**ORIGINAL PAPER** 



Check for updates

# Guest Editorial: The Power of the Science of Behavior in Today's Literacy Crisis

Shannon S. Hammond<sup>1</sup> · Denise Ross<sup>2</sup> · Gwendolyn Cartledge<sup>3</sup> · Jane Howard<sup>4</sup>

Accepted: 21 May 2024 / Published online: 10 July 2024 © Association for Behavior Analysis International 2024

The idea of literacy as a tool for social justice is not a recent concept, and others have discussed it in their work (Muhammad & Love, 2020). Likewise, the concept of science-based reading instruction is not new, as can be seen from the national "Science of Reading" legislation being enacted across the country (Schwartz, 2024). However, what is relatively novel in today's context is the proposition that behavior analysts can play a vital role in addressing the literacy crisis for children with disabilities, children from economically disadvantaged backgrounds, and English Language Learners. Although various systemic factors contribute to reading disparities, educators remain responsible for ensuring that all children can read proficiently. Thus, as behavior analysts grapple with how to make a difference in the lives of educationally marginalized children, we argue that addressing reading disparities is one area where our work can have a lifelong impact.<sup>1</sup>

This special section of *Behavior and Social Issues* was created to address the need for effective, science-based instruction to improve the reading outcomes of educationally marginalized students. The issue of low literacy in the United States disproportionately affects students with disabilities, students who are English Language Learners, and economically disadvantaged students. For example, whereas 66% of all students in the United States read at a basic or below basic level in 2022, 80% of all economically disadvantaged students read at a basic or below basic level. Likewise, 89% of students with disabilities and 90% of students who are English Language Learners read at or below a basic level in 2022 (National Center for Education Statistics, 2022). National reading outcomes show that these subgroups

- <sup>1</sup> National Louis University, Chicago, IL, USA
- <sup>2</sup> Kennesaw State University, Atlanta, GA, USA
- <sup>3</sup> Ohio State University, Columbus, OH, USA
- <sup>4</sup> Therapeutic Pathways and Blue Spring Pediatrics, Modesto, CA, USA

<sup>&</sup>lt;sup>1</sup> According to a United Nations Educational Scientific and Cultural Organization (UNESCO) report, "marginalization in education is a form of acute and persistent disadvantage rooted in underlying social inequalities" (UNESCO, 2010, p. 135).

Shannon S. Hammond shammond2@nl.edu

of students have been reading at a basic or below basic level for several decades (National Center for Education Statistics, 2022). There is a need, therefore, for effective reading instruction that affects students' outcomes at both a micro and macrosystem level.

#### The Impact of Low Literacy on Children's Lives

Imagine that you are a fourth-grade student who reads at the second-grade level. While taking the annual state reading test, you encounter the following sentence: "The city Atri, tucked away in the Abruzzi mountains in Italy, was famous for two things—a bell and a horse."<sup>2</sup> You read the words haltingly, sounding out the letters and word parts that you can recognize, and skipping over words that you cannot pronounce. When you finally finish reading the sentence and the remaining passage, you are unable to answer the comprehension questions that follow because you can't understand the words in the passage as you read them. Moreover, you have had years of frustrating moments like this when reading, leading you to conclude that you are just not a "good reader." In the future, you choose to avoid reading whenever you can. This avoidance results in missed opportunities to build vocabulary and background knowledge, further impeding skill development.

This scenario may represent the experiences of thousands of children across the country. Without intervention, children who cannot read proficiently by at least third grade will continue to underperform in reading throughout their formal schooling as disparities continue to compound (Annie E. Casey Foundation, 2022; Stanovich, 1986). Compared to proficient readers, third-grade students who do not read proficiently are four times as likely to drop out of school and six times as likely if they are economically disadvantaged (Hernandez, 2012). Dropping out of school has long-reaching implications, including underemployment and lower wage earnings in adulthood (McFarland et al., 2019). The World Literacy Foundation estimates that illiteracy in the United States costs the country approximately \$300.8 billion due to losses in healthcare, education, employment, and civic engagement (Cree et al., 2022). This issue is so pervasive in the United States that at least 37 states have adopted "Science of Reading" (SoR) laws requiring the use of science-based, explicit reading instruction (Schwartz, 2024). Further, increasing the reading proficiency of fourthgrade students is now a national objective of the "Healthy People 2030" plan developed by the U.S. Department of Health and Human Services (Office of Disease Prevention & Health Promotion, 2020).

<sup>&</sup>lt;sup>2</sup> From National Assessment of Education Progress (2019). Fourth-grade reading sample question: "The Bell of Atri" as retold by Stephen Corrin. U.S. Department of Education, Institute for Education Sciences.

