

The Science of Reading: A Legacy and the Future

The science of reading. It's a term in search of meaning or perhaps it is a body of knowledge that got lost in translation. In recent months, researchers, practitioners, parents, advocates, and many others have debated the meaning of "the science of reading." Undoubtedly, they will continue to do so for the foreseeable future. In light of the term being placed in state initiatives across the nation, there is a need for a clearly stated definition. In short, the term means the body of evidence that has been amassed from research into reading – how it develops and how to teach and support its development. As such, the term the science of reading must rest on a solid foundation of actionable conclusions drawn from scientific inquiry.

When discussing the science of reading, it seems important to highlight that actionable science is settled science. Some people highlight a need for more research. It seems inevitable that there always will be cries for more research, which bodes well for a center devoted to undertaking such research. Yet, some areas are settled science. For example, teaching reading requires direct phonics instruction coupled with exposure to print. This is settled. However, the best way to expose developing readers to print is still in question – as is the most effective means of providing phonics instruction to different students. It is also settled science that vocabulary and background knowledge support reading comprehension. Yet, how best to support students in growing their vocabulary and background knowledge to aid them with reading comprehension is an active area of investigation. And some students likely need more support in these areas than others – an area actively being explored through research.



While there is a need for clarity around the term and more research, an exciting shift is underway, highlighting additional needs. People are coming to appreciate that more transitional research is needed in how best to teach all children to read. This is because the settled science does a good job describing what reading is and how it relates to writing and other language aspects. However, what to teach, when to teach it, and to whom to teach it is something that we frankly need to explore more.

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Introduction (continued from cover)

The Science of Reading: A Legacy and the Future

There is also a realization that educators need support with implementing practices based on what is settled science. This is an exciting development because it establishes a dichotomy between what is left to understand and what we can translate and act on at the moment. There is a need to explore how this happens, but just as importantly, there is a need to start making this vital work happen. Of course, translating science into practice and helping educators with doing so has been the center's work since its inception long before the science of reading was a thing. So, while the need for this work may be a revolutionary idea to some, it is what we have always been doing here at the center.

In this newsletter, we explore topics related to the science of reading and showcase our long-standing tradition of translating research into practice. This work has been central to all that the center has done to make literacy – reading and writing – a reality for all children, even those who struggle to learn these critical life skills. And it will remain the center's work long after the term “the science of reading” is retired and replaced by the next phrase that will take its place. ■



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Recent Findings

Examinations of Educational Disparities Highlight the Importance of Building Community within Schools

A vast number of elementary school children struggle with reading. This finding reappears across many empirical articles and national reports. Further, our data suggest these struggles are not restricted to word reading and spelling. More often than not, the child's struggles also include vocabulary and comprehension (Odegard et al., 2020). This issue of our newsletter is about reading instruction in the general education classroom. Reading difficulties can be alleviated with high-quality instruction. That instruction involves a highly trained and knowledgeable educator and access to resources. The focus becomes the classroom.

Specifically, it is about providing support, training, and materials to classroom teachers. This is crucial. Yet, working on classroom instructional practices in isolation will not solve society's struggles. A large literature examines the impact of other aspects of the child's environmental context on school performance. Educational disparities are often found in U.S. schools between students from diverse backgrounds. There are justifiable concerns that such disparities will only be exacerbated as discrepancies between those with and without resources, either tangible or intangible, are more apparent during this

pandemic. This data is also important to share, even if the story it tells is a difficult one.

For example, studies have examined the impact of sociodemographic factors on the trajectory of children's academic skill development. Some of these sociodemographic factors include ethnicity and the experience of poverty. It is well established that these factors link to social inequities. They may impact how people interact with you. They may shape expectations or implicit biases held by others. They may impact access to tangible resources. These outside influences may impact how you view yourself and your own capabilities. Moreover, the impact is particularly strong for children who are African American and children who are poor. These children are more likely to begin kindergarten with lower scores in reading. They exhibit a trajectory whereby year after year they are learning in school, but their scores are not increasing at the rate of their peers (Morgan et al., 2011).



