STUDENT ACHIEVEMENT PARTNERS

Research Supporting Foundational Skills in Reading
An annotated bibliography curated by Student Achievement Partners

One of the most important jobs of an early-grade teacher is to support students as they unlock the code to the written language. A robust body of research points to the fact that systematic, explicit foundational skills instruction is a critical part of early childhood instruction, and it is crucial for students as they are learning to read and write in English.[1] This document names and summarizes the latest research on effective foundational skills instruction.

We know that in schools across the country, there is uneven practice when it comes to teaching students to read, causing some students to luck into reading and some to flounder. Others are systematically taught the code. The results are clear: students who might otherwise have learned to read if they had received explicit, structured guidance on cracking the code are unable to latch on to the skills of reading.[2] And many never catch up, struggling with literacy (and other text-dependent subjects such as history and science) their entire lives. Our vision is that all students, without exception, will be supported in their journey toward reading proficiency with teachers who are armed with knowledge of the foundations of reading and instructional materials that allow for the level of practice and support that children need to flourish.

This document outlines the research, publications, and scholarship that have influenced Student Achievement Partners' guidance, tools, and supports for educators around best practices for foundational skills instruction. It provides insight into what reading scientists have found about how novice readers progress toward expert reading, from early alphabetic skills to fluent word recognition to skilled reading.[3]

What are the foundational skills of reading? While many scholars and stakeholders utilize varied categories and terminology, widespread agreement can be found for the fact that each of these components is necessary for early reading:

Print Concepts and Letter Sound Recognition: The features of print and organization of print. The most important early print concept is letter recognition, which should begin immediately in kindergarten. Additionally, students should begin learning basic skills such as page-by-page reading and following words from left to right and top to bottom. They should begin noticing that words are separated by spaces and that these spaces are the same size.

Phonological Awareness: A broad term used for all things related to the sounds of spoken language. Phonological awareness is entirely oral, and it forms the building blocks for later reading before print is even introduced.

Phonics and Word Recognition: The learning of sound and spelling patterns in a distinct sequence that allows students to recognize, decode, and encode the sounds letters make in print.

Fluency: Fluency consists of three things: rate, accuracy, and expression. Expression, or prosody, includes timing, phrasing, emphasis, and intonation. Fluency is built through word recognition, one word at a time. Teaching systematic phonemic awareness and phonics, and applying these skills to text, allows students to build automaticity in word reading.

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[1] Liben, D., & Paige, D. D. (2017) *Why a Structured Phonics Program is Effective*. Student Achievement Partners. Retrieved from https://achievethecore.org/aligned/wp-content/uploads/2017/03/Why-a-Structured-Phonics-Program-is-Effective.pdf

[2] Lesnick, C. (2010). *Reading on Grade Level in Third Grade: How Is It Related to High School Performance and College Enrollment.* and

Committee on Education and the Workforce. (2001). Title I, Part B, Reading First; Early Reading First; Even Start and Reading is Fundamental. In *No Child Left Behind Act of 2001: Report of the Committee on Education and the Workforce, House of Representatives, on H.R. 1, Together with Additional and Dissenting Views.*

[3] Adams, M. (2011). The Relation Between Alphabetic Basics, Word Recognition, and Reading. *What Research Has to Say About Reading Instruction.* and

Castles, A., Rastle, K., & Nation, K. (2018). Ending the Reading Wars: Reading Acquisition from Novice to Expert. *Psychological Science in the Public Interest*, *19*(1), 5-51.

Assessment and Differentiation: In order to support the varied needs that students will inevitably have as they are working through this content, teachers must pay close attention to formative assessment data and adjust/alter/individualize instruction so that students have practice opportunities and feedback that match their given needs.

While there are many areas of settled science when it comes to foundational skills instruction, there is no one way to address practice. Student Achievement Partners believes that supporting teachers with the necessary professional learning they need to be steeped in research-based best practices, combined with a high-quality set of instructional materials, is necessary to support teachers and their students.

This document is a collection of research and scholarship that articulates the evidence base for explicit foundational skills instruction. In addition to making the case for why such instruction is necessary for students' ability to develop as readers, the document also provides insight into the practices and program components that reflect this type of high-quality, evidence-based teaching. The document is organized into the five components of foundational skills outlined above and includes an additional section illustrating the research connection between foundational skills in reading and vocabulary, knowledge, and comprehension. In each section, you'll find citations, summaries, and key points for each article. This collection reflects the evidence base that has informed and directed the work of Student Achievement Partners most directly, but it is not exhaustive; there are many other excellent pieces of scholarship that align with the research outlined in this paper. Additionally, since several pieces of research in this document address multiple components of foundational skills, some citations appear in different sections within this bibliography, with each summary highlighting the points specifically related to the foundational skills topic (e.g., the same citation might appear in both the Phonological Awareness and Phonics and Word Recognition sections).

We hope that this research will be used in the design of classroom instruction, materials selection and/or design, and professional learning—all of which must work together to create the early reading experience students need and deserve.

Print Concepts and Letter Sound Recognition

Adams, M. J. (1990). *Beginning to Read: Thinking and Learning About Print.* **Cambridge, MA: MIT Press.**

Marilyn Adams summarizes the early reading research over the course of more than twenty years. This book was commissioned for the U.S. Department of Education's Reading Research and Education Center, and it thoroughly outlines the content, related research, and known best instructional practices needed to address word recognition, phonics, behaviors of skilled readers, orthographic processing, print instruction, and more. This seminal work demonstrates that reading for meaning and phonics instruction interact with one another when establishing the knowledge and process of skillful reading.

Key Points:
- Letter knowledge and phoneme discrimination has been shown to be predictive of future reading success.
- Skilled readers have and use knowledge of word patterns, orthographic redundancy, spelling and pay attention to semantic and syntactic constraints of the text.
- Skilled readers have strong orthographic processing systems; they recognize words as well as likely letter sequences that make up syllables, words, and word parts.
- For learning to take place, students must both learn and make use of the rules of reading.
- For skillful reading to develop, the connections between print and language must be thorough and connected to meaning.
- Basic print awareness, word awareness, and letter recognition should be developed in preschool and kindergarten to set students up to learn to read.

Kim, Y.-S., Petscher, Y., Foorman, B. R., & Zhou, C. (2010). The Contributions of Phonological Awareness and Letter-Name Knowledge to Letter-Sound Acquisition—A Cross-Classified Multilevel Model Approach. *Journal of Educational Psychology, 102*(2), 313-326.

Studies have found that letter names provide crucial cues about letter sounds (Treiman & Kessler, 2003). Letter names provide a link between letters and print. Studies have found a significant and positive relationship between student letter-name knowledge and letter-sound knowledge, with correlation coefficients as high as .86 for preschoolers and kindergartners (Evans, Bell, Shaw, Moretti, & Page, 2006). Furthermore, evidence suggests that the relationship may be causal. Ehri (1983) found that kindergartners' and first graders' letter-name knowledge predicted later letter-sound knowledge, while the reverse did not hold. Ehri also found that students learn associated sounds more easily when they know letter names than when they do not.

Overall, the results of this study suggest that children do use letter-name knowledge in the learning of letter sounds. The authors find that that letter names in English provide critical clues about the sound(s) each letter contains. These results therefore suggest that letter-name knowledge has a significant impact on letter-sound knowledge. On average the study found that the probability of knowing letter sounds increased from 4% when students did not know letter names to 63% when student did know letter names.

In addition, the study shows that letter features play an important role in letter-sound acquisition (Treiman & Kessler, 2003). For example, consonant-vowel letters that provide letter-sound cues in the initial position of the names were more readily acquired than were other letters when students knew letter names and regardless of student level of phonological awareness. On the other hand, on average, letter sounds that did not contain letter-sound cues were most difficult to acquire irrespective of whether letter names were known.

Key Points:
- Letter-name knowledge has a significant impact on letter-sound knowledge.
- Letter features play an important role in letter-sound acquisition.

Piasta, S., & Wagner, R. (2010). Learning Letter Names and Sounds: Effects of Instruction, Letter Type, and Phonological Processing Skill. *Journal of Experimental Child Psychology, 105*(4), 324-344.

Alphabet knowledge is a strong predictor of a child's later word reading ability (Adams, 1990). In addition, failure to adequately acquire alphabet knowledge is an indicator of risk for later difficulty reading (Gallagher, Frith, & Snowling, 2000). The Early Reading First, Reading First, and Head Start programs set explicit goals to increase students' letter knowledge and their understanding of letter–sound correspondences (U.S. Department of Education, 2002, 2003 & U.S. Department of Health and Human Services, 2003).

Researchers have often focused on the influence of children's characteristics on the acquisition of alphabet knowledge. These characteristics include the letters in children's names (Treiman & Broderick, 1998) as well as multiple cognitive and emergent literacy skills such as oral language, memory, print awareness, and phonological processing (Burgess & Lonigan, 1998; de Jong & Olson, 2004; Evans et al., 2006; Lonigan, Burgess, & Anthony, 2000; Mann & Foy, 2003).

Letter properties have been shown to influence how easily letter names and corresponding sounds are learned (Evans, Bell, Shaw, Moretti, & Page, 2006; Justice et al., 2006; McBride-Chang, 1999; Treiman & Kessler, 2003; Treiman, Kessler, & Bourassa, 2001; Treiman, Kessler, & Pollo, 2006; Treiman, Levin, & Kessler, 2007; Treiman, Tincoff, Rodriguez, Mouzaki, & Francis, 1998). Some of these letter properties include:

1. Whether a letter is a consonant or a vowel
2. The position of a letter within the alphabet
3. How a letter is articulated
4. Whether a letter is associated with more than one sound
5. How easily confused a letter's shape or pronunciation is with other letters
6. How often a letter is present in print materials

Key Points:
- Alphabet knowledge is a strong predictor of a child's later word-reading ability.
- Failure to adequately acquire alphabet knowledge is an indicator of risk for later difficulty reading.
- Letter properties have been shown to influence how easily letter names and corresponding sounds are learned.

Stanley, C., Petscher, Y., & Catts, H. (2017). A Longitudinal Investigation of Direct and Indirect Links Between Reading Skills in Kindergarten and Reading Comprehension in Tenth Grade. *Reading and Writing, 31*(1), 133-153.

The Dynamic Indicator of Basic Early Literacy Skills (DIBELS) assessment of letter naming fluency (LNF) measures children's ability to identify letters of the alphabet. For the LNF test, the examiner presents a student with a list of random uppercase and lowercase letters. The student must then name as many letters as they can in one minute. The DIBELS nonsense word fluency (NWF) assessment presents students with a list of nonsense words. The student is then allotted one minute to read as many of these words as he or she can. The assessment procedures for LNF and NWF required children to indicate awareness of letters and corresponding sounds independent of meaning. Since the tests required children to match sounds with letters and phonetically decode words, the skills assessed can generally be characterized as phonological skills.

The study found a high degree of association between LNF and NWF. In addition, for paths spanning kindergarten to tenth grade, significant effects from NWF and LNF to reading comprehension were discovered.

Key Points:
- LNF and NWF can generally be characterized as phonological skills.
- The study found a high degree of association between LNF and NWF.
- For paths spanning kindergarten to tenth grade, significant effects from NWF and LNF to reading comprehension were discovered.

Phonological Awareness

Adams, M., Foorman, B., Lundberg, I., & Beeler, T. (1998). *Phonemic Awareness in Young Children: A Classroom Curriculum.* **13th Edition.**

Phonemic Awareness in Young Children remains one of the most practical and widely used programs addressing phonemic awareness in grades K-2. Marilyn Adams, co-author of the Foundational Skills Standards, explains what phonemic awareness is, why it is important, and, in a series of game-like activities, shows how it can be taught, reviewed, and assessed in these grades. The final part of the book includes a complete assessment.

Key Points:
- Based on research base going back to the mid 1980's
- Provides clear explanation of what phonemic awareness is and its role in beginning reading
- Provides yearlong coherent curriculum to teach phonemic awareness in kindergarten or PreK.
- Provides a complete assessment at end of the book that can be done by teachers

Bus, A. G., & Van IJzendoorn, M. H. (1999). Phonological Awareness and Early Reading: A Meta-Analysis of Experimental Training Studies. *Journal of Educational Psychology*, *91*(3), 403.

Phonological awareness programs differ widely in terms of content, duration, and timing. Differences between training programs may be related to differential effects on reading. This quantitative meta-analysis of experimental studies estimated the effects of various phonological training on reading which differ widely in terms of content, duration, and timing. The authors' sample included 32 articles containing 36 studies testing effects of training programs on phonological awareness and 34 studies testing effects on reading. They conducted the meta-analyses with the whole group of studies. They then applied tests for homogeneity of study results to check whether the results were sampled from different populations.

The outcomes for the group of studies as a whole were heterogeneous; thus, the authors selected a smaller and homogeneous subsample of strictly controlled experimental U.S. studies, and replicated all meta-analyses with this subset. This homogeneous subset allowed for more precise estimates of combined effect sizes for training on phonological awareness and reading, but because of the restricted variation in study outcomes predictor, analyses were less powerful.

Findings demonstrated the combined effect of training on phonological awareness is remarkably strong, whereas the combined effect on reading is only moderate; both effects were significant, however. Experimentally manipulated phonological awareness explains about 12% of the variance in word-identification skills. Training effects for phonological awareness were highest in preschool. Combined effect size for long-term studies of effects of phonological awareness training on reading were smaller. Programs combining phonological and letter training were more effective than a purely phonological training. Furthermore, training effects were stronger with posttests assessing simple decoding skills than with real-word-identification tests. In sum, phonological awareness is an important but not a sufficient condition for early reading.

Key Points:
- A training of phonological awareness improves not only children's phonological awareness but—to a lesser extent—their reading skills, as well.
- Phonological training reliably enhances phonological and reading skills and should thus be considered a causal factor in learning to read.
- Phonological awareness is not the single strongest predictor of reading development. Experimentally manipulated phonological awareness explains about 12% of the variation in reading skills.
- Reading skills are stimulated more by a phonemic training including letter or reading and writing practice than by purely metalinguistic games and exercises.
- An early start with phonological training tends to facilitate the process of learning to read; that is, preschoolers tend to profit more from phonological training than do participants from kindergarten or primary school.