#### What is Reading?

Reading is commonly viewed as a repertoire that develops from a combination of decoding and language comprehension, including listening comprehension, irrespective of the age of the reader (Foorman et al., 2015; Hoover & Tunmer, 2018; Tunmer & Chapman, 2012). This concept, known as the Simple View of Reading (SVR; Gough & Tunmer, 1986; Tunmer & Chapman, 2012), or the newly expanded Active View of Reading (AVR; Duke & Cartwright, 2021), highlights the importance of language in the successful acquisition of reading (Tunmer & Chapman, 2012). Reading research conducted by the National Reading Panel (National Institute of Child Health & Human Development, 2000) further suggests that five key repertoires comprise successful reading during early childhood: phonemic awareness, phonics, vocabulary, fluency, and comprehension.

The SVR (Tunmer & Champman, 2012) is not in conflict with theories of reading acquisition in behavior analysis. Research in behavior analysis also shows that reading starts with listening comprehension when children are infants and toddlers (Greer & Speckman, 2009). As they acquire vocal verbal behavior, children's vocabulary expands through tacts (Greer & Speckman, 2009). When parents read to children, they learn to distinguish between letters, words, and pictures and books become conditioned reinforcers (Greer & Ross, 2008). Children learn to textually respond to print through explicit instruction (Archer & Hughes, 2011). Reading comprehension is demonstrated when children can emit simple comprehension responses (e.g., read–do responses) and more complex reading comprehension such as derived relational responses (Hayes et al., 2001). Research in behavior analysis provides more complex descriptions of the phases that comprise reading including language development, early textual responding, and advanced reading comprehension (see Ross & Greer, forthcoming).

## Why the Science of Behavior and Reading?

The field of behavior science has a long history of developing research-based instruction and interventions to address reading challenges. Contributions such as:

- Skinner's (1957) theory of verbal behavior provides a functional account of verbal operants including textual responding and writing.
- Precision Teaching, a teaching method that emphasizes fluency in classrooms, was developed by Ogden Lindsley based on his work with Skinner (Lindsley, 1990). His work strongly influenced widely used curriculum-based measures (CBM) such as the now nationally disseminated Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2002) fluency measures (Binder, 1994; Lindsley, 1986).
- Direct Instruction Reading programs, a group of curricula that use highly structured instructional design to effectively teach children and adults to read,

were developed and refined by Siegfried Engelmann and colleagues (Engelmann & Carnine, 1991; Stockard et al., 2018).

- Headsprout Reading, developed by T. V. Joe Layng, provides adaptive computerized instruction to teach young children to read (Layng et al., 2004).
- Learning and instructional design research by Tiemann and Markle (1991), Anita Archer (Archer & Hughes, 2011), Kent Johnson (Johnson & Street, 2004), Charles Greenwood (Greenwood, 1999), R. Douglas Greer (Greer, 2002), Douglas Carnine (Carnine et al., 2016), and Bill Heward (1994) contributed to a science of teaching that is applied to reading.
- School-wide systems of instruction, developed by R. Douglas Greer (Greer, 2002), Robert Horner (Horner & Sugai, 2015), and Kent Johnson (Johnson & Street, 2004), have affected scientific teaching practices in schools.

In 1997, a special section of *Behavior and Social Issues* highlighted many contributions related to these and other academic approaches that have been used to improve reading. Since there have been significant advances related to reading research. For example, the role of derived relational responding (Hayes et al., 2001) and incidental bidirectional naming (Inc-BiN; Hranchuk & Greer, 2024) have advanced the understanding of both language acquisition and reading comprehension. These and other advances may help address reading disparities experienced by some children.

#### **Overview of Articles in the Special Issue**

We believe that it is important to provide effective, science-based reading instruction for all children, especially those who are educationally marginalized. As behavior analysts and educators, we hope to contribute to the larger discourse about reading and positively affect the number of children who receive effective science-based reading instruction. Our goal is to share some contributions of behavior science to reading and highlight work that still needs to be done. Based on submissions received, we broadened the scope of our original vision for this special section. For example, seminal research on early mathematics skills indicates that the mathematics performance of young children is a strong predictor of their later academic achievement and reading performance (Duncan et al., 2007). For this reason, submissions focused on math literacy were deemed appropriate for inclusion. In another example, you will see the inclusion of work on literacy outside of the United States. All articles are briefly described and organized by their main purpose (i.e., literacy skill acquisition, affecting literacy at the microsystem level, deepening our conceptual understanding of literacy and the impact of applied behavior science).