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Examinations of Educational Disparities Highlight the Importance of Building Community within Schools

In other words, there are cumulative effects. Their reading struggles appear to be getting larger over time.

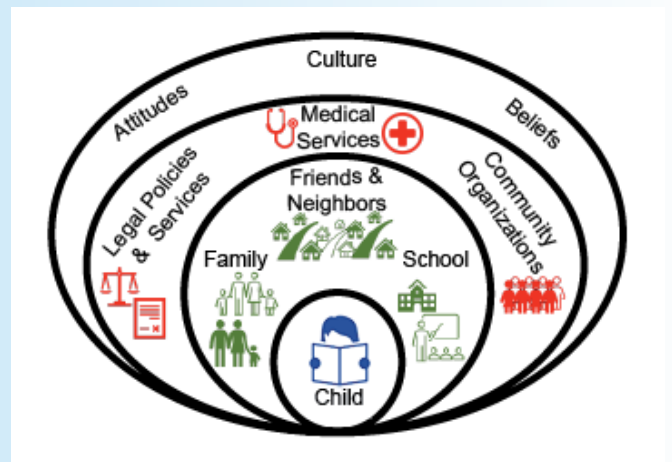
Preliminary findings from our lab with data from a state Department of Education align with these results. We examined reading scores from a universal screener. The scores were available for 15,000 kindergarten (K) students from 200 schools. These children represent about 44% percent of all K students in that state. The universal screening measure used in this sample has many scores. One score broadly represented foundational skills in phonological awareness, word reading, and decoding. Two other scores reflected vocabulary knowledge and listening comprehension abilities.

At the beginning of the school year, the average student is meeting grade-level expectations. Children begin to speak near the end of the first year of life. By the time formal schooling begins, they have a large amount of oral language skills. They learned this content in their homes and communities. Of course, some individuals may already be struggling or behind. But the data suggest many students had the requisite background knowledge. This knowledge helps them effectively engage with the new material that will be presented to them.

As the school year progresses, the amount of things a student is expected to know to stay on track with expectations increases. Students in our sample exhibited increases in their knowledge. The rate of increase observed varies across skills and across people. Some students show such large gains that their

relative standing compared to their peers' changes. Yet, this change in standing occurs in both directions. Some students demonstrate growth but appear to be losing ground and falling behind their peers. There are interactions between the growth rates and sociodemographic factors. The findings reveal how ethnic and socioeconomic disparities compound over time.

Children who experience greater levels of poverty exhibited smaller amounts of growth in all skills over the school year. African American children experience slower growth than their Caucasian and Hispanic peers. This means that children who are poor and African American are the ones who start out the lowest and grow the slowest throughout the school year.



Layers of ecological systems that impact a child. Adapted from Bronfenbrenner's bioecological systems theory.

Other researchers have focused on this particularly vulnerable population. One study examined low-income African American boys

and girls (Washington et al., 2019). The children came from the same neighborhood and schools. Their language skills and general abilities did not significantly differ in grades 1-5. Nor did they differ in growth across the years. Yet, gender differences appear in their reading skills in fourth and fifth grade. Specifically, African American boys' reading comprehension growth is not as fast as girls. Further, the boys' fluency skill development slows down over time. This study suggests that poverty levels and the school attended do not explain why African American boys struggle so much in school. There is a multitude of other variables that could influence this pattern of results. A full discussion of these factors is outside the scope of this piece.

Yet, the bioecological systems theory (e.g., Bronfenbrenner & Morris, 2007) pulls potential variables together. This theory emphasizes the importance of environmental context. It also emphasizes the interplay across different aspects of one's environment.