Castles, A., Rastle, K., & Nation, K. (2018). Ending the Reading Wars: Reading Acquisition from Novice to Expert. *Psychological Science in the Public Interest*, *19* (1), 5-51.

The first two sections of this article describe research-examining processes related to acquiring the alphabetic principle and alphabetic decoding for which phonological awareness is necessary. The authors reviewed studies investigating whether, on exposure to printed words, children will naturally induce the basic alphabetic principle that letters, or groups of letters, represent phonemes of the language. Results from across studies found no evidence that children develop the alphabetic principle on their own; thus, most children must be explicitly taught. Foundational skills such as phonemic awareness and letter knowledge are key precursors to this alphabetic insight, and these skills and knowledge interact reciprocally in complex ways. Indeed, the acquisition of the alphabetic principle in preschool children was shown to occur when children were trained to segment phonemes in spoken words and identify their initial phonemes as well as recognize the graphic symbols that correspond to key sounds.

The need to train children's ability to segment phonemes in spoken words is consistently supported by a large body of research on the importance of the metalinguistic skill of phonemic awareness in reading acquisition. This research suggests that, to crack the alphabetic code, children must be able to abstract the relevant phonemic units from the stream of the speech they hear, in which phonemes naturally overlap and run together. A large body of research also supports the aforementioned findings on training children to recognize that the visual symbols of the writing system (letters and groups of letters) correspond to phonemes.

Overall, research demonstrates an intimate and reciprocal association exists among children's letter knowledge, their phonemic awareness, and their skill in alphabetic decoding. Once this initial insight is acquired, children develop increasingly sophisticated skills in alphabetic decoding, moving in broad phases from partial to full decoding ability.

Key Points:
- Foundational skills such as phonemic awareness and letter knowledge are key precursors to children developing insight into the alphabetic principle—that phonemes of the language are represented by letters or groups of letters—and these skills and knowledge interact reciprocally in complex ways.
- Children acquire the alphabetic principle when they are trained to segment phonemes in spoken words and identify their initial phonemes as well as recognize the graphic symbols that correspond to key sounds.
- Once children had gained the phonemic awareness, letter knowledge, and insight into the alphabetic principle, their learning was relatively robust and could be generalized.

Foorman, B., Beyler, N., Borradaile, K., Coyne, M., Denton, C. A., Dimino, J., Furgeson, J., Hayes, L., Henke, J., Justice, L., Keating, B., Lewis, W., Sattar, S., Streke, A., Wagner, R., & Wissel, S. (2016). *Foundational Skills to Support Reading for Understanding in Kindergarten Through 3rd Grade* **(NCEE 2016-4008). Washington, DC: National Center for Education Evaluation and Regional Assistance (NCEE), Institute of Education Sciences, U.S. Department of Education. Retrieved from the NCEE website: http://whatworks.ed.gov.**

Phonological awareness is the recognition that words are made up of individual sound units. A 2000 National Reading Panel (NRP) report found that teaching students to recognize and manipulate the slices of sound in words (phonological awareness) and then to connect sounds to letters (alphabetic principle) is critical to preparing them to read and comprehend text. Evidence reviewed in the NCEE Guide supports the NRP's finding. All 17 studies reviewed in the Guide that examined interventions designed to help students develop awareness of segments of sound and letter/sound correspondence found positive effects in letter names and sounds and/or phonology outcomes.

Phonemic-awareness instruction should begin by showing students how to isolate individual sounds in words and divide words up into their component sounds through modeling and guided practice. Once students are able to isolate phonemes in speech, they should be shown each letter of the alphabet and their corresponding sounds. Students should be taught how to recognize that words are made up of individual sound units (phonological awareness). They should then be introduced to larger segments of speech (words) and gradually have their attention drawn to progressively smaller sound segments. This method will prepare them to learn about the sounds that letters represent and to identify those sounds and letters as used in words.

Key Points:
- Teaching students to recognize and manipulate the slices of sound in words (phonological awareness) and then to connect sounds to letters (alphabetic principle) is critical to preparing them to read and comprehend text.
- Phonemic-awareness instruction should begin by showing students how to isolate individual sounds in words and divide words up into their component sounds through modeling and guided practice.

Joshi, R. M., Dahlgren, M., & Boulware-Gooden, R. (2002). Teaching Reading in an Inner City School Through a Multisensory Teaching Approach. *Annals of Dyslexia, 52*(1), 229-242.

Research has shown that phonological awareness is a precursor to skilled reading (Liberman, 1971). The Orton-Gillingham (OG) approach is a multisensory method of reading instruction that focuses on the use of sounds, syllables, words, and sentences. The OG approach is language-based, systematic, explicit, cumulative, and direct.

This study was conducted to investigate whether first-grade children exposed to instruction delivered through multisensory techniques based on OG principles would perform significantly better on measures of phonological awareness, decoding, and comprehension, compared to a group of children taught in the conventional manner.

The results of this study showed that first-grade children exposed to the multisensory teaching approach based on OG principles performed better on tests of phonological awareness, decoding, and reading comprehension than the control groups taught in the conventional manner. Children in the control groups who were not taught phonics skills in a systematic and explicit fashion did not show any statistically significant gains in phonological awareness and decoding skills.

Key Points:
- Phonological awareness is a precursor to skilled reading.
- The Orton-Gillingham (OG) approach is a multisensory method of reading instruction that focuses on the use of sounds, syllables, words, and sentences.
- First-grade children exposed to the multisensory teaching approach based on OG principles performed better on tests of phonological awareness, decoding, and reading comprehension than the control groups taught in the conventional manner.

- Children in the control groups who were not taught phonics skills in a systematic and explicit fashion did not show any statistically significant gains in phonological awareness and decoding skills.

Kim, Y.-S., Petscher, Y., Foorman, B. R., & Zhou, C. (2010). The Contributions of Phonological Awareness and Letter-Name Knowledge to Letter-Sound Acquisition—A Cross-Classified Multilevel Model Approach. *Journal of Educational Psychology, 102*(2), 313-326.

In this study, the authors investigated the contribution of phonological awareness to acquiring letter-sound acquisition from letter names and the probability of letter-sound acquisition as it relates to letter characteristics. The study found that letter-name knowledge had a significant impact on letter-sound acquisition. In addition, phonological awareness had a larger effect on letter-sound knowledge when letter names were known than when letter names were not known. The study further found that students were more likely to know the sounds of consonant–vowel letters than vowel–consonant letters and letters with no sound cues when the letter name was known, and phonological awareness was taken into account.

Phonological awareness was found to play a significant role in facilitating a connection between a letter's name and its sound. The interaction between letter-name knowledge and phonological awareness was positive and statistically significant such that increases in phonological awareness also increased the log-odds for children who knew letter names. The study showed that phonological awareness plays a critical role in the learning of letter sounds as a function of letter-name knowledge.

The authors found that the impact of phonological awareness on letter-sound acquisition was larger the more letter names were known. When letter names were known, the probability of knowing letter sounds rose from 40% to 82% when phonological awareness increased from a minimal to highly a developed level. On the other hand, when letter names were unknown, the predicted probability of letter-sound knowledge increased only from 3% to 11% when a child's phonological awareness increased from minimal to highly developed. This finding supports the hypothesis that phonological awareness helps children acquire letter sounds from phonetic cues in letter names.

Key Points:
- Letter-name knowledge had a significant impact on letter-sound acquisition.
- Phonological awareness had a larger effect on letter-sound knowledge when letter names were known than when letter names were not known.
- Phonological awareness helps children acquire letter sounds from phonetic cues in letter names.

Piasta, S., & Wagner, R. (2010). Learning Letter Names and Sounds: Effects of Instruction, Letter Type, and Phonological Processing Skill. *Journal of Experimental Child Psychology, 105*(4), 324-344.

The study's purpose was to investigate whether particular types of letters were more likely to be learned by U.S. preschoolers, and whether such learning was affected by a child's phonological abilities. The authors implemented three training conditions:

1. Combined letter name and letter sound instruction
2. Letter-sound-only instruction
3. Number identification instruction as a treated control

The study found that, regardless of phonological processing skills, children exposed to letter name and letter sound instruction were most likely to learn the sounds of letters whose names contained cues to their sounds. In addition, only children with stronger phonological skills showed a similar effect in the control condition. The authors found that providing children with explicit letter name and sound instruction overrode phonological processing limitations in fostering letter sound development.

Regardless of phonological skill, children exposed to the letter-sound-only condition were no more or less likely to learn the sounds of letters with varying letter name structures. For students exposed to the number condition, phonological skills were more strongly related to the learning of CV letters than to the learning of letters with names that begin with vowels (VC).

The study also found that, regardless of phonological abilities, there were no differences between students exposed to different conditions in learning letters with names and sounds that are not associated. In addition, children with lower phonological abilities exposed to the combined letter name and letter sound and letter-sound-only conditions had an advantage in learning CV letters over similar children exposed to the number condition. Children with higher phonological abilities exposed to the combined letter name and sound and letter sound only conditions had an advantage in learning VC letters compared to similar children exposed to the number condition.

Key Points:
- Regardless of phonological processing skills, children exposed to letter name and sound instruction were most likely to learn the sounds of letters whose names contained cues to their sounds.
- Providing children with explicit letter name and sound instruction overrode phonological processing limitations in fostering letter sound development.
- Children with lower phonological abilities exposed to the combined letter name and sound and letter sound only conditions had an advantage in learning CV letters over similar children exposed to the number condition.

Read, C. (1971). Pre-School Children's Knowledge of English Phonology. *Harvard Educational Review, 41*(1), 1-34.

Phonology refers to the sound system of the English language. It is a system of regular processes that determine the pronunciation of English words. When learning the English language, children learn to master these processes so that they can automatically know some of the aspects of the pronunciation of unfamiliar words.

Read argues that the evidence suggests that pre-school and kindergarten children often enter school with some unconscious knowledge of phonological relations and categories. Pre-school and kindergarten children's phonology is highly abstract and differs from the phonology of adult English speakers. Seemingly strange spellings of words by these children may represent a system of abstract phonological relations of which educators are largely unaware. While children do not know the set of lexical representations and system of phonological rules that account for much of the standard spelling of words, they do know a system of phonetic relationships that they have not been taught at home or in the classroom.

Read suggests that further research is needed on how children learn abstract phonological relations. Until such research is undertaken, it cannot be assumed that general intelligence is the principal factor allowing pre-school and kindergarten children to acquire the knowledge that makes spelling possible. Read suggests that for some children, learning standard spelling is, in fact, learning to expand their pre-school phonological analysis.

Key Points:
- Evidence suggests that pre-school and kindergarten children's phonology is highly abstract and differs from the phonology of adult English speakers.
- Children implicitly recognize particular phonetic similarities and contrasts, which are represented in their original spelling of words.
- For some children, learning standard spelling is, in fact, learning to expand their pre-school phonological analysis.

Vellutino, F. R., Scanlon, D. M., & Reid Lyon, G. (2000). Differentiating Between Difficult-to-Remediate and Readily Remediated Poor Readers: More Evidence Against the IQ-Achievement Discrepancy Definition of Reading Disability. *Journal of Learning Disabilities, 33*(3), 223-238.

The results of a 1996 study conducted by the authors provide support for the argument that IQ scores are not reliable predictors of reading success at the beginning stages of reading development. On the other hand, tests evaluating word identification ability and phonological decoding skills were found to reliably indicate children's ability to learn to decipher print. Phonological awareness, rapid naming, and verbal memory measures were found to reliably distinguish between poor readers who were most difficult to remediate and poor readers who were most easily remediated. In addition, no strong correlation between IQ scores and measures of reading ability, especially measures of word identification and phonological decoding ability, were discovered.

The results of the 1996 study suggest that reading difficulties in some beginning readers may be caused by deficits in cognitive abilities underlying reading ability, particularly deficits in phonological abilities. The results are consistent with much of the existing research that finds that deficiencies in language and language-based abilities are the principal causes of reading disability in many weak readers. For example, Siegel (1988) found that reading disabled children within each of the IQ ranges performed below non-reading disabled children on a variety of language-based measures, which included phoneme awareness and short-term verbal memory.

Key Points:
- Tests evaluating word identification ability and phonological decoding skills were found to reliably indicate children's ability to learn to decipher print.
- No strong correlation between IQ scores and measures of reading ability, especially measures of word identification and phonological decoding ability, were discovered.

Phonics and Word Recognition

Adams, M. J. (2011). The Relation Between Alphabetic Basics, Word Recognition, and Reading. In *What Research Has to Say About Reading Instruction*, 4-24.

Reading with fluency and comprehension strongly depends on having acquired adequate working knowledge of spelling-sound correspondences (Adams, 1990). In addition, research shows that the letter–sound knowledge and phonemic awareness are prerequisites for learning to decode.

Learning is the result of creating new links between established representations in the mind. In learning to decode, links must be created between word spellings and their phonological representations. When children first start learning to read, they have a significant listening and speaking vocabulary. As part of that vocabulary knowledge, the basic phonetic structure of words and the differences between them are represented to some extent. Research has found that these representations are contained in an automatically operating precognitive specialized subsystem (Liberman & Liberman, 1992). When speaking and listening, people do not need to actively think about analyzing or putting words together phoneme by phoneme. Instead, words are heard and pronounced effortlessly as a single piece.

Research shows that people's conscious awareness of the phonological structure of language progresses only gradually to the level of phonemes. In other words, people gain awareness of words before awareness of syllables, awareness of syllables before awareness of onsets or rimes, and awareness of onsets and rimes before awareness of phonemes (Anthony & Lonigan, 2004).

Print becomes bound to the language centers of the brain as a consequence of mappings from word spellings to their associated pronunciations. The process of decoding for beginning readers serves to connect the letters of a word's spelling with the corresponding components of that word's pronunciation. Phonemic sensitivity increases as the same letter corresponds to the same sound in multiple words. Reciprocally, each word's pronunciation will be represented in terms of its phonemes in accordance with its spelling. Beginning readers' spelling–sound knowledge generally begins with initial consonants, progressing to final consonants, medial vowels, and blends (Duncan, Seymour, & Hill, 1997).