## **Establishing Early Literacy Repertoires**

Many of the contributors to this special section investigated the acquisition of specific skills required for textual responding (i.e., naming, phoneme segmentation, letter sounds, decoding, and fluency), demonstrating that word reading requires a multitude of skills that can be, and often requires, direct and explicit instruction (Abdool-Ghany & Fienup, this issue; Brown & Cariveau, this issue; Byers & Singer-Dudek, this issue; Kennedy & Cariveau, this issue; Laurent-Prophete et al., this issue; Mellon & Greer, this issue; Newsome et al., this issue). Two studies focused on mathematics while providing a rationale as to how building math repertoires would positively affect other areas of literacy (Maurilus & Greer, this issue; Robbins et al., this issue).

Abdool-Ghany and Fienup (this issue) describe their research on incidental bidirectional naming (Inc-BiN). First, they developed criteria to determine if Inc-BiN was partially or fully in a preschooler's repertoire. Then, they assessed the effects of establishing Inc-BiN on the acquisition of novel tacts and correct textual responses for students previously missing an Inc-BiN repertoire. Their results showed that preschoolers with Inc-BIN acquired textual responses more rapidly than when Inc-BiN was not in their repertoire. This study is important because it adds to the growing and existing body of research on the role of naming in the acquisition of vocabulary and textual responding (Hranchuk et al., 2019). Moreover, it adds a way to assess for Inc-BiN.

Byers and Singer-Dudek (this issue) examined the effects of establishing observational learning for young children. During classroom instruction, observational learning is important because children are often expected to learn from observing others during teacher-led group instruction. The authors developed methods to assess and then teach observational learning, showing that this repertoire is more likely to be present for students who are aware of their peers and that it can be established when missing. This study is one of a few studies to describe an assessment procedure for observational learning, which is important given its role in learning.

Mellon and Greer (this issue) used a composite-to-component vocal phoneme segmentation (CtCVPS) intervention to teach kindergartners textual responses through classroom instruction. Participants in their study learned to read, write, blend, and segment novel words after learning to segment sets of words into vocal phonemes. This study provides an intervention to establish textual responses for young children. It also adds to the literature on derived relational responding and relational frames in reading.

Brown and Cariveau (this issue) extended previous research examining emergent learning arrangements to teach letter-sound combinations, an important foundational literacy skill, to 5- and 6-year-old students. The participants acquired visual–visual and auditory–visual relations; however, equivalence did not occur. Visual and auditory differential observing response (DOR) training was required for participants to demonstrate the emergence of the textual relation. This study extends existing research on the use of emergent responses when establishing textual responding.

Laurent-Prophete et al. (this issue) demonstrated that teaching first-grade students derived relational responding increased complex reading comprehension responses such as producing metaphors. This study is significant because it extends research on Direct Instruction and provides a way to teach complex reading comprehension responses to early readers.

Newsome et al. (this issue) investigated the impact of the Fit Lite literacy intervention on the oral reading fluency (ORF) of second-grade students in a

rural school district. Students who received the intervention demonstrated more growth on the AIMSWEB ORF measure compared to classroom peers who did not receive the intervention. Moreover, students with the lowest baseline scores demonstrated the greatest growth and the classroom teacher noted that the students' increased reading skills positively affected the classroom environment. The Fit Lite Literacy intervention extends the work of Precision Teaching within a common classroom center's structure and provides an example of "scaling up" an intensive, individualized instructional program that would be cost-effective for school districts.

One empirical study and one descriptive literature review investigated the role instructional materials can play in textual responding (Kennedy & Cariveau, this issue; Lozy et al., this issue). Lozy et al. (this issue) examined the effects of visual and kinesthetic mnemonics on the acquisition, maintenance, and generalization of letter-sound combinations with 4- and 5-year-old children. Both Experiments 1 and 2 showed that pairing kinesthetic movements with phonemes was most efficacious but all interventions (kinesthetic, picture, and traditional grapheme-phoneme instruction) resulted in greater learning of letter sounds compared to no intervention (classroom instruction only). This study extends the literature on effective letter–sound acquisition for early readers.

Kennedy and Cariveau's (this issue) ancestral search of literature found that the simultaneous presentation of pictures with text may detrimentally affect word reading skills, at least for some learners. Of note, the negative effects of picturecompounds differed based on the experimental design with all single-subject design experiments demonstrating a negative affect compared to less than half of the between-subject design studies.

Taken together, these articles on early literacy support existing research in behavior science on how reading is acquired. According to research in behavior analysis, reading begins with the development of listening comprehension in infants and toddlers (Hart & Risley, 1995; Hranchuk & Greer, 2024). As children grow older, listening comprehension is joined to tacts, which are initially presented by caregivers, acquired through echoics (Skinner, 1957), and accelerated through Inc-BiN (Abdool-Ghany & Fienup, this issue; Hranchuk & Greer, 2024). When caregivers read books and print to their children, children learn to differentiate between words and pictures (Greer & Ross, 2008); books and text also become conditioned reinforcers through a pairing process (Maurilus & Greer, this issue).