A child's school is one aspect of his or her environment. A school environment is complex on its own. There are lots of different people who have different roles within a school. It is especially important for each individual in the school community to be able to listen to, learn from, and provide support to each other. One way to assist in building the sense of community in a school is to establish dialogues across individuals who serve different roles. This task can feel arduous. Yet, it can be done when everyone in the room can agree on common goals. The ultimate goal for a school is to support students' development. The development is optimal when educators are knowledgeable of content and techniques, practiced in performing the techniques, sufficiently supplied, and empowered to act. Training opportunities from centers like ours

provide some of these ingredients. When educators whose primary roles are outside of the classrooms take part in training, they gain insight into the challenges that classroom teachers face. This insight may facilitate their ability to support and empower their colleagues. ■



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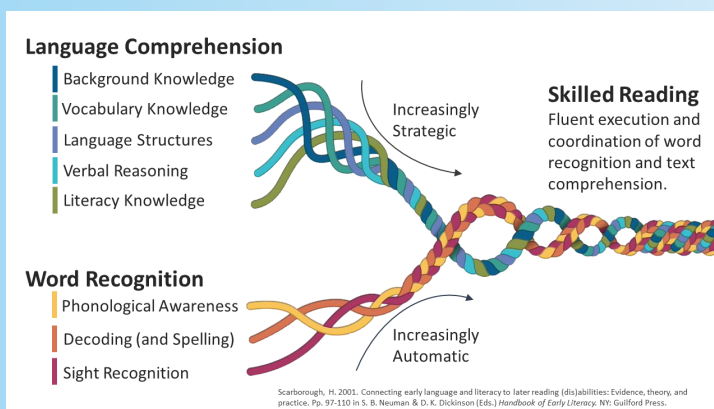
Center News

Introducing the 2020-21 Literacy Success Series

Developments in cognitive science and reading research have refined our understanding of how our brains learn to read. We know that reading is a language-based skill. Scarborough’s Reading Rope model shows how oral language (speech) comprehension and word reading are both needed to produce skilled reading. Most of our students come to school ready to expand existing oral language skills. They know how to order their words in speech and have learned many word meanings based on listening and speaking. Yet, most of our students do not enter school knowing how speech sounds are mapped onto letters. Most of our students do not enter school knowing how to blend and segment individual speech sounds for reading and spelling. Direct instruction in these word reading skills is beneficial for all developing readers. These foundational skills are not endpoints of reading instruction. As Scarborough’s Reading Rope shows, both oral language and word reading skills are

topic. However, conflicting information abounds on what constitutes evidence-based instruction, how and when to deliver it, and who needs it. As corporations, institutions, and politicians grapple with how to translate the science of reading into classroom instruction, this top-down approach can leave classroom teachers awash in competing information and motivations.

It is individual teachers working with their students who really determine the implementation of effective reading instruction. Well-informed teachers use their knowledge to evaluate resources and match them to their students’ needs. This bottom-up approach is as



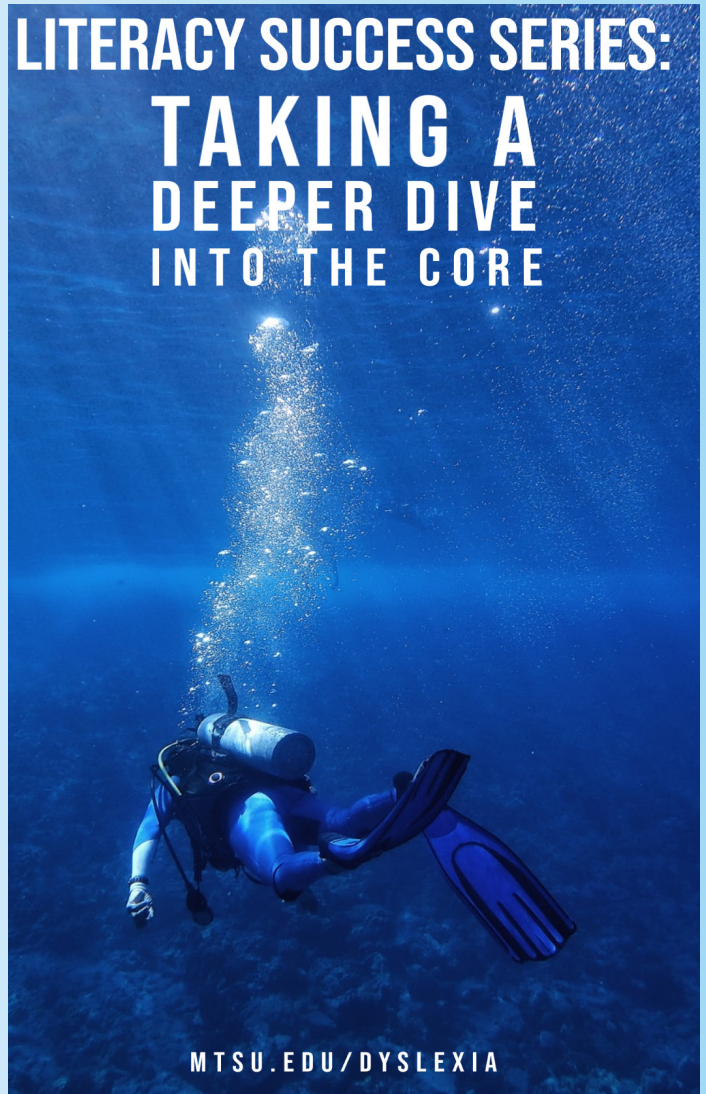
strengthened and entwined to best support reading comprehension. Evidence-based reading instruction has been studied by researchers, publishers, professional organizations, legislators, and state departments of education. It is important for these groups to be attentive to this