The most straightforward benefit of phonics is that it allows readers to sound out occasional unknown words. However, beyond the early reading stages, the most important benefit of phonics may be that it leads to decoding automaticity, which is rooted in a reader's cumulative knowledge of spelling–sound correspondences. Readers' cumulative decoding experience allows for progressive refinement of phonological sensitivity over time. As knowledge grows, a support structure is created that allows almost every new word encountered to be partly learned already.

Key Points:
- In learning to decode, links must be created between word spellings and their phonological representations.
- People's conscious awareness of the phonological structure of language progresses only gradually to the level of phonemes.
- Beyond the early reading stages, the most important benefit of phonics may be that it leads to decoding automaticity which is rooted in a reader's cumulative knowledge of spelling–sound correspondences.
- As knowledge grows, a support structure is created that allows almost every new word encountered to be partly learned already.

Adams, M. J., & Bolt Beranek and Newman, Inc. (2004). Why Not Phonics *and* Whole Language? *Literacy: Major Themes in Education*, 2, 193-220.

Frank Smith's seminal 1971 work, *Understanding Reading*, set the framework for the whole language movement. Smith's fundamental thesis was that skillful readers' units of analysis were not single letters or words. If this were so, readers' progress would be slow; their memories would quickly overload, and they would be confused by the unreliability of English spelling-sound correspondences and by the multiple uses, meanings, and pronunciations of words. Instead, Smith argued that skillful readers must work from visual features directly to meaning.

The whole language movement's position on phonics is one of the main differences between whole language and other approaches. In *Understanding Reading*, Smith agreed that phonics does need to be learned in order to give beginning readers the visual-acoustic categories that will enable them to mediate the identification of words that cannot be recognized by sight. However, he warned against an overemphasis on phonics. Smith argued that children largely need to discover phonic rules for themselves, which they can only accomplish through reading experience. In addition, Smith believed that a new reader who must stop to decode every word encountered in print will read too slowly and therefore will not adequately capture meaning.

In his later writings, Smith argues against both teaching and encouraging the use of spelling-to-sound correspondences. He makes the claim that the alphabetic principle is entirely irrelevant to skilled readers. Furthermore, he argues that skilled readers identify words as ideograms and are likely not concerned with the sound of words (Smith, 1973).

Evidence has reliably demonstrated the value of phonics instruction. When included as part of a larger reading and writing program, phonics instruction has been shown to lead to higher achievement in word recognition, spelling, and vocabulary, at least in the primary grades, and particularly for economically disadvantaged and weaker students. Beginning readers must develop an understanding of the alphabet principle and knowledge of spellings and spelling-sound correspondences in order to read with fluency and reflective comprehension (Adams, 1990). Growth in spelling-sound knowledge depends on an active understanding of what it is for and how it works.

Key Points:
- The whole language movement's position on phonics is one of the main differences between whole language and other approaches.
- Frank Smith's seminal 1971 work, *Understanding Reading*, set the framework for the whole language movement.
- In *Understanding Reading,* Smith warned against an overemphasis on phonics.
- In his later writings, Smith argues against both teaching and encouraging the use of spelling-to-sound correspondences.
- Research has found that beginning readers must develop an understanding of the alphabet principle and knowledge of spellings and spelling-sound correspondences in order to read with fluency and reflective comprehension.

Castles, A., Rastle, K., & Nation, K. (2018). Ending the Reading Wars: Reading Acquisition From Novice to Expert. *Psychological Science in the Public Interest, 19*(1), 5-51.

In the first section of this comprehensive literature review, the authors review research spanning several decades that reveals a strong scientific consensus around the importance of phonics instruction in the initial stages of learning to read. The rationale for systematic phonics instruction—which teaches children that phonemes of the English language are graphically represented by letters or groups of letters—is that a relatively small body of knowledge provides children with the ability to decode most words in their language. If a child learns to decode the symbol-to-sound relationship (the alphabetic principle) then, provided they have adequate vocabulary, they will have the ability to translate printed words into spoken language, thereby accessing information about meaning. Once this initial insight is acquired, children develop increasingly sophisticated skills in alphabetic decoding, moving in broad phases from partial to full decoding ability.

The evidence for the effectiveness of phonics instruction is extensive, though the research reviewed demonstrates early phonics instruction (beginning before the first grade) has greater impacts than that which begins after the first grade. In these studies, phonics instruction improved decoding, spelling, and text comprehension. Moreover, phonics instruction has been found to be an effective intervention for poor readers. Overall, results from the studies reviewed consistently demonstrated evidence that explicit teaching of phonics assists all children to access text material relatively early in reading instruction, and that this explicit instruction is particularly vital for some children. Research has further concluded that a key ingredient of successful phonics instruction is that it is systematic; beyond this, there is not yet evidence determining whether a "synthetic" approach is preferable to an "analytic" one. Evidence also suggests that phonics teaching is more effective when children are given immediate opportunities to apply what they have learned to their reading.

Key Points:
- Research spanning several decades reveals a strong scientific consensus around the importance of phonics instruction in the initial stages of learning to read.
- Studies demonstrate phonics instruction improves decoding, spelling, and text comprehension.
- Beginning phonics instruction before the first grade has greater impacts than beginning after the first grade.
- Children do not develop insight into the fundamental symbol-to-sound relationship (the alphabetic principle) on their own. Teaching phonics explicitly allows children to develop this insight, which allows them to translate letters and groups of letters into sounds and thereby access knowledge about meaning.
- Foundational skills such as phonemic awareness and letter knowledge are key precursors to this alphabetic insight. Children acquired the alphabetic principle when they were trained to segment phonemes in spoken words and identify their initial phonemes as well as recognize the graphic symbols that correspond to key sounds (Byrne & Fielding-Barnsley,1989).
- Given the depth and irregularities of English orthography, teaching some sight words can be a helpful addition to phonics instruction. Teaching phonics and sight words ensures that children can relate the visual symbols of writing to spoken language for as many words as possible and as early in their schooling as possible. Sight words do not interfere with children's acquisition of alphabetic decoding skills.
- Once children master the alphabetic principle taught in phonics, they develop increasingly sophisticated skills in alphabetic decoding, moving in broad phases from partial to full decoding ability.

- The process of alphabetic decoding is essential for learning to read, but even skilled adult readers continue to use alphabetic decoding and phonological processes as a matter of routine. There is also substantial evidence that alphabetic decoding processes affect skilled readers' word recognition and comprehension.

Cheatham, J., & Allor, J. (2012). The Influence of Decodability in Early Reading Text on Reading Achievement: A Review of the Evidence. *Reading and Writing: An Interdisciplinary Journal, 25*(9), 2223-2246.

Public policy changes within the past twenty years have encouraged the adoption of systematic, explicit phonics instruction in the classroom. For example, the National Reading Panel encouraged educators to teach phonics explicitly and systematically and to provide students with opportunities to practice these phonics skills in context. In addition, section 1,208 of the 2001 No Child Left Behind Act required phonics instruction in order for schools to receive certain federal funds.

Research has subsequently studied the use of appropriate texts to aid in the development of phonics skills.
Both theory and empirical evidence have supported the need for students to apply phonics skills in connected text. As a result, this research argues that connected text used by developing readers must include at least some decodable words. Decodable texts are designed to provide students with opportunities to apply phonological skills so that they are more likely to become successful readers who process all of the letters within words with little effort. Mesmer (2005) found that students who read decodable texts applied taught letter-sound correspondences to a greater degree than students who read less-decodable texts.

On the other hand, Jenkins et al. (2004) randomly assigned struggling first graders to either a group that read more decodable texts or to a group that read texts that were written without consideration of phonics elements. All treatment students were individually provided scripted phonics instruction with the only difference between the two groups being the type of text used in the storybook part of instruction. The study found no statistically significant differences between the two groups on any outcome measure. This finding raised questions about the role of text decodability when well-designed phonics intervention is also present.

More on Decodability:

Although it is clear that some degree of decodability is beneficial, the exact degree of decodability required to produce positive benefits is less clear. Texts consist of various degrees of decodable words, and as a result, have degrees of decodability instead of being classified solely as "decodable" or "not decodable." Decodability should be viewed as a characteristic of text and not a type of text used with beginning readers. As a result of this way of thinking about decodability, students in the partial and alphabetic phases should read texts with "increased levels of decodability" instead of simply reading ''decodable texts.'' Furthermore, it is essential to determine what levels of decodability will be most beneficial for beginning readers.

Theoretically, decodable texts provide students in the partial and full alphabetic phases with opportunities to apply decoding skills in context. The empirical evidence, although limited and somewhat mixed, leads to the same conclusion. Overall, the results of descriptive studies find that students in the early phases of learning to read are able to read decodable texts more successfully than they can less-decodable texts. Decodability had a positive effect on student reading performance, particularly reading accuracy, rate, and prosody (Compton et al., 2004; Hiebert & Fisher, 2007; Hoffman et al., 2001). Mesmer (2005) found that students who read texts with a greater degree of decodability were more able to apply their phonics skills than students receiving the same instruction who read less-decodable text.

Key Points:
- Public policy changes within the past twenty years have encouraged the adoption of systematic, explicit phonics instruction in the classroom.
- Both theory and empirical evidence have supported the need for students to apply phonics skills in connected text.
- Decodable texts are designed to provide students with opportunities to apply phonological skills so that they are more likely to become successful readers who process all of the letters within words with little effort.
- The role of text decodability has been questioned when well-designed phonics intervention is also present.
- Empirical studies indicate that decodable text positively impacts early reading progress.
- Decodability should be viewed as a characteristic of text and not a type of text used with beginning readers.
- Students who read more-decodable text are more able to apply their phonics skills than students receiving the same instruction who read less-decodable text.

Cunningham, A. E., & Stanovich, K. E. (1998). The Impact of Print Exposure on Word Recognition. In *Word Recognition in Beginning Literacy.* Metsala, J., & Ehri, L. (Eds.). Mahwah, N.J.: L.

Erlbaum Associates.

Research has found that there are important linkages between the development of phonological abilities and the acquisition of word recognition skills (Juel, 1988). Although phonological abilities play an important role in explaining variance in the acquisition of word recognition skill, other factors may explain additional variance. Some researchers have argued that the development of a minimal level of phonological sensitivity is necessary but not sufficient for the development of efficient word recognition processes (Juel, Griffith, & Gough, 1986).

Stanovich and West (1989) found that, even after the variance associated with phonological processing had been controlled for, orthographic processing skills explain significant additional variance in reading and spelling ability. In addition, Stanovich and West (1989) found that differences in exposure to print were linked to orthographic processing variance even after phonological abilities had been controlled for.

Research has focused on orthographic processing abilities as a possible second source of variance in word recognition skills (Stanovich & West, 1989). However, it is highly likely that the development of orthographic processing skill is partially dependent on phonological processing abilities (Barron, 1986). The authors used a hierarchical multiple regression to examine whether there is variance in word recognition that can be linked to orthographic processing skill once variance due to phonological processing had been controlled for. The authors found that orthographic processing ability accounts for word recognition skill independent of phonological processing skill. These findings suggest that phonological and orthographic processing skills are separable components of variance in word recognition for beginning readers.

Key Points:
- Although phonological abilities play an important role in explaining variance in the acquisition of word recognition skill, other factors may explain additional variance.
- Some researchers have argued that the development of a minimal level of phonological sensitivity is necessary but not sufficient for the development of efficient word recognition processes.
- The authors found that orthographic processing ability accounts for word recognition skill independent of phonological processing skill.

Cunningham, A. E., & Stanovich, K. E. (1998). What Reading Does for the Mind. *American Educator, 22*, 8-17.

In this article, Cunningham and Stanovich explain the importance of an early successful start in reading. Early in the reading process, poor readers with difficulties breaking the spelling-to-sound code are exposed to less text than their more skilled counterparts (Allington, 1984). In addition, the problem is made worse by the fact that these less-skilled readers often find themselves working with materials that are too difficult for them (Allington, 1977). The initial difficulty breaking the spelling-to-sound code, along with less skilled readers' weak decoding skills, lack of practice, and the difficult materials they must use, all combine and result in unfulfilling early reading experiences that lead to less participation in reading activities for these less-skilled readers. Less-skilled readers' lack of exposure to reading and the absence of practice delays the development of automaticity and speed at the word recognition level. Slow, capacity-depleting word recognition processes require weak readers to use mental resources that should be allocated to comprehension. As a result, reading for meaning is impaired further leading to unrewarding reading experiences.

On the other hand, the authors argue that children who crack the spelling-to-sound code early on are more likely to read more over the years. The subsequent exercise of this reading habit serves to further develop reading comprehension ability (Juel, Griffith, & Gough, 1986). Furthermore, reading volume serves as a strong predictor of vocabulary and knowledge differences among children.

Key Points:
- Early in the reading process, poor readers with difficulties breaking the spelling-to-sound code are exposed to less text than their more skilled counterparts.
- On the other hand, the authors argue that children who crack the spelling-to-sound code early on are more likely to read more over the years.
- The subsequent exercise of this reading habit serves to further develop reading comprehension ability.

D'Angiulli, A., Siegel, L., & Maggi, S. (2004). Literacy Instruction, SES, and Word-Reading Achievement in English-Language Learners and Children with English as a First Language: A Longitudinal Study. *Learning Disabilities Research & Practice, 19*(4), 202-213.

Evidence suggests that prereading-stage instruction that is focused on reading and phonological processing skills can be used to reduce the negative influence of socioeconomic disadvantage (e.g., Lonigan et al., 1999; Lundberg, Frost, & Petersen, 1988; Vadasy, Jenkins, & Pool, 2000). Studies have also found that intensive programs that include teaching reading skills and strategies complementary to basic phonological-processing skills are especially effective (e.g., Ball & Blachman, 1991).