Textual responding is acquired when whole words and grapheme-phoneme relationships gain stimulus control over children's responses to print through explicit instruction (Brown & Cariveau, this issue; Lozy et al., this issue; Mellon & Greer, this issue). Later, reading comprehension is demonstrated as children emit derived relational responses to both nonarbitrary and arbitrarily applicable relational stimuli (Laurent-Prophete et al., this issue). Each of these repertoires described above joins with the next repertoire in a developmental sequence that establishes reading (Greer et al., this issue). If any of these repertoires are missing, they can be established through operant procedures that rely on science-based teaching procedures and interventions such as those described by the articles in this special section of *BSI*.

## Math Literacy

Research on math literacy indicates that math performance in kindergarten is a strong predictor of fifth-grade reading (Duncan et al., 2007; Ten Braak et al., 2022). The first paper on math literacy, authored by Maurilus and Greer (this issue), used a stimulus–stimulus pairing intervention to increase math preference for preschoolers. When the stimulus–stimulus pairing intervention did not produce math preference for a particular learner, the researchers used conditioning by denial. Following the use of either stimulus–stimulus pairing or conditioning by denial, participants required fewer learn units to criterion to master a math concept, had more correct responses per session, and selected math more often in free play. This study adds to existing literature on conditioning preference and serves as a potential intervention when math (or reading) is nonpreferred.

The second article, authored by Robbins et al. (this issue) is based on the work of Tiemann and Markle (1991). The authors used the Morningside Model of Generative Instruction to support math instruction in a South African township. The authors applied the Morningside Model in a way that was culturally responsive to the South African students they were teaching. Their work not only demonstrates how behavior analysts can work together in a partnership to apply effective models of instruction but also the importance of considering context when engaging in partnerships with schools in differing cultures.

## Microsystems that Affect Literacy

The 2023 issue of *Behavior and Social Issues*, and the special section on Culturally Responsive Pedagogy (Kourea et al., 2023), emphasized the value of Bronfenbrenner's (1979, 2005) socioecological model in understanding how various systems affect educational equity. "It takes a village" is a familiar Nigerian proverb, but its application to securing literacy merits a closer look. Thus, the current special section also includes research that examines how microsystems, including parents, volunteers, community organizations, and schools, contribute to the fabric of contingencies that support literacy (Galbally et al., this issue; Gautreaux & Weber, this issue; Greer et al., this issue; Hernandez et al., this issue; Murdoch et al., this issue).

Hernandez et al. (this issue) used behavior skills training (BST) to teach volunteer reading tutors in a community-based adult literacy program. The program's goal was to support parents with low literacy in promoting early reading behaviors with their children. The preliminary data they collected suggest that BST was not only effective in teaching these specific strategies to tutors but also resulted in high approval of treatment acceptability.

Galbally et al. (this issue) engaged parents/caregivers, volunteer screeners, and community partners in surveys and interviews about their experience with the Early Language and Literacy Screening (ELLS) that was administered to children and their families. Data were collected regarding the feasibility and impact of screening efforts. Quantitative and qualitative data showed that stakeholders found the ELLS instrument easy to administer. In addition, parents and caregivers noted how the screening outcomes helped them advocate for their children's literacy needs in school.

Two articles focus on the Comprehensive Application of Behavior Analysis to Schooling (CABAS). Greer et al. (this issue) discuss how CABAS can be applied to general education in public school systems. Known as the Accelerated Independent Learner Model (AIL), the authors discuss specific components, including objectives, measurement, curriculum, classroom management, and student and teacher repertoires designed to individualize education to promote equity in reading and math literacy. Gautreaux and Weber (this issue) describe the sequential implementation of these basic components of the AIL model of CABAS across 2 years in an underperforming charter school as a part of a "turnaround" effort. Although not all components of the AIL model were implemented, their findings suggest a positive relationship between the implementation of the AIL model and student literacy.

Murdoch et al. (this issue) describe a Multi-Tiered System of Supports (MTSS) process evaluation approach focused on helping beginning reading teachers implement effective teaching practices. Elements of the MTSS process are described in the Literacy Analysis Planning Guide (LAP-G), a tool that organizes and describes evidence-based practices that promote literacy. Preliminary data suggest that participating teachers improved their capacity to engage in effective reading instruction.

## **Conceptual Understanding of Literacy**

Three articles discuss the key role that applied behavior science (ABS)/applied behavior analysis (ABA), and curricula derived from ABA/ABS, can have in improving literacy outcomes (Ramaswamy & Sudha, this issue; Stocker et al., this issue; Yurick et al., this issue). A set of conceptual articles by Ramaswamy and Sudha (this issue), Stocker et al. (this issue), and Yurick et al. (this issue) tackle the thorny but critical issue of the SoR relative to its definition, components, and effective applications for the most marginalized members of our society. The authors of these three articles all recognized the work and authority of the National Reading Panel (National Institute of Child Health & Human Development, 2000), identifying the basic reading components of phonemic awareness, phonics, fluency, vocabulary, and comprehension. They also were unified in the importance of the science of behavior (i.e., ABA or ABS) for effective instruction but differed in their description, or perception, of its application in this definition.