necessary as the top-down efforts in our goal to optimize our students reading achievement. Recently, the Tennessee Department of Education provided a free resource for teachers to support their instruction of vital early reading skills. The Tennessee Foundational Skills Curriculum Supplement includes essential literacy components for pre-K through second grades.

The center is dedicated to supporting teachers with evidence-based literacy instruction for all students. Our 2020-21 Literacy Success Series explains what constitutes evidence-based reading instruction. This series is designed for core/tier 1 classroom settings with diverse

student populations. All students benefit from explicit, systematic instruction of foundational skills in the early grades. This approach can serve as a preventative for students at risk of developing a reading disability (such as those with characteristics of dyslexia). Lessons from the Tennessee Foundational Skills Curriculum Supplement are modeled by a certified teacher. Intensifying instruction based on student need is also addressed. The series was designed with guided independent study to allow educators to build essential knowledge on their own schedules. We then meet together remotely for lesson demonstrations.

The series begins with a deep dive into phonological and phonemic awareness. Building these skills is vital for students to make the connection of speech sounds to letters as reading and spelling develops. Letter knowledge is the focus of the second session. This prepares students to understand the alphabetic principle. The series continues with research and modeling on direct, explicit, and systematic phonics instruction. This is an integral support for reading comprehension. The impact of explicit handwriting instruction on both reading and writing is detailed in the fourth session. The next session emphasizes our need to be intentional in building reading fluency so that words are decoded instantly. That allows the brain to focus on making meaning when reading. Attention to student progress is imperative. The series concludes with how assessment is used to group students and intensify instruction. We



enthusiastically welcome the cohort of educators who are taking this deep dive into foundational reading skills with us! ■

Conferences

“Characterizing the Knowledge of Educators Across the Tiers of Instructional Support” by Timothy N. Odegard, Emily A. Farris, K. Melissa McMahan, and Susan Porter in the published abstracts for cancelled presentations of the 27th annual meeting of the Society for the Scientific Study of Reading, which was scheduled for July 2020 but not held due to the COVID-19 pandemic.

Instruction Matters

The Science of Reading: Using Research to Guide Instruction

Lately there seems to be a lot of talk about the “science of reading,” along with a renewed interest in discussions on how to best teach children to read. Several states, including Tennessee, have recently made efforts to increase educators’ knowledge about the science of reading, to choose instructional materials that align with the science of reading, and to apply this scientific knowledge in the classroom.

What is the science of reading?

Reading is a complex task that has been widely studied. Decades of high-quality research on reading development has been conducted around the world and in many languages by scientists from several different disciplines. The “science of reading” refers to this large body of research that tells us how people learn to read, why some people have difficulty learning to read, and what kind of reading instruction is most effective. The science of reading is based on consistent findings from decades of studies, along with knowledge of how the brain learns to read.