D'Angiulli, Siegel, and Maggi found that children who suffer chronic phonological deficits involved in basic linguistic processing are the students known to be the most resistant to change with instruction, and at high risk for school failure. In these students, comprehension and vocabulary development are strongly correlated with word-reading skills (Stanovich, 1988). In other words, if a student has difficulties at the word-decoding level, there is a high probability that he or she will not have good vocabulary comprehension skills. This is due to the fact that basic decoding skills that they must use to support broader linguistic processing, such as verbal working memory, are not functioning correctly. The authors conclude that low scores in comprehension and vocabulary may ultimately reflect deficits of the phonological core. The authors also found that this tendency may be even more pronounced in children with lower socioeconomic status (for further evidence, see data discussed by Brooks-Gunn, Duncan, & Britto, 1999).

Key Points:
- Evidence suggests that prereading-stage instruction that is focused on reading and phonological processing skills can be used to reduce the negative influence of socioeconomic disadvantage.
- Children who suffer chronic phonological deficits involved in basic linguistic processing are the students known to be the most resistant to change with instruction, and at high risk for school failure.

Ehri, L. C., & Flugman, B. (2018). Mentoring Teachers in Systematic Phonics Instruction: Effectiveness of an Intensive Year-long Program for Kindergarten Through 3rd Grade Teachers and Their Students. *Reading and Writing, 31*(2), 425-456.

Teaching students to read in the primary grades is essential for their future academic success. Early phonics instruction establishes foundational knowledge including letter names and sounds, grapheme-phoneme correspondences, phonemic awareness, and their application in reading words and text (i.e., decoding). Studies show students who received systematic phonics instruction perform better than those who received unsystematic or no phonics instruction. Effects of systematic phonics instruction are greatest in the early grades: kindergarten and first. Research has not demonstrated statistically significant differences among approaches to systematic phonics instruction. However, the effectiveness of any approach depends on teachers' capacity to carry it out. Unfortunately, many primary-grade teachers lack the specialized knowledge and training required to teach systematic phonics effectively to beginning readers.

This study examined the effectiveness of a year-long mentoring program to improve teachers' (n=69) knowledge and skill in providing systematic phonics instruction and the extent to which it proved students' (n=1,336) achievement in reading and spelling. The K-3 teachers were provided instruction in one of two systematic synthetic phonics programs in which the structure of the English language was taught in a logical, sequential, organized, and direct manner, starting simply and progressing to the complex.

Findings showed that the phonics mentoring model was very effective in impacting both teachers and students. Teachers began the program in fall with limited knowledge and skills but by spring many became proficient and held views highly consistent with principles of high-quality systematic phonics instruction. Students showed very large gains in reading and spelling from fall to spring, which far exceeded effect sizes from comparable data sources. Students met grade-level expectations at the end of kindergarten and first grade but fell short in second and third grades. General education students outperformed bilingual/ELL and special needs students, although all subgroups made large gains.

Key Points:
- Phonics instruction is considered important because it teaches beginners the alphabetic writing system, which is essential for learning to read and spell words.
- Early phonics instruction establishes foundational knowledge including letter names, major grapheme-phoneme correspondences, phonemic awareness, and how to apply this knowledge to read words (i.e., decode, map onto pronunciation, and retain in memory with meanings).
    - According to Chall (1983), acquiring foundational knowledge and basic decoding skill happens in Stage 1 during kindergarten and first grade. Mastery moves children to Stage 2, where the focus is on attaining fluency. This happens in second and third grades. All along the way, children's ability to read words from memory grows to support their ability to read and comprehend more advanced text.
- Studies show that students who received systematic phonics instruction perform better than those who received unsystematic or no phonics instruction.
- In studies comparing approaches to systematic phonics instruction, differences in student performance have not been found to be statistically significant.
- Research shows effects of systematic phonics instruction are greatest in the early grades: kindergarten and first.

- In this study, the teachers were provided instruction in one of two systematic synthetic phonics programs in which the structure of the English language was taught in a logical, sequential, organized, and direct manner, starting simply and progressing to the complex.
  - Reading, spelling, and handwriting were taught simultaneously.
  - Following a scope and sequence, students were taught the precise sounds for one letter or a combination of letters (phonograms – e.g., *ea*, *ng*, *ough*), how to blend them into words for reading, and how to write them for spelling.
  - As students progressed, they were taught syllable and morphemic patterns and spelling rules.
  - They were taught manuscript and cursive formation of letters.
  - Instruction also included vocabulary building through analysis of the meanings of words, their roots and affixes, reading and listening comprehension of text, and writing of compositions.
  - Instructional procedures were systematic and were guided by lesson plans. This instruction was taught to general education students, to bilingual and English Language Learners (ELL), and to special needs students in kindergarten through third grades.
- The mentoring program had positive impacts on teachers and students.
- Across all grades and tests, the main effect of test point was highly significant, indicating that scores increased from fall to spring with phonics instruction. Effect sizes were greater in grades K-1 than in grades 2-3 and declined steadily from K to 3.
  - Greater growth in early grades may indicate either that phonics instruction exerts a greater impact or that there is more room to grow in earlier grades, when children are advancing from non-readers to readers, than in later grades, when children are refining their reading and spelling skills.

Ehri, L. C. (2014). Orthographic Mapping in the Acquisition of Sight Word Reading, Spelling Memory, and Vocabulary Learning. *Scientific Studies of Reading*, *18*(1), 5-21.

Research has shown that teaching children phonemic awareness improves their word reading and spelling abilities (Ehri et al., 2001). While teachers generally direct students' attention to the sounds in words, the motor theory of speech perception (Liberman, 1999) suggests that articulatory gestures produced by mouth movements rather than processed sounds represent phonemes in the brain. While sounds disappear soon after they are heard, mouth positions can be felt, viewed, and analyzed.

Boyer and Ehri (2011) conducted a phonemic awareness experiment in order to investigate whether teaching preschool children to analyze articulatory gestures in words would better link spellings to pronunciations in memory and therefore improve sight word learning. The authors found that providing children with articulation training improved access to the motoric gestures configuring the phonemic representations of words in memory. Consequently, letters making up words became more firmly attached to these motoric phonemic constituents, which served to improve word reading. The results of this study suggest that there is value in teaching children phoneme segmentation with mouth pictures.

When preschool children first took part in Boyer and Ehri's study, they were in the pre-alphabetic phase. During the study, groups that received instruction in phonemic awareness and grapheme-phoneme relation significantly outperformed the no-treatment control group on word reading and spelling tests. This suggests that learning phonemic awareness and grapheme-phoneme-relation skills moved preschool children from the pre-alphabetic to the partial-alphabetic phase of development.

Key Points:
- The motor theory of speech perception (Liberman, 1999) suggests that articulatory gestures produced by mouth movements rather than processed sounds represent phonemes in the brain.
- Boyer and Ehri (2011) found that providing preschool children with articulation training improved access to the motoric gestures configuring the phonemic representations of words in memory.
- Groups that received instruction in phonemic awareness and grapheme-phoneme relation significantly outperformed the no-treatment control group on word reading and spelling tests.

National Reading Panel. (2000). *Report of the National Reading Panel: Teaching Children to Read. Report of the Subgroups*. Washington, DC: U.S. Government Printing Office.

The 14-member panel included members from different backgrounds, including school administrators, working teachers, and scientists involved in reading research. The panel reviewed hundreds of studies, taking only the strongest of these for the final report. In the area of foundational skills, the report concluded that "…systematic phonics instruction makes a bigger contribution to children's growth in reading than alternative programs providing unsystematic or no phonics instruction." (NRP, 2-92). And, "…systematic phonics instruction is significantly more effective than non-phonics instruction

in helping to prevent reading difficulties among at-risk children and in helping to remediate reading difficulties in disabled readers" (NRP, 2-94).

Since the release of the report, it has been cited over 17,000 times and remains one of the most important documents addressing foundational skills instruction as well as vocabulary and comprehension.

Key Points:
- Confirmed the essential role of phonemic awareness in early reading
- Confirmed the essential role of systematic phonics in early reading
- Confirmed that systematic phonics improves reading for students on grade level as well as below
- Confirmed that systematic phonics improves reading for students diagnosed with a learning disability
- Confirmed that systematic phonics is effective with kindergarten students
- Confirmed that systematic phonics can be taught in a whole class setting as well as small groups
- Confirmed that students need to read books "that have the spelling sounds they are learning" but no evidence these need to be the only texts that students read

Foorman, B., Beyler, N., Borradaile, K., Coyne, M., Denton, C. A., Dimino, J., Furgeson, J., Hayes, L., Henke, J., Justice, L., Keating, B., Lewis, W., Sattar, S., Streke, A., Wagner, R., & Wissel, S. (2016*). Foundational Skills to Support Reading for Understanding in Kindergarten Through 3rd Grade* (NCEE 2016-4008). Washington, DC: National Center for Education Evaluation and Regional Assistance (NCEE), Institute of Education Sciences, U.S. Department of Education. Retrieved from the NCEE website: http://whatworks.ed.gov.

The NCEE Practice Guide recommends that students develop awareness of the segments of sounds in speech and how they link to letters. All 17 studies reviewed in the Guide that examined interventions designed to help students develop awareness of segments of sound and letter/sound correspondence found positive effects in letter names and sounds and/or phonology outcomes.

The Guide recommends that teachers first show students that sentences can be broken into words. Then, teachers should demonstrate that some words can be further broken into smaller words. Next, teachers should show how words can be broken further into syllables. Students should then practice identifying and manipulating syllables within common words. After students have learned how to break words into syllables, they should be taught to recognize even smaller units within a syllable, onsets and rimes. Finally, students should be taught to isolate and manipulate individual phonemes, the smallest units of sound in a word.

Once students have learned to isolate phonemes in speech, the Guide recommends teaching students each letter of the alphabet and their corresponding sounds. Teachers should first present consonants and short vowel sounds represented by single letters. Next, students should be introduced to consonant blends and common two-letter consonant digraphs. The Guide recommends teaching each sound in a blend and then having students blend the sounds together. Next, students should learn long vowels with silent e and two-letter vowel teams.

For each phoneme, teachers should name the letter(s) that represent the phoneme. The letters should then be introduced to students in both uppercase and lowercase. Finally, a picture of a familiar word containing that phoneme should be shown. Teachers should say the sound that the phoneme makes and then have students repeat that sound. Finally, students should be provided with continued practice with the phoneme.

Key Points:
- The NCEE Practice Guide recommends that students develop awareness of the segments of sounds in speech and how they link to letters.
- Once students have learned to isolate phonemes in speech, the Guide recommends teaching students each letter of the alphabet and their corresponding sounds.

Hurford, D., & Hurford, J. (2016). The Dyslexia Dilemma: A History of Ignorance, Complacency and Resistance in Colleges of Education. *Journal of Childhood & Developmental Disorders, 2*(3).

Learning to read requires explicit and systematic instruction while language acquisition does not. English uses an alphabetically based writing system that represents sounds with letters. The English writing system can therefore be thought of as a code. Access to phonology takes place as a function of deciphering symbols into respective phonemes. Once an understanding of the relationship between sounds and their respective symbols has been acquired, decoding and reading acquisition can take place.

The Knowledge and Practice Standards for Teachers of Reading (Standards), developed by the International Dyslexia Association, identified underdeveloped phonological processing as a core weakness in individuals who have dyslexia.

Teaching phonological processing skills is a crucial component in remediating weak reading skills. Teachers should be able to identify goals of phonological skill instruction, should know the progression of phonological skill development (rhymes, syllables, onset-rimes, phonemes), and the principles of phonological skill instruction (brief, multisensory, conceptual and auditory-verbal). In addition, teachers should understand the reciprocal nature of phonological processing, reading, spelling and vocabulary, and know how second language phonological features might interfere with English pronunciation and phonics.

California serves as an example of the issues associated with adopting a system that does not apply the Science of Reading. In 1987, the state of California adopted a conceptual framework where the phonics approach was significantly deemphasized. By 1994, California' fourth grade reading scores tied with Louisiana's and Guam's as the worst of the 39 states and territories that participated in the National Assessment of Educational Progress.

Key Points:
- Once an understanding of the relationship between sounds and their respective symbols has been acquired, decoding and reading acquisition can take place.
- Underdeveloped phonological processing is a core weakness in individuals who have dyslexia.
- Teaching phonological processing skills is a crucial component in remediating weak reading skills.

Joshi, R. M., Dahlgren, M., & Boulware-Gooden, R. (2002). Teaching Reading in an Inner City School Through a Multisensory Teaching Approach. *Annals of Dyslexia, 52*(1), 229-242.

Research has shown that children who do not adequately develop good decoding skills at the beginning grade levels will likely develop reading problems during the later grades (Stanovich, 1986). Rack, Snowling, and Olson (1992) conclude that "the development of word recognition is constrained by poor phonological decoding." In addition, "phonological deficit in the language domain plays a causal role in the reading problems of dyslexics."

Various studies have shown that systematic and explicit decoding instruction that emphasizes synthetic phonics yields better results than other instructional approaches (Auckerman, 1984). The Orton-Gillingham (OG) approach seeks to establish a link between printed language and phonetic elements. The OG approach proposes that reading comprehension will emerge once decoding skills and vocabulary knowledge are well developed in readers. Poor word recognition skills serve to impede comprehension, which causes readers with poor skills to spend an excessive amount of time and energy decoding words instead of concentrating on the meaning of what is read.

This study was conducted to investigate whether first-grade children exposed to instruction delivered through multisensory techniques based on OG principles would perform significantly better on measures of phonological awareness, decoding, and comprehension, compared to a group of children taught in the conventional manner.

The results of this study showed that first-grade children exposed to the multisensory teaching approach based on OG principles performed better on tests of phonological awareness, decoding, and reading comprehension than the control groups taught in the conventional manner. Children in the control groups who were not taught phonics skills in a systematic and explicit fashion did not show any statistically significant gains in phonological awareness and decoding skills.

Key Points:
- Children who do not adequately develop good decoding skills at the beginning grade levels will likely develop reading problems during the later grades.
- Various studies have shown that systematic and explicit decoding instruction that emphasizes synthetic phonics yields better results than other instructional approaches.
- The results of this study showed that first-grade children exposed to the multisensory teaching approach based on OG principles performed better on tests of phonological awareness, decoding, and reading comprehension than the control groups taught in the conventional manner.

Juel, C. (1988). Learning to Read and Write: A Longitudinal Study of 54 Children From First Through Fourth Grades. *Journal of Educational Psychology, 80*(4), 437-47.