Stocker et al. (this issue), for example, analyzed the concept of the SoR in two parts: (1) the science of reading as identified by the NRP and (2) the science of behavior as presented in ABA (i.e., the relationship between behavior and the context in which it occurs) and provided specific examples of teaching within this ABA system. Ramaswamy and Lackey (this issue) do not specifically define the science of reading but, instead, extensively discuss the history, theory, design, components, and research of ABA instructional applications within Direct Instruction. Finally, Yurick et al. also stress the instructional advantages of ABA, detailing why ABA is a valid and research-based system for teaching reading through examples for each dimension of ABA (i.e., behavior, analytic, technological, replication, conceptually systematic, effective, and generality; Baer et al., 1968). In addition, they describe why reading is more than decoding and how other theorists might elaborate on the basic component skills of reading (see model of reading in Fig. 2 of their article). All three sets of authors contrasted instruction derived from ABA/ABS to less explicit, and less systematic approaches (e.g., Whole Language or Balanced Literacy).

## **Future Research and a Call to Action**

## **Future Research**

Several themes stood out in the calls for continued research in this special section. First, the empirical studies in this special section positively affected literacy acquisition. There is a need for continued research that demonstrates not only the effectiveness of teaching interventions in reading instruction but also the most efficacious instructional practices in school settings (Brown & Cariveau, this issue). Murdoch et al. (this issue) and Newsome et al. (this issue) provide strong examples of working within current classroom and school structures to affect teacher skills and student outcomes, respectively, ensuring their interventions were efficacious for both faculty and students.

Second, there is a need for future research that further investigates how verbal developmental cusps and derived relational responding affect a learner's acquisition of advanced textual responses and reading comprehension repertoires (Abdool-Ghany & Fienup, this issue; Brown & Cariveau, this issue; Laurent-Prophete et al., this issue). Third, assessment procedures to identify the presence or absence of verbal developmental cusps were described in three articles; future research could demonstrate the utility of these assessments when evaluating reading comprehension, observational learning, and language acquisition (Abdool-Ghany & Fienup, this issue; Byers & Singer-Dudek, this issue; Laurent-Prophete et al., this issue). Fourth, Kennedy and Cariveau (this issue) called for additional research on stimulus control technologies to assist in determining the specific task characteristics and participant reading repertoires that make a learner more or less likely to be affected by picture-text compounds.

Finally, articles in this special section suggest that making changes at the curricular and systems level (e.g., school level) is possible but continued examination is needed to address barriers such as teacher retention and other school-based contextual factors that affect implementation (Gautreaux & Weber, this issue; Greer et al., this issue; Murdoch et al., this issue; Robbins et al., this issue). Given the significant impact of teachers and their practices (Hattie, 2009), authors called for more pressure to use evidence-based programs and ensure teacher preparation programs are aligned with evidence-based, research-backed methodology (e.g., explicit, systematic instruction; Ramaswamy and Lackey, this issue; Yurick et al., this issue). Collaboration with other disciplines, including those engaged in the SoR work, may increase the sustainability and scalability of reading practices. Behavioral systems, interventions, and assessments such as DIBELS (Good & Kaminski, 2002), positive behavior intervention supports (PBIS; Horner & Sugai, 2015), and functional behavior assessment (FBA; Beavers et al., 2013) have been sustained because they were grounded in evidence, made accessible to educators and practitioners, and incorporated into national education policy.

Although we would not expect all topics to be addressed in this special section, there are a couple that are worth noting. First, most of the contributing authors addressed the importance of literacy proficiency and the need for effective instructional practices as a tool for equitable literacy access. What was not addressed was the role of culture and literacy (see *BSI* Special Sect. 2023). In addition, key areas of literacy such as morphology and writing were not included. Finally, all interventions in this special section, including studies with adult participants (Hernandez et al., this issue; Murdoch et al., this issue), were focused on increasing literacy skills for students under the age of 10. However, we cannot ignore the literacy needs of older emergent readers in this country (U.S. Department of Education, 2024). Behavior analysis with its science-based tools has something to offer in each of these areas of reading research and practice.

## A Call to Action

Ensuring that students can proficiently read and comprehend text empowers them to access other forms of education. One of, if not the most, important expectations of our educational system is to successfully teach our children to read. When we do not teach these skills, we are denying children the right to fully access education, resulting in fewer positive social and life outcomes after formal schooling (Hernandez, 2012). Below, we discuss a call to action from this special section of *BSI*.