The science of reading refers to research evidence. Thus, it is not a set of traditions, personal beliefs, or philosophies. While it is not a teaching method or program, the science of reading is the accumulation of evidence that should inform our teaching. This evidence tells us what skills we should teach and how we should teach them based on what research has shown to be effective with students.

Providing scientifically based reading instruction for all students requires:

- investing in science-based training of future and current teachers
- aligning teaching practices with research evidence
- providing educators teaching materials that are aligned with science
- abandoning practices that are not supported by evidence

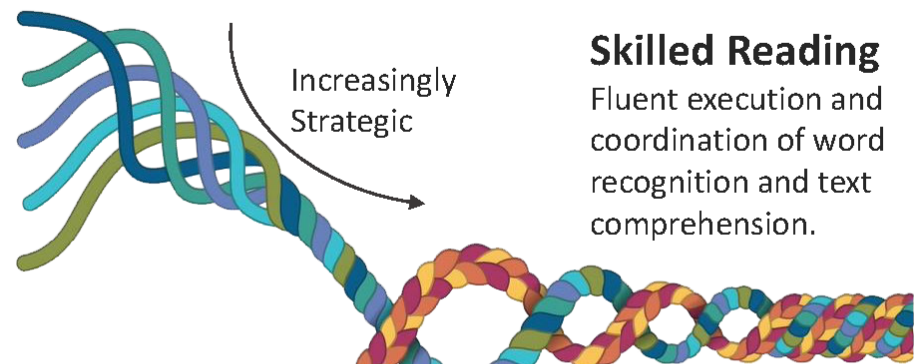
Skills that should be taught

The goal of reading instruction is to produce skilled readers – individuals who can efficiently recognize words so that they can gain information from text. There are many skills that a competent reader must possess. For a large majority of students, these skills do not develop without effort. They must be explicitly taught. Hollis Scarborough’s famous Reading Rope provides a good illustration of the many skills that are needed to be able to comprehend text. Students must learn that letters represent speech sounds, and they must learn how to connect these sounds with the letters or groups of letters that represent them. They then must be able to blend these sounds together to

Scarborough's Reading Rope

Language Comprehension

- Background Knowledge
- Vocabulary Knowledge
- Language Structures
- Verbal Reasoning
- Literacy Knowledge



Skilled Reading

Fluent execution and coordination of word recognition and text comprehension.

Word Recognition

- Phonological Awareness
- Decoding (and Spelling)
- Sight Recognition



Scarborough, H. 2001. Connecting early language and literacy to later reading (dis)abilities: Evidence, theory, and practice. Pp. 97-110 in S. B. Neuman & D. K. Dickinson (Eds.) *Handbook of Early Literacy*. NY: Guilford Press.

make words (i.e., decoding). They must also learn to recognize familiar, frequently occurring words that are not fully decodable. When they have enough repetition and practice with decoding and word reading, familiar words are decoded very quickly "by sight." Over time, students should become increasingly more efficient at these skills so that they happen automatically, or without much mental effort.

They need to be able to read fluently (i.e., with a high level of accuracy, at an appropriate pace, and with expression). This is not enough, however, for reading comprehension to occur. Students must also have strong language comprehension, which includes a variety of skills and sources of knowledge. For example, having background knowledge of the topic can increase comprehension of what is being read. A person must also understand what a word means once it is decoded, or else they

cannot fully understand the information on the page. As they become better readers, students should grow in their ability to access these sources of knowledge and apply language comprehension skills, which leads to better reading comprehension.

While research is very clear that phonics instruction is essential to developing word recognition skills, research has also shown that effective reading instruction must focus on developing other skills as well. Thus, the science of reading is not just about phonics. Research evidence on how reading develops must lead us to conclude that both strands of the reading rope are important. In other words, for our students to be good readers, we need to teach word recognition skills and language comprehension skills. In addition, we need to give students enough opportunities to practice their word recognition skills in connected text

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The Science of Reading: Using Research to Guide Instruction

so that they become fluent. When they are not having to spend much effort on decoding, students are then able to focus on applying their comprehension strategies.