Juel's study examined the development of literacy in an elementary school with a significant minority, low socioeconomic status student population. The study found that students who became poor readers entered first grade with little phonemic awareness, which contributed to a slow start in learning spelling-sound correspondences. The study found that there was an 88% probability that a student who was a poor reader at the end of first grade would still be a poor reader at the end of fourth grade. Tunmer and Nesdale (1985) found that, in first grade, phonemic awareness indirectly affects reading comprehension through phonological recoding. In addition, in a hierarchical regression predicting word

recognition at the end of first grade, phonemic awareness accounted for 49% of the variance after holding IQ and listening comprehension constant. Maclean, Bryant, and Bradley (1987) found that phonological skills were strong predictors of early reading ability after controlling for IQ and socioeconomic status.

Juel et al. (1986) found that phonics instruction has little to no effect unless children have some phonemic awareness at the beginning of first grade. Phonemic awareness is not a single insight or ability but instead represents various phonemic insights. Some phonemic abilities, such as phoneme blending, are critical to learning to read. On the other hand, other abilities, such as phoneme deletion, may be the results of learning to read (Perfetti, Beck, Bell, & Hughes, 1987). Both experimental and longitudinal evidence finds that some form of phonemic awareness is necessary to learn to read alphabetic languages successfully (Blachman & James, 1985).

Black and Hispanic students with low socioeconomic status are more likely to have poor phonemic awareness than low socioeconomic status White students (Juel et al., 1986). This may be due to more significant differences between language used at school and in the home for Black and Hispanic students, as well as cultural differences. Results indicate that the low socioeconomic status or minority students often require more phonemic awareness. Jule found that low phonemic awareness results in slow acquisition of decoding and is one of the early contributors to the so-called "Mathew Effect."

Key Points:
- Students who became poor readers entered first grade with little phonemic awareness, which contributed to a slow start in learning spelling-sound correspondences.
- Research has found that phonological skills are strong predictors of early reading ability after controlling for IQ and socioeconomic status.
- Phonemic awareness is not a single insight or ability but instead represents various phonemic insights.
- Both experimental and longitudinal evidence finds that some form of phonemic awareness is necessary to successfully learn to read alphabetic languages.
- Black and Hispanic students with low socioeconomic status are more likely to have poor phonemic awareness than low socioeconomic status White students.

Word Recognition

Adams, M. J. (2011). The Relation Between Alphabetic Basics, Word Recognition, and Reading. In *What Research Has to Say About Reading Instruction*, 4-24.

Research has found that younger and weaker readers are more accurate decoders when they are given short words with simple, regular letter–sound correspondences. Decoding accuracy falls with consonant clusters and falls even more with complex or inconsistent vowel spellings. In addition, difficulties are compounded with polysyllabic words (Duncan & Seymour, 2003).

The *visual word form area* of the brain is tasked with visual perception of individual words (McCandliss, Cohen, & Dehaene, 2003). It responds to the sight of printed words but is unconcerned with their pronunciations, meanings, contexts, and even with whether they are actually real. The responsiveness of this area depends on the structure of printed words and is determined by the familiarity of the orthographic structure or spelling of the word in consideration. The visual word form area is highly responsive to real words and to well-spelled, pronounceable nonwords (Binder, Medler, Westbury, Liebenthal, & Buchanan, 2006).

The first sign of specialized activity in the region of the brain that will eventually become the visual word form area is a relatively quick response to letters that develops as children become skilled in letter recognition (Maurer et al., 2005). It is only after almost two years of reading instruction that the area begins to show a clear preference for real letters over other letter-like symbols (Maurer et al., 2006). For children who are on pace, it is not until fourth grade that the visual word form area starts to produce an adult- like response to frequently encountered words (McCandliss et al., 2003). Research shows the actual timing of these developmental changes at each stage is correlated with children's reading ability (Maurer et al., 2006).

Key Points:
- Research has found that younger and weaker readers are more accurate decoders when they are given short words with simple, regular letter–sound correspondences.
- The *visual word form area* of the brain is tasked with visual perception of individual words.
- The responsiveness of this area depends on the structure of printed words and is determined by the familiarity of the orthographic structure or spelling of the word in consideration.
- Research shows the actual timing of developmental changes in the region of the brain that will eventually become the visual word form area is correlated with children's reading ability.

Cunningham, A. E., & Stanovich, K. E. (1998). The Impact of Print Exposure on Word Recognition. In *Word Recognition in Beginning Literacy*. Metsala, J., & Ehri, L. (Eds.). Mahwah, N.J.: L. Erlbaum Associates.

The authors conducted a longitudinal study of students in the first through third grades to investigate the contribution of phonological and orthographic processing skills to variation in word recognition skill. The results of the study indicated that orthographic processing ability accounts for word recognition skill independent of phonological processing skill during the early stages of reading development.

The authors suggest that early word recognition ability significantly shapes children's later literacy environments. There are rich-get-richer and poor-get-poorer effects not only in terms of absolute levels of reading ability, but also in levels of print exposure. Both in the classroom and out of school, readers of higher ability are increasingly exposed to more print than less-skilled readers are. This results in an increasing divergence in the relative performance of skilled and less-skilled readers (Allington, 1980).

Juel (1994) found that most children do not seem to gain cipher knowledge just by being exposed to many words. The quantity of reading cannot overcome poor decoding skill. Being able to recognize words is more important than the number of words that children are exposed to. Once high-quality word recognition ability is present, quantity of reading becomes important.

Cunningham and Stanovich (1990) found that, after controlling for IQ, memory ability, and phonological processing ability, print exposure accounted for additional variance in word recognition ability. There seems to be growing consensus that print exposure may have very specific effects in word recognition skill development. Research has found that print exposure's principal role at the early stages of word recognition may be more strongly related to the buildup of the orthographic lexicon and therefore plays a more indirect role in phonological processing development (Barker et al., 1992).

Key Points:
- Orthographic processing ability accounts for word recognition skill independent of phonological processing skill during the early stages of reading development.
- Early word recognition ability significantly shapes children's later literacy environments.
- Once high-quality word recognition ability is present, quantity of reading becomes important.
- After controlling for IQ, memory ability, and phonological processing ability, print exposure accounted for additional variance in word recognition ability.

D'Angiulli, A., Siegel, L., & Maggi, S. (2004). Literacy Instruction, SES, and Word-Reading Achievement in English-Language Learners and Children with English as a First Language: A Longitudinal Study. *Learning Disabilities Research & Practice, 19*(4), 202-213.

D'Angiulli, Siegel, and Maggi conducted a study where they investigated the effect of a districtwide literacy-intensive curriculum delivered to ELL and children whose first language was English (E1). The literacy-intensive instruction began in kindergarten and continued through grade 5.

The authors obtained word-reading achievement scores from 1,108 students in all 30 schools of the North Vancouver school district for students in kindergarten to grade 5. They then conducted a gradient analysis that indicated that, as early as kindergarten, word-reading achievement was related to socioeconomic status. In addition, the influence of socioeconomic status on word-reading development was significantly larger in the ELL groups than in the groups of students whose first language was English (E1). However, the performance of ELL and E1 students became similar as they progressed through grade 5. This finding implies that the similarities in the word-reading development of the two groups of students were associated with the role of instruction. In addition, the study found that in kindergarten, ELL students earned significantly lower word-reading scores than E1 students in both the lowest and highest socioeconomic groups. However, by grades 3 or 5, ELL students of both the lowest and highest socioeconomic status tended to score higher than their E1 counterparts.

Key Points:
- As early as kindergarten, word-reading achievement is related to socioeconomic status.
- The influence of socioeconomic status on word-reading development was significantly larger in the ELL groups than in the groups of students whose first language was English (E1).
- In kindergarten, ELL students earned significantly lower word-reading scores than E1 students in both the lowest and highest socioeconomic groups.
- By grades 3 or 5, ELL students of both the lowest and highest socioeconomic status tended to score higher than their E1 counterparts.

Ehri, L. C. (2014). Orthographic Mapping in the Acquisition of Sight Word Reading, Spelling Memory, and Vocabulary Learning. *Scientific Studies of Reading, 18*(1), 5-21.

While print strategies are used to read unfamiliar words, words that have been previously read are read from memory. Ehri (1992) referred to words read from memory as *sight words.* Sight words instantly activate pronunciations and meanings in memory.

Orthographic mapping is required to memorize sight words. Readers must apply knowledge of the writing system in order to make connections between the spellings and pronunciations of specific words. After readers see a new word in print, and say or hear its pronunciation, the word's spelling becomes mapped onto its pronunciation and meaning and stored in memory. Sight of the word will then activate its pronunciation and meaning immediately from memory and allows readers to concentrate on comprehension instead of word recognition. As a result, the application of word-reading strategies is no longer required for word identification. Print strategies such as decoding letters into blended sounds allow readers to figure out words they have not read before and helps turn unfamiliar words into familiar sight words. Rereading a new word eventually moves the word into memory so that it can also be read by sight. All words, when practiced, can eventually become sight words.

During development, the strategies that children acquire for reading unfamiliar words expand. In addition, the types of connections to read and spell words from memory also improve. Ehri's (2005) phase theory explains the development of skills and strategies that support sight word reading.

Key Points:
- While print strategies are used to read unfamiliar words, words that have been previously read are read from memory.
- After readers see a new word in print, and say or hear its pronunciation, the word's spelling becomes mapped onto its pronunciation and meaning and stored in memory.
- Sight of the word will activate its pronunciation and meaning immediately from memory and allows readers to concentrate on comprehension instead of word recognition.
- Ehri's (2005) phase theory explains the development of skills and strategies that support sight word reading.

Liben, D. & Paige, D. D. (2017). *Why a Structured Phonics Program is Effective.* **Student Achievement Partners. Retrieved from https://achievethecore.org/aligned/wp-content/uploads/2017/03/Why-a-Structured-Phonics-Program-is-Effective.pdf**

Automaticity, the instant recognition of words by sight, is essential to fluent reading (LaBerge & Samuels, 1974). Understanding sound-to-letter correspondences allows students to leverage what they know in order to learn new words quickly and serves to develop automaticity (Share, 1995). Being fluent with grade-level text by the end of third grade increases the likelihood of having an adequate understanding of letter-sound combinations. Acquiring this understanding of letter-sound combinations results in further word learning. Research has consistently found that many students are not becoming fluent readers. This indicates that these students are not acquiring the fundamental phonics knowledge that positively contributes to efficient word and connected-text reading.

As beginning readers learn an increasing number of spelling/sound patterns, they increase their ability to recognize new words that also contain these known patterns. In addition, students have a greater chance of recognizing irregular words and words with spelling/sound patterns that have not yet been learned. This is due to the increased confidence and general reading enjoyment that results. In addition, all the words that are learned provide contextual support for words that are not known. This contextual support will grow as students learn additional spelling/sound patterns. Stanovich and Cunningham (1998) found that a Mathew Effect results when this process does not progress at an adequate pace. Students who enjoy strong starts advance at a faster rate each year relative to students with slow starts.

Structured phonics teaches students words' phonologies (pronunciations), orthographies (spellings), and morphologies (prefixes, roots, and suffixes). In addition, it teaches students how to apply this knowledge to decode and spell words. After students apply their knowledge to decode and spell words for a given pattern many times, word spellings become stored in memory and connected to the word pronunciations and meanings (Reitsma, 1983). This allows students to read these words quickly from memory the next time the words are encountered and to remember how to write the words.

Key Points:
- Automaticity, the instant recognition of words by sight, is essential to fluent reading.
- Understanding sound-to-letter correspondences allows students to leverage what they know in order to learn new words quickly and serves to develop automaticity.

- As beginning readers learn an increasing number of spelling/sound patterns, they increase their ability to recognize new words that also contain these known patterns.
- After students apply their knowledge to decode and spell words for a given pattern many times, word spellings become stored in memory and connected to the word pronunciations and meanings.

Mesmer, H., & Griffith, P. (2005). Everybody's Selling It -- But Just What is Explicit, Systematic Phonics Instruction? *The Reading Teacher, 59*(4), 366.

Reading involves both word recognition and understanding both the individual and collective meanings of those words in order to get to the meaning of the text. Phonics is one important tool used to recognize words. Ehri & McCormick (1988) suggest four strategies that a reader might use to recognize a word:

1. Predicting by using context and linguistic knowledge to make an educated guess.
2. Decoding by converting letters and letter patterns into sounds and then blending these sounds together.
3. Analogy - using word parts to analyze the structure of a word.
4. Recalling a known word from memory.

Both decoding and analogy strategies require knowledge of phonics. Phonics, like other word-recognition tools, is used to help a reader arrive at an approximate pronunciation for a written word that gets the reader closer to the word's meaning (Anderson, Hiebert, Scott, & Wilkinson, 1985).

The ultimate goal of word recognition is the prevalent use of a sight-word strategy. Ehri (1980, 1994) found that readers use prediction, analogy, and decoding temporarily as the spelling of words is committed to memory. Once the commitment to memory occurs, words can be recognized simply by sight. As a result, phonics as a word-recognition tool provides readers with both a temporary strategy for word recognition as well as with a process of word recognition that focuses a beginning readers' attention on the patterns of letters that make up words. The process ultimately allows students to commit information about the spellings of words to memory (Ehri, 1980).

Key Points:
- Phonics is one important strategy used to recognize words.
- The ultimate goal of word recognition is the prevalent use of a sight-word strategy.
- Phonics as a word-recognition tool provides readers with both a temporary strategy for word recognition as well as with a process that focuses a beginning readers' attention on the patterns of letters that make up words.
- The process ultimately allows students to commit information about the spellings of words to memory.

Schatschneider, C., Buck, J., Torgesen, J., Wagner, R., Hassler, L., Hecht, S., & Powell-Smith, K. (2004). *A Multivariate Study of Individual Differences in Performance on the Reading Portion of the Florida Comprehensive Assessment Test: A Brief Report.* Florida Center for Reading Research.

The present study sought to identify the principal reading, cognitive, and linguistic skills that contribute to individual performance differences on the reading portion of the Florida Comprehensive Assessment Test (FCAT) for third, seventh, and tenth grades. The study identified the primary skill and knowledge deficiencies that were associated with below-grade-level performance on the FCAT (Level 1 and 2 students).