## Whose Fault Is It?

A 9-year-old student, who was lamenting the fact that he could not read, made a profound statement that encapsulates the call to action for this special section: "I should be able to read and I can't," he said. "Now whose fault is it?" As we noted, educators remain responsible for ensuring that all children learn to read regardless of their background. However, we cannot ignore the societal systems and environmental factors that affect the educational outcomes of students with disabilities, English Language Learners, and economically disadvantaged students. Factors such as poverty, housing instability, food insecurity, immigration, and barriers to preschool access, among others, affect a child's well-being and educational outcomes. Thus, it is important to address these systems and avoid a deficit lens in which we attribute the problem of reading outcomes to individual children. Instead, we should view all children through an asset lens that sees their possibilities. In other words, although highlighting the needs of the specific groups discussed in this special section is intended to bring awareness and action, it is important not to blame reading

problems on the characteristics or identities associated with groups of children. Rather, we think of the children who are the focus of this special section as "Brilliant Children in Broken Systems" (Ross, 2024). The children are brilliant; the systems need fixing. Literacy instruction is one system that can be changed to empower children so they can succeed despite these broken systems.

## Joining the Literacy Movement

At present, there are increased calls for every child to have access to effective literacy instruction (Schwartz, 2024). Changes to state laws and educational policies, discussions about how teachers are prepared to teach reading and how students are assessed for reading proficiency, as well as our special education identification process, are all examples of how literacy is being used to change the outcomes of education. Is what we are witnessing the long-awaited merging of scientific knowledge and consensus for employing effective literacy practices? Is research informing and influencing the advocacy of state bills and policies, resulting in the use of researchaligned, evidence-based literacy instruction? How can we join the larger discourse on reading instruction to share the science of behavior and its tools?

## The Power of One

The science of behavior has undoubtedly influenced the field of education. We have a great deal of knowledge and many effective teaching tools. Still, literacy outcomes continue to be abysmal, and disproportionately so for educationally marginalized students. If these children are the measure, then we, as a community of behavior scientists, have not fully reached our goals to change socially significant behaviors to a meaningful degree (Heward et al., 2022). However, each of us has the power to change the outcomes of these children's lives. Imagine how generations of lives are affected when just one child learns to read, graduates from high school, attends college, and affects the world around them (U.S. Bureau of Labor Statistics, 2023). We can be the difference in their lives.

## Literacy is Social Justice

So, where do we go from here? What will we do with this knowledge and our tools? How will we propel reading research forward? How will we collaborate with other professionals? How will we utilize the tools of our science to significantly affect literacy instruction and the literacy and life outcomes for many individuals? The authors and editors in this special section of *BSI* call on readers to help determine how we can contribute to the building of an equitable education system that ensures every student's fundamental right to proficient literacy. Literacy is the baseline for a functioning democracy and fundamental to citizenship. Our unalienable rights—life, liberty, and the pursuit of happiness—require literacy. Literacy *is* social justice.

## In Gratitude

The phrase "It takes a village" is used to celebrate a community of people who come together to complete an important task. It took about 1.5 years to finish this special section of BSI and we would like to thank the "village" that came together to produce it. First, a special thank you to Dr. Traci Cihon, editor-in-chief of BSI, who started the process by asking us to guest edit a special section focused on literacy and social justice. Second, thank you to the guest editors—Drs. Shannon Hammond, Denise Ross, Gwendolyn Cartledge, and Jane Howard-who each work separately on issues related to the education of educationally marginalized children, but came together as a group to edit this special section. Third, thank you to the outstanding authors who sacrificed their time to write articles, carefully integrated the feedback from the editors and reviewers, and trusted BSI as an outlet for their research. One special group of authors, all busy mothers and entrepreneurs, formed a weekly writing group to convert their dissertations on literacy into manuscripts by the submission deadline. Those manuscripts represent several articles in this special section. Fourth, thank you to the many reviewers who spent time carefully reading these articles on behalf of BSI. Your great work is appreciated. Last, but most important, we thank the brilliant children whose lives inspired this special section, along with their families and educators. We believe in you.

Author Contribution All authors contributed equally to the conceptualization and writing of this article.

Funding This article was not supported by any funding mechanism.

**Data Availability** Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

## Declarations

**Conflicts of Interest** The authors declare that they do not have any conflicts of interest. Denise Ross serves as an associate editor for *Behavior and Social Issues* and was a guest editor for this special section; therefore, guest editors Shannon Hammond, Gwendolyn Cartledge, Jane Howard, and editor-in-chief Traci Cihon served as action editors for articles authored by Denise Ross. Guest editors Shannon Hammond, Denise Ross, Jane Howard, and editor-in-chief Traci Cihon served as action editors for the article authored by Gwendolyn Cartledge.