Structured Literacy applies the science

While the reading rope is a simple illustration to help us understand the complexity of learning to read, it does not tell us how all these skills should be taught. Structured Literacy is the application of the science of reading. In other words, it is instruction based on what science has taught us about how children learn to read.

The elements of Structured Literacy (i.e., what skills should be taught) include both strands of Scarborough’s reading rope. Teaching students phonology, sound-symbol relationships, and syllables is needed to develop word recognition skills. Teaching morphology, syntax, and semantics addresses the language comprehension side of the reading rope.

Structured Literacy Element	Brief Description
Phonology	learning how to identify and manipulate units of speech, from words to syllables, to individual speech sounds; helps with decoding and spelling
Sound-Symbol Relationships	learning which letters or groups of letters represent speech sounds; helps with decoding and spelling
Syllables	learning the six syllable types of English and how words are divided into syllables; helps students know how to pronounce the vowel in a given syllable and how to decode multisyllable words
Morphology	learning word parts such as prefixes, suffixes, and roots; helps with decoding and with vocabulary development
Syntax	learning about grammar, the order of words, and how they function in sentences; helps students understand language used in sentences
Semantics	learning about the meanings of words and phrases and the relationships among words; helps students to better understand language they hear and read and to become better writers

A teacher using a Structured Literacy approach will teach these skills in an explicit manner where skills are directly taught by the teacher, students are given many opportunities for practice, and teachers give prompt, corrective feedback. The teaching is systematic and cumulative, with skills

and how to teach it. Therefore, scientifically based professional development is very important for teachers in training as well as practicing teachers. In addition, teachers must have the resources necessary to provide this instruction so they can spend their time teaching and not searching for and putting together materials. Therefore, schools must provide them with textbooks and other materials that are based on a solid understanding of the reading research and do away with materials based on theories that are not supported by science. School and district leaders can play a vital role in this effort by committing to providing the necessary training opportunities and resources.



The elements (inner circle) and teaching principles (outer circle) of Structured Literacy
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Reading research steadily evolves as we continue to learn more about the reading process and the conditions that are best for learning. There is still much work to do to get research findings into the hands of those who teach reading. In addition, there is much more to learn about how to best apply the research findings to classroom practices. This will take thoughtful and respectful collaboration among researchers, administrators, policy makers, classroom teachers, and others involved in this work.

taught in a defined sequence built around the structure of the English language. The easiest, most frequently occurring skills are taught first, and the more difficult concepts build on these previously taught concepts. The teacher must also know enough about the language to be diagnostic. In other words, a teacher needs to use data to determine what skills each student should be taught, and which skills a student should review or practice.

The science of reading has much potential to improve the lives of our students. To reach this potential, educators must be given the knowledge and tools to provide instruction that is known to be effective. Our center is committed to assisting educators in reaching these goals. We hope you will join us in these efforts. For more information on teacher training opportunities, see https://mtsu.edu/dyslexia/school_training.php. ■

Teacher support needed

In order for Structured Literacy instruction to be effective, teachers must have a good understanding of why each skill should be taught

In Focus

2019-20 Fiscal Year in Review

October is Dyslexia Awareness Month. We celebrate the progress we've made in the field of dyslexia and reading instruction this month. We celebrate the teachers and parents who support the students in their lives. We celebrate the students who work so diligently to master the science of reading. As we celebrate these accomplishments, the center also reflects on the accomplishments of the past fiscal year. This year brought several "firsts" for the center. It brought the first pandemic since the center was established. It also brought about the first all-virtual Fox Reading Conference. Despite the challenges this year has brought, our mission remains focused on education, research, and assessment.