The authors found that text-reading fluency is the leading factor in explaining individual differences in third grade performance on the FCAT. Verbal knowledge/reasoning was the second most important factor and was found to be significantly more important than nonverbal reasoning and working memory. Third-grade Level 1 and 2 readers performed substantially below average in reading fluency. In addition, the study found that Level 1 children had relatively poor phonemic decoding skills. On the other hand, Level 1 children performed only slightly below the average in verbal knowledge and reasoning.

Reading fluency and verbal knowledge/reasoning were equally important in explaining seventh grade individual performance differences on the FCAT. Seventh-grade Level 1 and 2 students were significantly below average in reading fluency. Additionally, Level 1 students performed well below average on a measure of phonemic decoding ability. The study also found that Level 1 readers' verbal knowledge and reasoning skills fell further below average than did Level 1 third-grade students. Finally, Level 1 reading comprehension scores fell below what was predicted by their verbal knowledge/reasoning skills.

The study found that individual differences in verbal knowledge and reasoning was the most important factor in explaining tenth-grade test performance variability on the FCAT. Text reading fluency remained an important factor in accounting for

FCAT performance. Tenth-grade Level 1 and 2 readers continue to score well below average in reading fluency. Furthermore, Level 1 and 2 readers performed significantly below average on a measure of phonemic decoding ability.

The results of the study support the construct validity of the FCAT as a measure of reading comprehension. Across the three grades, skills on every reading and language measure were positively associated with higher FCAT scores. This suggests that FCAT scores consistently identify students who are stronger readers and who have more verbal knowledge and reasoning skills.

Key Points:
- The results of the study support the construct validity of the FCAT as a measure of reading comprehension.
- Across the three grades, skills on every reading and language measure were positively associated with higher FCAT scores.
- The study found a gradual increase in the relative importance of the verbal knowledge/reasoning factor in accounting for variance on FCAT performance.

Scheffel, D., Shaw, J., & Shaw, R. (2008). The Efficacy of a Supplementary Multisensory Reading Program for First-Grade Students. *Journal of Reading Improvement, 45*(3), 139-152.

This study found that the Institute for Multi-Sensory Education's (ISME) supplemental reading program led to faster attainment of, and increased proficiency in, phonemic awareness and alphabetic principle skills for treatment group students when compared to students who did not receive the program.

Research has found that the stronger a young child's skill is at segmenting words into individual sounds, the more likely he or she will be able to read, and the faster the reading process will progress (Blachman, 1991). Studies have also found that children who have not adequately developed their decoding skills during early grade levels will likely experience later reading difficulties (Stanovich, 1986).

Liberman, Shankweiler, and Liberman (1989) discovered that mastering the alphabetic principle depends upon existing phonological awareness skills. The improved phonemic awareness skills developed by treatment students in the current study during the first half of the year may have therefore led to accelerated gains on the alphabetic principle during the last half of the year. Research has found that phonological awareness is a precursor to reading achievement (Liberman, 1971, 1973) and that the development of word recognition is impaired by poor phonological decoding (Rack, Snowling, & Olson, 1992). As a result, the authors expect that lower-performing students at treatment schools who made significant progress in phonemic awareness and the alphabetic principle would show significant gains in reading connected text only after having adequately acquired these precursor skills.

Key Points:
- Children who have not adequately developed their decoding skills during early grade levels will likely experience later reading difficulties.
- Poor phonological decoding impairs the development of word recognition.

Vellutino, F. R., Scanlon, D. M., Sipay, E. R., Small, S. G., Pratt, A., Chen, R., & Denckla, M. B. (1996). Cognitive Profiles of Difficult-to-Remediate and Readily Remediated Poor Readers: Early Intervention as a Vehicle for Distinguishing Between Cognitive and Experiential Deficits as Basic Causes of Specific Reading Disability. *Journal of Educational Psychology, 88*(4), 601.

Specific reading disability is generally defined as significant difficulty learning to identify printed letters and words in children who are at least of average intelligence and who do not suffer general learning difficulties (Gough & Tunmer, 1986).

In this study, the authors found that children who were identified as poor readers at the outset performed significantly below normal readers on word-identification and pseudoword-decoding tests. In addition, the authors found that poor readers assigned to a tutored group that would end up achieving the least amount of growth in reading had the lowest scores among poor readers on an initial word-identification test. On the other hand, poor readers assigned to a tutored group that would end up achieving the highest levels of growth in reading had the highest scores among poor readers on the word-identification test at the outset. Research has found that tasks evaluating children's phonological skills explain more of the variance on measures of word identification than do tasks evaluating other language-based skills or tasks evaluating children's visual-processing abilities (Vellutino, Scanlon, Small, & Tanzman, 1991).

Key Points:
- The authors found that children who were identified as poor readers performed significantly below normal readers on word-identification and pseudoword-decoding tests.
- Tasks evaluating children's phonological skills explain more of the variance on measures of word identification than do tasks evaluating other language-based skills or tasks evaluating children's visual-processing abilities

Fluency

Castles, A., Rastle, K., & Nation, K. (2018). Ending the Reading Wars: Reading Acquisition from Novice to Expert. *Psychological Science in the Public Interest*, *19*(1), 5-51.

This comprehensive literature review most fully discussed fluency in the second section, which covers research surrounding children's progress beyond alphabetic decoding to becoming a skilled word reader. Theories of skilled word reading demonstrate that fluency is more than just alphabetic decoding. These major theories all converge in their representation of two key cognitive processes: (1) the translation of a word's spelling into its sound and then to meaning, and (2) gaining access to meaning directly from a word's spelling, without relying on phonology. Together, these two broad mechanisms allow optimal processing of words across the full spectrum, from being new and unfamiliar to a reader, where alphabetic decoding is critical, to highly familiar, where direct access to meaning is more efficient.

After discussing these cognitive models (demonstrating *what* children need to become a fluent reader), the authors review the research on *how* these fluent word-reading skills develop in children. Specifically, studies suggest reading progress is facilitated by acquiring knowledge of morphological regularities, which allows children to capitalize on systematic mapping between spelling and meaning. Additionally, reading experience matters—exposure to print provides the dynamic database from which children can accumulate detailed orthographic knowledge, supported by a foundation of alphabetic decoding skills. The authors assert that the *single most* effective pathway to fluent word reading is print experience: children need to see as many words as possible, as frequently as possible.

Finally, the review covers what can be done in educational settings to promote this transition toward fluency. First, research shows explicit instruction on morphological relationships in the writing system (i.e., development of morphological knowledge/awareness) can benefit the acquisition of literacy, but the most effective form of instruction remains unclear. The authors predict the benefits of explicit morphological instruction are more likely to be observed somewhat later in reading development, promoting learning as children accumulate the experience necessary to accomplish the direct mapping between spelling and meaning. Print experience may be most important to fluent word reading. Teachers should seek to provide as much exposure to print as they can, but research shows that what they can achieve pales in comparison to the exposure that children can attain for themselves during independent reading. Thus, statistics point to the enormous value of fostering a love of reading in children and a motivation to read independently.

Key Points:
- Expert (fluent) readers can gain access to the meanings of many words directly from their printed forms, and that reading progress is characterized by a gradual transition from a profile of reading words primarily via alphabetic decoding to one of heavy reliance on this direct mechanism.
- The processes by which children transition from novice to expert word reader are complex, and many questions remain. However, it is clear that reading experience matters.
- An important part of progressing towards fluent reading is acquiring knowledge of morphological regularities, which allows the child to capitalize on systematic mappings between spelling and meaning. Children must be supported in their development of morphological knowledge/awareness.
- Once children can read even simple texts on their own—either for pleasure or for learning—their exposure to words grows rapidly. Ultimately, it is children's own extensive, varied, and rich experience in reading that undoubtedly plays the most important role in their transition from novice to expert readers
- Fluency provides a foundation from which children may be taught comprehension strategies.

Dowhower, S. L. (1987). Effects of Repeated Reading on Second-Grade Transitional Readers' Fluency and Comprehension. *Reading Research Quarterly*, *22*(4), 389-406.

The repeated reading of connected discourse is a long-used procedure but, at the time of the study, there had been renewed interest in the efficacy of such procedures. Repeated reading (RR) procedures are grounded in whole-language theory and information-processing paradigms. The terminology and methods of RR procedures differ, but all share a common goal—to increase fluency—and a common strategy—rereading a meaningful passage until oral production is fluid, flowing, and facile. RR procedures generally fall into two categories: those in which reading of the passage is modeled either live or by audiotape (assisted), and those in which there is no modeling (unassisted).

This study investigated the effect of two RR procedures on second-grade transitional readers' (n=17) oral reading performance with practiced and unpracticed passages. Transitional readers are defined as those with average or better decoding ability but below-average reading rate. The students were randomly assigned to one of two RR trainings, using either a read-along procedure (assisted) or independent practice (unassisted). Results showed transitional readers' rate, accuracy, comprehension, and prosodic reading significantly improved with RR practice regardless of the specific procedure employed (though prosodic indicators slightly favored the assisted read-along procedure). These results are in line with prior research reporting gains in reading rate and word-recognition accuracy after RR. However, the findings regarding improvements in prosodic reading are novel. Prosodically, the children no longer read in word-by-word fashion; they used more appropriate segmental lengthening and intonation at phrase boundaries, so their phrases were longer and more appropriate. Gains in RR of practiced passages transferred to unpracticed, similar passages. Practice on a single passage was not as effective as practice on a series of passages. That is, there was a cumulative practice effect as children practiced across multiple stories. Overall, the five RR sequences formed a profile that charted the successive developmental steps of the students in the study as they became more fluent readers. Reading performance improved in small increments after each RR sequence, in a linear fashion.

Key Points:
- RR can be an effective strategy for students to learn to read a passage faster, more accurately, and with more understanding.
- Transitional readers' rate, accuracy, comprehension and prosodic reading were significantly improved by RR practice regardless of the specific procedure employed.
- Gains in RR of practiced passages transferred to unpracticed, similar passages.
- Practice on a single passage was not as effective as practice on a series of passages.
- Prosodic indicators slightly favored the read-along technique; however, reading rate seemed to be an important factor in the efficacy of the two procedures.
    - Children initially reading in the 25-45 words per minute (WPM) range were less frustrated when practicing with an audiotape read-along than the children practicing independently at that rate.
    - However, when these children reached a speed of approximately 60 words per minute, they rehearsed only once or twice with the audiotape then chose to practice independently.
    - Thus, the read-along procedure was more helpful at lower rates of reading speed whereas the independent practice procedure was preferred at higher rates of speed.
    - It may be that children reading at higher rates of speed (over 45 WPM) need more practice to increase fluency, whereas those reading at lower rates (under 45 WPM) need more support with a fluent model until they reach higher rates when they can practice independently.
- RR gives practice beyond the accuracy needed by early readers, and these holistic reading opportunities are critical for readers to become fluent. Thus, RR should be made part of the reading program for children who are processing text on a word-by-word level.
- This study does not answer the question of how much RR is effective for transitional readers. It is still unknown whether RR should be used on a regular basis (daily or weekly) or interspersed in units throughout the year.
- Initial exposure to RR procedures can be demanding, especially for very slow readers (under 45 WPM). The initial passages should be kept short, frequent feedback should be given, and the children should be prepared for the likelihood that it may take a number of rehearsals for them to reach the target reading rate.

Foorman, B., Beyler, N., Borradaile, K., Coyne, M., Denton, C. A., Dimino, J., Furgeson, J., Hayes, L., Henke, J., Justice, L., Keating, B., Lewis, W., Sattar, S., Streke, A., Wagner, R., & Wissel, S. (2016). *Foundational Skills to Support Reading for Understanding in Kindergarten Through 3rd Grade* (NCEE 2016-4008). Washington, DC: National Center for Education Evaluation and Regional Assistance (NCEE), Institute of Education Sciences, U.S. Department of Education. Retrieved from the NCEE website: http://whatworks.ed.gov.

The NCEE Practice Guide recommends that students read connected text daily in order to support reading accuracy and fluency. A review of the evidence showed that 18 studies found positive effects on word reading, oral reading accuracy, oral reading fluency, and/or reading comprehension outcomes. However, eight of these studies reported no significant effect on other outcomes in these areas. In addition, three of the reviewed studies found no significant effects for any of these outcomes, with one study actually finding a negative effect for one outcome.

Reading connected text accurately and fluently requires students to identify words quickly, to integrate ideas in the text with background knowledge, to self-monitor their understanding of what they read, and to apply strategies to support comprehension and future reading success. The National Reading Panel (2000) found evidence that instruction designed to increase reading fluency has beneficial effects on reading comprehension. Having students read connected text daily, with and without constructive feedback, supports the development of fluency and comprehension.

The Guide recommends having teachers model expression, emphasis, and phrasing in fluent reading. Teachers should model how to read at a fluent pace using familiar texts. At first, teachers should set a slow, steady pace for student

reading. Reading rate should then be gradually increased as students move on to more challenging text. In addition, teachers should set a pace that reflects students' word-reading abilities, slowing down for words that are challenging. Teachers can further develop students' fluency by identifying and practicing challenging words with students before they begin to read a full text.

In order to support oral reading fluency, students should be given assignments for both repeated reading (reading the same text many times) and wide reading (reading various texts). The repeated exposure to the same words will help students recognize these words. On the other hand, wide reading exposes students to new vocabulary and world knowledge.

Key Points:
- The NCEE Practice Guide recommends that students read connected text daily in order to support reading accuracy and fluency.
- Instruction designed to increase reading fluency has beneficial effects on reading comprehension.
- In order to support oral reading fluency, students should be given assignments for both repeated reading and wide reading.

Paige, D., & Magpuri-Lavell, T. (2014). Reading Fluency in the Middle and Secondary Grades. *International Electronic Journal of Elementary Education, 7*(1), 83-96.

Teachers have the ability to help students develop fluent reading skills in order to facilitate student comprehension and understanding. Reading fluency is defined by the three characteristics:

1. Word identification accuracy
2. Pacing (automaticity)
3. Prosody

Together, these three characteristics interact to aid comprehension of what is read (Paige, Rasinski, Magpuri-Lavell & Smith, 2014).