Ethical Approval No studies involving human participants were conducted to prepare this article.

## References

Annie E. Casey Foundation (2022). Early warning: Why reading by the end of third-grade matters.

- Archer, A. L., & Hughes, C. A. (2011). *Explicit instruction: Effective and efficient teaching*. Guilford Press.
- Beavers, G. A., Iwata, B. A., & Lerman, D. C. (2013). Thirty years of research on the functional analysis of problem behavior. *Journal of Applied Behavior Analysis*, 46(1), 1–21. https://doi.org/10.1002/ jaba.30

- Binder, C. (1994). Precision Teaching and curriculum-based measurement. Journal of Precision Teaching, 7(2), 33–35.
- Bronfenbrenner, U. (1979). The ecology of human development. Harvard University Press.
- Bronfenbrenner, U. (2005). Making human beings human: Bioecological perspectives on human development. Sage.
- Carnine, D., Silbert, J., Kame'enui, E., Slocum, T., & Travers, P. (2016). *Direct Instruction reading* (6th ed.). Pearson.
- Cree, A., Kay, A., & Steward, J. (2022). The economic and social cost of illiteracy: A snapshot of illiteracy in a global context. World Literacy Foundation. https://worldliteracyfoundation.org/wp-content/uploads/2022/08/The-Economic-Social-Cost-of-Illiteracy-2022.pdf
- Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, 43(6), 1428–1446. https://doi.org/10. 1037/0012-1649.43.6.1428
- Duke, N. K., & Cartwright, K. B. (2021). The science of reading progresses: Communicating advances beyond the Simple View of Reading. *Research Quarterly*, 56(S1), 25–44. https://doi.org/10.1002/ rrq.411
- Engelmann, S., & Carnine, D. (1991). *Theory of instruction: Principles and applications.* (rev. ed.). NADI Press.
- Foorman, B. R., Herrera, S., Petscher, Y., Mitchell, A., & Truckenmiller, A. (2015). The structure of oral language and reading and their relation to comprehension in kindergarten through Grade 2. *Reading* and Writing, 28(5), 655–681. https://doi.org/10.1007/s11145-015-9544-5
- Good, R. H., & Kaminski, R. A. (2002). Dynamic indicators of basic early literacy skills (DIBELS) (6th ed.). Institute for the Development of Educational Achievement.
- Gough, P., & Tunmer, W. (1986). Decoding, reading, and reading disability. *Remedial & Special Educa*tion, 7, 6–10. https://doi.org/10.1177/074193258600700104
- Greenwood, C. R. (1999). Reflections on a research career: Perspective on 35 years of research at the Juniper Gardens Children's Project. *Exceptional Children*, 66, 7–21. https://doi.org/10.1177/00144 0299906600101
- Greer, R. D. (2002). Designing teaching strategies: An applied behavior analysis systems approach. Academic Press.
- Greer, R. D., & Ross, D. (2008). Verbal behavior analysis: Inducing and expanding new verbal capabilities in new verbal capabilities in children with language delays. Pearson.
- Greer, R. D., & Speckman, J. (2009). The integration of speaker and listener responses: A theory of verbal development. *The Psychological Record*, 59(3), 449–488.
- Hart, B., & Risley, T. R. (1995). Meaningful differences in the everyday experience of young American children. Paul H. Brookes.
- Hattie, J. (2009). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. Routledge.
- Hayes, S. C., Barnes-Holmes, D., & Roche, B. (Eds.). (2001). Relational frame theory: A post-Skinnerian account of human language and cognition. Springer Science & Business Media.
- Hernandez, D. (2012). Double jeopardy: How third grade reading skills and poverty influence high school graduation. Annie E. Casey Foundation. https://www.aecf.org/resources/double-jeopardy
- Heward, W. (1994). Three "low-tech" strategies for increasing the frequency of active student response during group instruction. In R. Gardner, D. M. Sainato, J. O. Cooper, T. E. Heron, W. L. Heward, J. Eshleman, & T. A. Grossi (Eds.), *Behavior analysis in education: Focus on measurably superior instruction* (pp. 283–320). Brooks/Cole.
- Heward, W. L., Critchfield, T. S., Reed, D. D., Detrich, R., & Kimball, J. W. (2022). ABA from A to Z: Behavior Science applied to 350 domains of socially significant behavior. *Perspectives on Behavior Science*, 45(2), 327–359. https://doi.org/10.1007/s40614-022-00336-z
- Hoover, W. A., & Tunmer, W. E. (2018). The simple view of reading: Three assessments of its adequacy. *Remedial & Special Education*, 39(5), 304–312. https://doi.org/10.1177/0741932518773154
- Horner, R. H., & Sugai, G. (2015). School-wide PBIS: An example of applied behavior analysis implemented at a scale of social importance. *Behavior Analysis in Practice*, 8, 80–85. https://doi.org/10. 1007/s40617-015-0045-4
- Hranchuk, K., & Greer, R. D. (2024). General reflections on interactions between cross-disciplinary theories of human language development. *Psychological Record*. Advance online publication. https:// doi.org/10.1007/s40732-024-00588-y