EDUCATION

The center provided professional development to educators in Tennessee, across the country, and even around the world in FY 2019-20. Center staff provided professional development to Tennessee educators through eleven

school-based workshops in Tennessee. The center also expanded its professional development outside of Tennessee, delivering workshops in Florida, New York and Pennsylvania. The 2020 Fox Reading Conference was offered in March, and over 18,000 educators worldwide have taken advantage of this professional development opportunity.

During the 2019-20 fiscal year, the center hosted three distinct events as well as our Success Series. The center brought Nancy Hennessy to the campus of MTSU to deliver Comprehension Construction Zone. Over 80 educators joined Ms. Hennessy to learn more



about explicit reading comprehension instruction.

The center also held a collaborative workshop with the Tennessee Branch of the International Dyslexia Association and Decoding Dyslexia. The Empowering Parents of Struggling Readers workshop was simultaneously offered at several sites across the states and featured keynote speaker Dr. Bradley Rogers of The Gow School, who addressed building social and emotional skills in children with learning disabilities.



Other presentations at the Empowering Parents workshop focused on advocacy, accommodations, and appropriate reading instruction. Dr. Melinda Hirschmann provided an overview of structured literacy instruction. Erin Alexander discussed advocacy strategies for

2019-20 Year in Review



Tennessee Center for the
Study and Treatment of Dyslexia

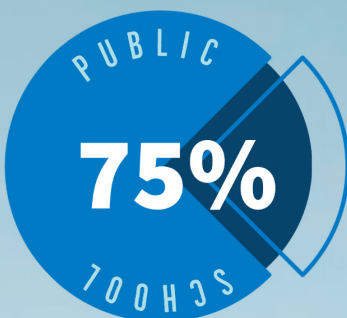
Education



Research



Assessment

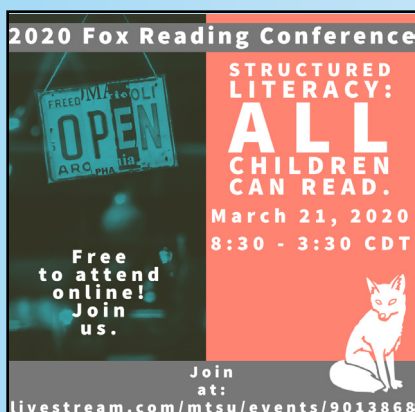


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parents. Allison McAvoy presented a session on accommodations and building self-advocacy skills in children.

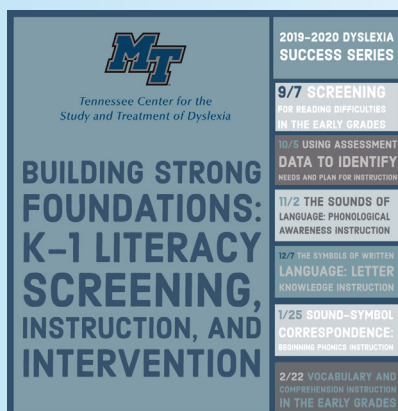
The center also hosted the 2020 Fox Reading Conference Structured Literacy: All Children Can Read. The format of this biennial conference, typically held on the campus at MTSU, was changed to a virtual conference as MTSU responded to the developing pandemic situation.



Our distinguished speakers for the 2020 Fox Reading Conference included Dr. Louisa Moats who delivered the keynote speech, Teaching Reading Is Rocket Science: What Skilled Teachers Know and Do, as well as a session on the importance of explicit language instruction.

Dr. Louise Spear-Swerling contrasted typical instructional practices with Structured Literacy, and Dr. Margie Gillis

highlighted the importance of teacher knowledge in delivering reading instruction. While the center typically hosts 300 educators for the Fox Reading Conference, we were able to expand our audience to over 4,500 educators during the live presentation of the 2020 Fox Reading Conference. Since the conference was held, over 18,000 educators have viewed the conference sessions, which are still available at livestream.com/mtsu.



The 2019-2020 Dyslexia Success Series continued its focus on research-based reading instruction. The 2019-2020 series explored reading intervention in the K-1 setting. Screening, identification, and targeting intervention for students with characteristics of dyslexia using the data collected in the identification process were

featured in the first portion of the series. Direct, explicit instruction in the five pillars of reading instruction were the focus of the remainder of the sessions. Over 60 educators participated in the entire series over the course of the 2019-20 academic year.