The interaction of word identification accuracy and automaticity results in "accumaticity." Accumaticity is the ability to read with good flow because the reader avoids frequent pauses to analyze and decode words. Prosody, reading with expression, forms the cognitive framework crucial to building comprehension (Frayser, Carlton, & Clifton, 2006). Since most reading is done silently, it's important to understand that the same characteristics that encourage fluency when reading aloud are also used when reading silently (Raynor et al., 2012). Disfluent readers struggle with one or more of the three fluency characteristics.

Many children struggle with reading because they lack necessary phonological awareness and skills (Adams, 1990; Stanovich, 2000). Since phonological disabilities affect an estimated 5% of the population, most children are capable of fluent reading (Interagency Committee on Learning Disabilities, 1987). Failure to acquire a thorough understanding of the alphabetic principle interferes with decoding, which results in inaccurate word recognition skills and ultimately poor reading fluency (Torgesen, Wagner, Rashotte, Rose, Lindamood, Conway et al., 1999).

Researchers have found a significant relationship linking reading fluency to comprehension (Fuchs, Fuchs, Hosp, & Jenkins, 2001). Research finds that poor reading fluency is a significant barrier to comprehension and affects up to 40% of fourth-grade students (Pinnell, Pikulski, Wixon, Campbell, Gough, et al., 1995).

The authors introduce a set of strategies to encourage fluent reading. For example, in whole-class choral reading, students simultaneously read aloud from the same text in unison with the teacher. Hearing the teacher read the text aloud provides students with a model of how to read fluently. In addition, the authors introduce two word-study strategies—syllabic analysis and morphemic analysis—to help build fluency.

Fluent reading is essential because it allows readers to switch attention from decoding to understanding.

Key Points:
- Reading fluency is defined by the three characteristics: word identification accuracy, pacing (automaticity), and prosody.
- Disfluent readers struggle with one or more of the three fluency characteristics.
- Failure to acquire a thorough understanding of the alphabetic principle interferes with decoding, which results in inaccurate word recognition skills and ultimately poor reading fluency.
- Research finds that poor reading fluency is a significant barrier to comprehension.

Paige, D. D., Smith, G. S., Rasinski, T. V., Rupley, W. H., Magpuri-Lavell, T., & Nichols, W. D. (2019). A Path Analytic Model Linking Foundational Skills to Grade 3 State Reading Achievement. *The Journal of Educational Research*, *112*(1), 110-120.

The indicators of reading fluency include 1) accuracy of word identification, 2) automaticity (rate or pacing), and 3) prosody (Samuels, 2007). Accurate word identification is characterized by not skipping or inserting words and by not repeating words or phrases. Automaticity reflects the speed at which a reader reads through a text. The proficient interaction between accuracy of word identification and automaticity, "accumaticity," is reflected in the words correct per minute (WCPM) metric (Paige, Magpuri-Lavell, Rasinski, & Rupley, 2015). Research has found that a minimum WCPM level is needed in order to arrive at basic comprehension (Paris & Hamilton, 2009). Prosody is a fluency indicator that conveys expression, pitch, stress, and phrasing to make reading mirror normal conversation. Fluent reading is crucial to comprehension and has been found to contribute from 25% to 50% of the variance in comprehension through the middle grades and later grades (Dowhower, 1991).

Fluent reading depends on a reader's understanding of the orthographic relationships that form the basis of decoding. This results in quick and accurate word identification (Rupley, 2009). On the other hand, weak decoding skill results in slow and inaccurate word identification (Ehri, 2005), reduced reading fluency (Daane et al., 2005), and poor reading comprehension (Kucer, 2009).

In the present study, spelling knowledge was found to directly contribute to fluency and reading achievement. In addition, sight-word and pseudo-word reading were found to exert direct effects on fluency. Fluency was found to exert a direct effect on reading achievement.

Key Points:
- Fluent reading is crucial to comprehension and has been found to contribute from 25% to 50% of the variance in comprehension through the middle grades and later grades (Dowhower, 1991).
- Weak decoding skill results in slow and inaccurate word identification (Ehri, 2005), reduced reading fluency (Daane et al., 2005), and poor reading comprehension (Kucer, 2009).
- In the present study, spelling knowledge was found to directly contribute to fluency and reading achievement.
- Fluency was found to exert a direct effect on reading achievement.

Paige, D., Smith, G., & Magpuri-Lavell, T. (2019). Learning to Improve: Report of a Three-Year Capacity-Building Project Leveraging Professional Development + Coaching to Improve Third-Grade Reading Outcomes. *Advances in Literary Study*, *07*(4), 193-223.

The Common Core standards (2010) identify foundational skills such as concept of print, phonological awareness, phonics, high-frequency words, and fluency as the reading sub-skills that are involved in converting print to speech and the fluent reading skills that are necessary for reading comprehension.

The present study reports the results of a three-year professional development initiative to improve core reading knowledge and instruction in third-grade teachers and its effect on student reading outcomes.
For each of the three years, the authors measured spelling development, sight-word reading, pseudo-word reading, and reading fluency for an independent sample of third-grade students taught by participating teachers at both the beginning and end of each school year. In the first year of the initiative, the authors found that students' pseudo- and sight-word reading attainment scores were approximately in the 14th percentile. Additionally, reading fluency scores at the end of the first year approximated the 23rd percentile on the Hasbrouck & Tindal (2006) reading norms. These scores suggest that these students had a relatively poor understanding of the sound structure of words, which resulted in poor word reading and reading fluency.

The study's results showed that student improvement in each of the four variables took place between fall and spring of each year. The authors interpreted year 2 and 3 increases across the measured variables as indirect evidence that instruction improved as a result of the initiative. Results suggest that the initiative played a significant role in advancing these students into the within-word stage. Students who enter the within-word stage reflect an understanding of letter features that includes long vowels, r-controlled vowels, other common long- and short-vowel patterns. In addition, students who enter this stage reflect an increasing understanding of complex consonant patterns, silent consonant patterns, and abstract vowel understanding.

Key Points:
- The Common Core standards (2010) identify foundational skills as the reading sub-skills that are involved in converting print to speech and the fluent reading skills that are necessary for reading comprehension.
- The present study reports the results of a three-year professional development initiative to improve core reading knowledge and instruction in third-grade teachers and its effect on student reading outcomes.

- First-year scores suggested that an independent sample of third-grade students taught by participating teachers had a relatively poor understanding of the sound structure of words, which resulted in poor word reading and reading fluency.
- The study results showed that student improvement in each of the four variables took place between fall and spring of each year.
- Evidence suggests that the initiative played a significant role in advancing these students into the within-word stage.

Paige, D. D., Rupley, W. H., Smith, G. S., Rasinski, T. V., Nichols, W., & Magpuri-Lavell, T. (2017). Is Prosodic Reading a Strategy for Comprehension? *Journal for Educational Research Online/Journal für Bildungsforschung Online, 9*(2), 245-275.

Research suggests that the three indicators of reading fluency are automaticity (rate), word identification accuracy, and prosody (Samuels, 2007). Evidence indicates that prosody, particularly the rhythm of speech, predicts unique variance in word reading and the ability to phrase connected text, which are important indicators of fluent reading (Dowhower, 1991). Schwanenflugel and Benjamin (2017) found that lexical prosody was associated with fluent reading in a study of third-grade students. In addition, lexical prosody predicted reading comprehension beyond what was predicted by rate and accuracy. Research acknowledges the importance of fluency to comprehension (Schwanenflugel et al., 2006). The National Reading Panel (2000) identified reading fluency as critical to effective reading instruction due to its relationship to comprehension (Paige, 2011).

Accurate and automatic decoding are fundamental skills for fluent reading. Accurate and automatic decoding allow readers to concentrate on text comprehension (Logan, 1988). Efficient decoding encourages automaticity at the word level, which enhances reading fluency and lets the reader allocate more mental resources to comprehension (LaBerge & Samuels, 1974).

The results of the present study showed that prosody explains unique variance in reading comprehension beyond that of other fluency indicators. The study's finding that prosody contributes to reading comprehension suggests that prosody should be included in reading instruction curriculums in the primary grades. Classroom activities such as teachers' modeling and explanation of expressive reading, and the creation of instructional scenarios in which students engage in repeated readings that help to improve their expressive oral interpretation of the texts, may result in increased reading achievement.

Key Points:
- Research suggests that the three indicators of reading fluency are automaticity (rate), word identification accuracy, and prosody.
- Evidence indicates that prosody, particularly the rhythm of speech, predicts unique variance in word reading and the ability to phrase connected text, which are important indicators of fluent reading.
- Accurate and automatic decoding are fundamental skills for fluent reading.
- The results of the present study showed that prosody explains unique variance in reading comprehension beyond that of other fluency indicators.

Rasinski, T. (2004). Creating Fluent Readers. *Educational Leadership, 61*(6), 46-51.

Research finds that reading fluency is an important factor for student reading achievement. However, reading instruction programs and materials rarely address reading fluency (Rasinski & Zutell, 1996). Reading fluency refers to a reader's ability to master surface-level text processing in order to understand the deeper levels of meaning found in a text.

There are three dimensions to reading fluency that ultimately lead to comprehension.

1. Accuracy in word decoding: A fluent reader must be able to accurately sound out the words in a text. This dimension refers to phonics and other word-decoding strategies.
2. Automatic processing: A reader must use minimal mental effort when decoding so that mental resources can be used to derive meaning from a text (LaBerge & Samuels, 1974).
3. Prosodic reading (Schreiber, 1980): Prosodic reading refers to reading with appropriate expression.

Rasinski explains how teachers can assess each of the three dimensions of reading fluency. For example, to determine accuracy in word decoding, a teacher can calculate the proportion of words a reader can accurately decode in on-grade-level material. As a general rule, an accuracy rate of 90–95% can be considered acceptable. Teachers can assess automaticity by observing students' reading rates. Since reading rates increase as students progress, target reading rates should likewise increase as students move on to higher grade levels. In order to assess prosodic reading, a teacher can

listen to a student read a passage and then rate the quality of the reading using a rubric that measures students on expression, volume, phrasing, smoothness, and pace.

Reading fluency instruction should be tailored to the areas in which students require the most help. Research (Pinnell et al., 1995) finds that reading fluency is a crucial element among fourth grade students. Furthermore, reading fluency may also be an important factor beyond elementary school, especially among students from less-advantaged backgrounds.

Key Points:
- Reading fluency is an important factor for student reading achievement.
- There are three dimensions to reading fluency that ultimately lead to comprehension: accuracy, automatic processing, and prosodic reading.
- Reading fluency instruction should be tailored to the areas in which students require the most help.
- Reading fluency may also be an important factor beyond elementary school, especially among students from less-advantaged backgrounds.

Schatschneider, C., Buck, J., Torgesen, J., Wagner, R., Hassler, L., Hecht, S., & Powell-Smith, K. (2004). *A Multivariate Study of Individual Differences in Performance on the Reading Portion of the Florida Comprehensive Assessment Test: A Brief Report.* **Florida Center for Reading Research.**

The present study sought to identify the principal reading, cognitive, and linguistic skills that contribute to individual performance differences on the reading portion of the Florida Comprehensive Assessment Test (FCAT) for third, seventh, and tenth grades. The study identified the primary skill and knowledge deficiencies that were associated with below-grade-level performance on the FCAT (Level 1 and 2 students).

The authors found that text reading fluency is the leading factor in explaining individual differences in third-grade performance on the FCAT. Verbal knowledge/reasoning was the second most important factor and was found to be significantly more important than nonverbal reasoning and working memory. Third-grade Level 1 and 2 readers performed substantially below average in reading fluency. In addition, the study found that Level 1 children had relatively poor phonemic decoding skills. On the other hand, Level 1 children performed only slightly below the average in verbal knowledge and reasoning.

Reading fluency and verbal knowledge/reasoning were equally important in explaining seventh-grade individual performance differences on the FCAT. Seventh-grade Level 1 and 2 students were significantly below average in reading fluency. Additionally, Level 1 students performed well below average on a measure of phonemic decoding ability. The study also found that Level 1 readers' verbal knowledge and reasoning skills fell further below average than did Level 1 third-grade students. Finally, Level 1 reading comprehension scores fell below what was predicted by their verbal knowledge/reasoning skills.

The study found that individual differences in verbal knowledge and reasoning was the most important factor in explaining tenth-grade test performance variability on the FCAT. Text reading fluency remained an important factor in accounting for FCAT performance. Tenth-grade Level 1 and 2 readers continue to score well below average in reading fluency. Furthermore, Level 1 and 2 readers performed significantly below average on a measure of phonemic decoding ability.

The results of the study support the construct validity of the FCAT as a measure of reading comprehension. Across the three grades, skills on every reading and language measure were positively associated with higher FCAT scores. This suggests that FCAT scores consistently identify students who are stronger readers and who have more verbal knowledge and reasoning skills.

Key Points:
- The results of the study support the construct validity of the FCAT as a measure of reading comprehension.
- Across the three grades, skills on every reading and language measure were positively associated with higher FCAT scores.
- The study found a gradual increase in the relative importance of the verbal knowledge/reasoning factor in accounting for variance on FCAT performance.

Schwanenflugel, P., Hamilton, A. M., Kuhn, M., Wisenbaker, J., & Stahl, A. (2004). Becoming a Fluent Reader: Reading Skill and Prosodic Features in the Oral Reading of Young Readers. *Journal of Educational Psychology, 96*(1), 9-129.

Prosodic reading, or reading with expression, is considered one of the principal characteristics of fluent reading. Prosodic reading requires children to do more than merely decode text and translate punctuation into speech. Prosodic reading also requires students to incorporate the natural rise and fall of pitch in ordinary conversation.

The current study's main purpose was to learn how reading prosody is related to word decoding. Schwanenflugel et al. found that students with quicker decoding speed "made shorter and less variable intersentential pauses, shorter intrasentential pauses, and larger sentence-final fundamental frequency declinations." In addition, the pitch contours of their sentences more closely paralleled those of adults who read the same passage. On the other hand, students with weaker decoding speed "read slowly with many long, hesitant pauses, with pauses that occurred in the middles of sentences, and with a rather flat prosodic contour."

