, children and adolescents expand their language, their knowledge about the world, their comprehension of others' perspectives, and their understanding of written texts. In fact, children learn language by using language, and thus, they learn the language of school texts by engaging in discussions about texts and ideas. Aligned with this, intervention research shows that classroom discussion is an effective mechanism to support students' reading comprehension during the elementary, middle-school, and high-school years (Goldman, et al., 2016; Jones et al., 2019; Murphy et al., 2009). Language learning needs to be scaffolded from early on to support the ongoing acquisition of the vocabulary and language structures readers need to understand text; it cannot wait until the later years. Despite the robust evidence in favor of discussion-based approaches to promote reading to learn, classrooms tend to be dominated by teacher talk with students often having minimal opportunities to actively participate in the discussion of ideas and, thus, in using and learning the language of school texts (Applebee et al., 2003). Robust and recent research calls for the transformation of classes so that students learn better through active participation in the discussion of texts, ideas, and information. On the basis of three distinct research projects supported by the Institute of Education Sciences, Goldman et al., (2016) aptly highlight three common features of productive instruction for reading for understanding: "(a) students purposefully engage with multiple forms of texts and actively process them, (b) instructional routines incorporate social support for reading through a variety of participation structures, and (c) instruction supports new content learning by leveraging prior knowledge and emphasizing key constructs and vocabulary." We now turn to this latter point.

4. **Combined teaching and learning of language and content is needed.** It is important to acknowledge that reading to learn is influenced by many factors beyond language (e.g., motivation, prior knowledge, cognitive strategies). Foundational reading comprehension research (Anderson, 1984; Kintsch, 1994) as well as recent research (O'Reilly et al., 2019) shed light on the crucial role of content knowledge in text comprehension. Expanding students' knowledge to support text understanding is intimately related to language learning. In fact, the most recent research recommends precisely expanding students' knowledge and understanding while scaffolding language learning through active participation in authentic disciplinary practices (Cervetti, et al., 2016; Osborne, 2014). While perhaps counterintuitive, it is precisely in the context of discussing, reading, and writing about rich content with demanding reasoning skills that language is learned more effectively. Yet, this requires intentional scaffolding to expand students' knowledge of the language of texts through content-rich instruction. Recent successful interventions call for students' authentic participation in content-rich literacy instruction: the "sustained and thematic content literacy" approach (Kim et al., 2023) and the use of "informational texts that cohered around a set of concepts related to [a] topic" (Cervetti, et al., 2016) are recent examples of successful literacy instruction shown to improve students' content knowledge, knowledge of the language of texts, and reading-to-learn abilities.

5. **English-learning multilingual students need to participate in cognitively demanding and linguistically supported instruction.** Instruction cannot wait for English-learning multilingual students to develop English proficiency before they participate in content-area classes with rich content and demanding higher-order thinking skills. It is through scaffolded participation in these classes that students will learn the language of the disciplines and how to understand and reason with disciplinary texts (Estrada, 2014; Walqui & Bunch, 2020).

In sum, rigorous research recommends an integrative approach to literacy instruction; in other words, instructional approaches that explicitly teach code-based skills to support word recognition, but which also offer students plenty of engaging, content-rich opportunities to engage and discuss texts and ideas through teaching that intentionally expands language and knowledge to support reading to learn (Lee, 2023). Far from quick fixes, this crisis calls for evidence-based viable approaches that embrace the full complexity of preparing students to "read to learn" in today's world.