RESEARCH

The center continues to conduct research and facilitate the involvement of MTSU students within our research program.

This year, 17 MTSU students were involved in active research conducted at the center. Students involved in research at the center are involved in a variety of degree programs at MTSU, including B.S. in Psychology, M.A. in School Psychology, M.A. in Clinical Psychology students, and Ph.D. in Literacy Studies. Students and center staff presented research findings at local, national, and international conferences, including the 8th Annual Literacy Research Conference, the annual International Dyslexia Association Reading, Literacy, and Learning Conference, and the Annual Conference of the Society for the Scientific Studies of Reading.

PUBLICATIONS

Publications resulting from research conducted at the center:

Bernstein, S. E., Flipse, J. L., Jin, Y., & Odegard, T. N. (2020). Word and sentence level tests of morphological awareness in reading. *Reading & Writing*. <https://doi.org/10.1007/s11145-020-10024-6>

Farris, E. A., Alexander, E., & Odegard, T. N. (2020). Assessment and identification of learning disabilities. In M.M. Martel (Ed). *A clinical guide to assessment and treatment of childhood learning and attention problems*. Philadelphia, PA: Elsevier.

Odegard, T. N. (2020). Structured literacy is exemplified by an explicit approach to teaching. *Perspectives on Language and Literacy*, 46(1), 21-26.

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Odegard, T. N., Farris, E. A., Middleton, A. E., Oslund, E., & Rimrodt-Frierson, S. (2020). Characteristics of students identified with dyslexia within the context of state legislation. *Journal of Learning Disabilities*. <https://doi.org/10.1177/0022219420914551>

The center continues to collaborate with several organizations on research projects. Collaborators include Texas Scottish Rite Hospital for Children, the International Dyslexia Association, and AIM Institute. The center also collaborates with several researchers at other institutions as well as several school districts.

ASSESSMENT

The center provides assessments to K-12 Tennessee students to identify characteristics of dyslexia. Assessments include measures of phonological processing, basic reading skills, fluency, spelling, and comprehension. The majority of the children evaluated at the center were enrolled in the public school system; i.e., 75%. The remainder of children were either homeschooled (12.5%) or attended private schools (12.5%). Most of the children evaluated were under the age of 10, and the children were from counties across the state of Tennessee. This year, center staff evaluated 24 children for characteristics of dyslexia. Assessments were postponed in March due to the closing of the MTSU campus in response to the pandemic. Currently, the center is remodeling two of our testing rooms to create a testing suite which will allow center staff to resume conducting assessments safely. The anticipated completion of the testing suite is October of 2020. ■

Upcoming Workshops & Conferences

The center offers professional development in the area of reading and reading disabilities. All workshops are appropriate for K-12 settings (public and private schools), and all educators will benefit from attendance: general education teachers, special/exceptional education teachers, RTI coaches and interventionists, reading coaches, speech-language pathologists, school psychologists, school and district administrators. All workshops will be grounded in a visual presentation with interactive lecture (questions, comments and personal experiences encouraged), educator activities, modeling, and instructional examples. Current workshop offerings include:

- Trouble with Words: An Overview of Dyslexia
- School-Based Identification of Dyslexia
- Three Layers of Decoding: Understanding Phonemes, Syllables, & Morphemes
- It's Not Just What You Teach, But How You Teach It: Strategies to Maximize Your Small Group Instruction
- Teaching Handwriting: Automaticity in Support of Reading & Spelling
- Intensive Intervention for Students with Dyslexia
- Using Assessment Data to Inform Instruction

Workshop content may be refined to target a specific grade level and audience. Please contact the center to further customize these offerings to meet your specific professional development goals, including extended collaborations and consultations. Workshops are offered via virtual delivery as the center follows current public health guidance.

Please join our listserv to receive updates about future professional development workshops and conferences offered by the center.

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