- Hranchuk, K., Greer, R. D., & Longano, J. (2019). Instructional demonstrations are more efficient than consequences alone for children with naming. *Analysis of Verbal Behavior*, 35(1), 1–20. https://doi. org/10.1007/s40616-018-0
- Johnson, K. R., & Street, E. M. (2004). The Morningside Model of Generative Instruction: What it means to leave no child behind. *Journal of Direct Instruction*, 4(2), 143–157.
- Kourea, L., Gibson, L., & Lovelace, T. S. (2023). Guest Editorial: It is time for systemic change—A call for action in implementing inclusive and culturally responsive educational practices for young people. *Behavior & Social Issues*, 32, 182–190. https://doi.org/10.1007/s42822-023-00132-7
- Layng, T. V., Joe, T., & J. S., & Stikeleather, G. (2004). Selected for Success: How Headsprout Reading Basics<sup>™</sup> teaches beginning reading. In D. J. Moran & R. W. Malott (Eds.), *Educational psychology: Evidence-based educational methods* (pp. 171–197). Academic Press.
- Lindsley, O. R. (1986). In Memoriam: Eric C. Haughton 1934–1985. The Behavior Analyst, 9(2), 241– 242. https://doi.org/10.1007/Bf03391958
- Lindsley, O. R. (1990). *Precision teaching: By teachers for children*. American Association for the Advancement of Science.
- McFarland, J., Husser, B., Zhang, J., Wang, X., Wang, K., Hein, S., Diliberti, M., Forrest Cataldi, I., Mann, F. B., & Barmer, A. (2019). *The condition of education 2019*. National Center for Education Statistics.
- Muhammad, G., & Love, B. L. (2020). Cultivating genius: An equity framework for culturally and historically responsive literacy. Scholastic.
- National Center for Education Statistics. (2022). NAEP data explorer. National Assessment of Educational Progress.
- National Institute of Child Health & Human Development. (2000). Report of the National Reading Panel: Teaching children to read: Reports of the subgroups (00–4754). Government Printing Office.
- Office of Disease Prevention & Health Promotion. (2020). Social determinants of health: Healthy People 2030. U.S. Department of Health & Human Services. https://health.gov/healthypeople/objectives-and-data/browse-objectives/schools/increase-proportion-4th-graders-reading-skills-or-above-profi cient-level-ah-05
- Ross, D. E. (2024, February 7). Brilliant children. Broken systems: The power of the science of behavior in today's reading crisis [Blog post]. https://www.abainternational.org/constituents/practitioners/ behavior-analysis-blogs.aspx
- Ross, D. E., & Greer, R. D. (forthcoming). When text speaks: Learning-to-read & reading-to-learn. Sloan.
- Schwartz, S. (2024). The 'Science of Reading' in 2024: 5 state initiatives to watch. Education Week. https://www.edweek.org/teaching-learning/the-science-of-reading-in-2024-5-state-initiatives-towatch/2024/01
- Skinner, B. F. (1957). Verbal behavior. Appleton-Century-Crofts. https://doi.org/10.1037/11256-000
- Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, 21(4), 360–407. https://doi.org/10.1177/00220 57409189001-204
- Stockard, J., Wood, T. W., Coughlin, C., & Rasplica Khoury, C. (2018). The effectiveness of Direct Instruction curricula: A meta-analysis of a half century of research. *Review of Educational Research*, 88(4), 479–507. https://doi.org/10.3102/0034654317751919
- Ten Braak, D., Lenes, R., Purpura, D. J., Schmitt, S. A., & Størksen, I. (2022). Why do early mathematics skills predict later mathematics and reading achievement? The role of executive function. *Journal of Experimental Child Psychology*, 214, 105306. https://doi.org/10.1016/j.jecp.2021.105306
- Tiemann, P. W., & Markle, S. M. (1991). Instructional design and the development of expertise. Springer Science & Business Media.
- Tunmer, W. E., & Chapman, J. W. (2012). The simple view of reading redux: Vocabulary knowledge and the independent components hypothesis. *Journal of Learning Disabilities*, 45(5), 453–466. https:// doi.org/10.1177/0022219411432685
- U.S. Bureau of Labor Statistics. (2023). Education Pays, 2022. Career Outlook. U.S. Bureau of Labor Statistics. https://www.bls.gov/careeroutlook/2023/data-on-display/education-pays.htm

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.