Key Points:
- Prosodic reading is considered one of the principal characteristics of fluent reading.
- There exists a relationship between decoding speed and reading prosody.
- Fluent decoding skills are associated with shorter, less variable intersentential pauses, shorter intrasentential pauses, steeper sentence-final pitch declines, and a prosodic profile more closely resembling that of an adult.

Assessment/Differentiation

Moats, L. (2017). Can Prevailing Approaches to Reading Instruction Accomplish the Goals of RTI? *Perspectives on Language and Literacy, 43*(3), 15–22.

Recommendations on implementing Response to Intervention (RTI) often advocate flexible grouping of students in order to allow children with similar instructional requirements to be taught effectively.

It is possible for schools to adopt the RTI approach without fully implementing assessment and instructional practices that are consistent with the Science of Reading (Brady, 2011). However, successful implementation of RTI (Spear-Swerling, 2015) depends on educators' understanding of scientific research in reading psychology, linguistics, educational measurement, and instruction.

Key Points:
- Successful implementation of RTI depends on educators' understanding of scientific research in reading psychology, linguistics, educational measurement, and instruction.

Paige, D. D., Smith, G. S., Rasinski, T. V., Rupley, W. H., Magpuri-Lavell, T., & Nichols, W. D. (2019). A Path Analytic Model Linking Foundational Skills to Grade 3 State Reading Achievement. *The Journal of Educational Research, 112*(1), 110-120.

What is tested by state accountability assessments largely determines the focus of the school curriculum (Glatthorn, Jailall, & Jailall, 2016). Most end-of-year state reading assessments test students' ability to accurately answer questions after reading grade-level passages (Foorman, Petscher, & Schatschneider, 2015). However, end-of-year state reading assessments often do not assess the crucial underlying reading subskills that lead to understanding. Neglecting reading subskills on state reading assessments results in classroom instruction that gives insufficient attention to the development of the foundational skills needed to adequately understand what is read (Perfetti, 1985). Poor reading outcomes may be due to the fact that a significant percentage of students leave third grade with poor foundational skills (Pinnell et al., 1995). The present study investigates the relationships between foundational reading skills and achievement on a state assessment of reading standards.

Foundational skills were found to be a statistically significant predictor of state reading proficiency. The present study found that a student who was proficient in foundational skills was around 6.94 times more likely to be proficient on the state reading assessment than a student who was less than proficient at foundational skills. Spelling knowledge, sight-word reading, and fluency were found to explain similar amounts of variance in state reading achievement. The findings suggest that students with strong letter-sound correspondence knowledge have an advantage over students with weaker skills.

The authors found that adequate orthographic and reading fluency abilities by the end of third grade are crucial to achieving proficient status on a state reading assessment. These skills are foundational to reading comprehension and therefore should not be under-developed as the result of an overly narrow focus on reading comprehension. The study's findings agree with those of Valencia and Buly (2004), who discovered that the majority of students who performed poorly on state-mandated assessments of general reading achievement experienced difficulties with foundational reading skills.

Key Points:
- Foundational skills are a statistically significant predictor of state reading proficiency.

- End-of-year state reading assessments often do not assess the crucial underlying reading subskills that lead to understanding.
- Neglecting reading subskills on state reading assessments results in classroom instruction that gives insufficient attention to the development of the foundational skills needed to adequately understand what is read.
- Adequate orthographic and reading fluency abilities by the end of third grade are crucial to achieving proficient status on a state reading assessment.

Schatschneider, C., Buck, J., Torgesen, J., Wagner, R., Hassler, L., Hecht, S., & Powell-Smith, K. (2004). *A Multivariate Study of Individual Differences in Performance on the Reading Portion of the Florida Comprehensive Assessment Test: A Brief Report.* **Florida Center for Reading Research.**

The present study sought to identify the principal reading, cognitive, and linguistic skills that contribute to individual performance differences on the reading portion of the Florida Comprehensive Assessment Test (FCAT) for third, seventh, and tenth grades. The study identified the primary skill and knowledge deficiencies that were associated with below-grade-level performance on the FCAT (Level 1 and 2 students).

The authors found that text reading fluency is the leading factor in explaining individual differences in third-grade performance on the FCAT. Verbal knowledge/reasoning was the second most important factor and was found to be significantly more important than nonverbal reasoning and working memory. Third-grade Level 1 and 2 readers performed substantially below average in reading fluency. In addition, the study found that Level 1 children had relatively poor phonemic decoding skills. On the other hand, Level 1 children performed only slightly below the average in verbal knowledge and reasoning.

Reading fluency and verbal knowledge/reasoning were equally important in explaining seventh-grade individual performance differences on the FCAT. Seventh-grade Level 1 and 2 students were significantly below average in reading fluency. Additionally, Level 1 students performed well below average on a measure of phonemic decoding ability. The study also found that Level 1 readers' verbal knowledge and reasoning skills fell further below average than did Level 1 third-grade students. Finally, Level 1 reading comprehension scores fell below what was predicted by their verbal knowledge/reasoning skills.

The study found that individual differences in verbal knowledge and reasoning was the most important factor in explaining tenth-grade test performance variability on the FCAT. Text reading fluency remained an important factor in accounting for FCAT performance. Tenth-grade Level 1 and 2 readers continue to score well below average in reading fluency. Furthermore, Level 1 and 2 readers performed significantly below average on a measure of phonemic decoding ability.

The results of the study support the construct validity of the FCAT as a measure of reading comprehension. Across the three grades, skills on every reading and language measure were positively associated with higher FCAT scores. This suggests that FCAT scores consistently identify students who are stronger readers and who have more verbal knowledge and reasoning skills.

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- The results of the study support the construct validity of the FCAT as a measure of reading comprehension.
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The Effect of Foundational Skills on Vocabulary, Knowledge, and Reading Comprehension

Castles, A., Rastle, K., & Nation, K. (2018). Ending the Reading Wars: Reading Acquisition from Novice to Expert. *Psychological Science in the Public Interest, 19*(1), 5-51.

Throughout this comprehension literature review, the authors reveal how vocabulary comes into play at each level of reading development. First, vocabulary comes into play while children are first learning grapheme-phoneme relations and begin decoding familiar and unfamiliar print words. Children develop the necessary knowledge surrounding how graphemes relate to phonemes with familiar words, which in turn provides them with the ability to decode most words in their language. However, to use the sound-based representation to access the meaning of written words, they must have

adequate vocabulary. That is, children can decode unfamiliar printed words and access their pronunciations but cannot use these to access their meanings unless the words are familiar in oral form. Even where the alphabetic decoding process results in an incorrect pronunciation, children may be able to draw on their oral vocabulary to correct the decoding attempt or use the mispronunciation to make links between printed and spoken words. Thus, even while children are still developing the alphabetic principle and learning to read words, instruction in oral language will bring about gains in knowledge and enhance processing skills that will subsequently serve reading comprehension.

Indeed, vocabulary becomes even more important as children progress to learning to comprehend text. Vocabulary correlates with reading comprehension—this relationship may be both direct and indirect through vocabulary's association with other general cognitive resources. Moreover, this strong association might reflect bidirectional influences: Oral vocabulary sets the foundation for reading comprehension and successful reading itself and then provides opportunities to expand vocabulary. Once children can read, reading provides the major substrate for vocabulary growth. So, does teaching vocabulary improve reading comprehension? While even brief instructional opportunity to develop vocabulary contained in a reading passage can help comprehension of that passage, this instruction and knowledge was not shown to transfer to more general comprehension measures. Instead, research demonstrates instruction effective in shifting reading comprehension includes: vocabulary instruction in the context of broader oral language; instruction focused on specific types of words (e.g., those words that are not yet known but need to be known to comprehend a variety of texts and topics); and systematic instruction in more formal or technical academic vocabulary.

Key Points on vocabulary:
- Vocabulary comes into play while children are first learning grapheme-phoneme relations and begin decoding familiar and unfamiliar print words.
- Vocabulary is increasingly important as children progress to learning to comprehend text.
- Vocabulary correlates with reading comprehension. This strong association might reflect bidirectional influences: Oral vocabulary sets the foundation for reading comprehension and successful reading itself and then provides opportunities to expand vocabulary.
- Rich vocabulary knowledge subsumes not just the number of individual words known but also lexical quality. That is, how well words are known and how flexibly words can be used in a given context (i.e., knowledge of multiple meanings or "senses" of a word such as reading about eating *jam* versus reading about getting in a *jam*).
- Once children can read, reading provides the major substrate for vocabulary growth. Importantly, exposure to print can increase lexical quality—how well/precisely a printed word is known and how flexibly words can be used in a given context.
- High lexical quality frees up cognitive resources for reading comprehension. For example, vocabulary is also associated with other constructs underpinning reading comprehension—specifically, the cognitive resource of working memory, which facilitates the building of a detailed, rich, and well-connected situation model (the general definition of true reading comprehension). When lexical quality is low, some of the reader's limited cognitive resources must be directed to the more basic task of word recognition, thus compromising comprehension.
- Relatedly, as children continue to progress in their reading, development of morphological knowledge and awareness presents an important advantage in helping them map spelling and meaning.
- Beyond single words, reading comprehension requires knowledge of multiword utterances (e.g., "by the way"), idioms ("kick the bucket"), and other figurative expressions.
- Even brief instructional opportunity to develop vocabulary contained in a reading passage can help comprehension of that passage. This is important given the improvements and relatively minimal instructional demands. However, this instruction/knowledge does not transfer to more general comprehension measures.
- Research demonstrates approaches effective in shifting reading comprehension include vocabulary instruction in the context of broader oral language and instruction focused on specific types of words (e.g., those words that are not yet known but need to be known to comprehend a variety of texts and topics). Studies show systematic instruction in more formal or technical academic vocabulary may hold promise, especially because such words are rare in speech.

Key Points on reading comprehension:
- Reading comprehension is not a verbatim record of what has been read, replicating its form and structure; instead, meaning emerges from the formation of a "situation model" that builds dynamically as people read, culminating in a rich representation of the text that goes beyond what is stated explicitly.
- Reading comprehension is complex and multifaceted and as such, its underlying constructs—separating knowledge, processing, and general resources such as memory—are difficult to separate out.
- Key ideas surrounding development of knowledge & processing:
    - Oral language is the foundation of reading comprehension; vocabulary, grammar, and narrative skills predict later reading comprehension. Thus, instruction to improve reading comprehension initially does not need to involve written text. Even before children can read, interventions that target oral language lead to gains in knowledge and enhance the processing skills that will subsequently serve reading comprehension.

- As children's reading development progresses, comprehension is constrained by limitations in word-reading ability, for obvious reasons.
- Word recognition and high-quality lexical knowledge provide the necessary input to reading comprehension, but knowledge and processes beyond the individual word level are vital too. These aspects are not all specific to reading but are features of language comprehension more broadly.
- As word-reading skills strengthen, reading comprehension becomes constrained by limitations in knowledge and the capacity to build a rich and coherent representation of language, regardless of whether the language is heard or read.
- Key ideas surrounding general cognitive resources:
  - Of the general cognitive resources implicated in reading comprehension (e.g., working memory, cognitive flexibility, and inhibitory control), working memory has been discussed most in the literature on children's reading development.
  - The availability of working-memory resources should facilitate the building of a detailed, rich, and well-connected situation model. In line with this prediction, a strong relationship exists between reading comprehension and individual differences in working memory tasks across the life span.
- While the authors focus on research that demonstrates reading comprehension is foundational, underpinned by knowledge, processing, and general resources, they also acknowledge that other factors beyond the scope of this review—such as motivation to read, attitudes about reading, or knowledge about reading for different purposes—undoubtedly also contribute in complex and important ways.
- Comprehension strategies can be taught, and research shows they can be learned quickly and applied after relatively little instruction. More evidence is needed to identify which strategies should be taught, when, and for how long.
- While comprehension strategy instruction might be quick, the acquisition of knowledge is gradual and continuous. This can be assisted by direct teaching and using structured materials that support the curriculum; ultimately, however, it relies on rich input, much of which will come from reading experience itself.

Cunningham, A. E., & Stanovich, K. E. (1998). What Reading Does for the Mind. *American Educator*, *22*, 8-17.

There is general agreement that comprehension ability and reading volume are reciprocally related. Early reading success has been shown to lead to life-long reading habits. The subsequent exercise of this reading habit further develops reading comprehension ability (Juel, Griffith, & Gough, 1986).

In a 1992 study, Cipielewski and Stanovich focused on the question of whether reading volume is a significant predictor of individual differences in reading comprehension growth from third grade to fifth grade. Cipielewski and Stanovich found that reading volume successfully predicted differences in fifth-grade reading comprehension ability even after third-grade reading comprehension scores had been removed.

Key Points:
- Comprehension ability and reading volume are reciprocally related.
- The subsequent exercise of a reading habit further develops reading comprehension ability.

Dowhower, S. L. (1987). Effects of Repeated Reading on Second-Grade Transitional Readers' Fluency and Comprehension. *Reading Research Quarterly*, *22*(4), 389-406.

The repeated reading of connected discourse is a long-used procedure but, at the time of the study, there had been renewed interest in the efficacy of such procedures. Repeated reading (RR) procedures are grounded in whole-language theory and information-processing paradigms. The terminology and methods of RR procedures differ, but all share a common goal—to increase fluency—and a common strategy—rereading a meaningful passage until oral production is fluid, flowing, and facile. RR procedures generally fall into two categories: those in which reading of the passage is modeled either live or by audiotape (assisted), and those in which there is no modeling (unassisted).

This study investigated the effect of two RR procedures on second-grade transitional readers' (n=17) oral reading performance with practiced and unpracticed passages. Transitional readers are defined as those with average or better decoding ability but below-average reading rate. The students were assigned to one of two RR trainings, using either a read-along procedure (assisted) or independent practice (unassisted). Results showed transitional readers' rate, accuracy, comprehension, and prosodic reading significantly improved with RR practice regardless of the specific procedure employed. Gains in RR of practiced passages transferred to unpracticed, similar passages. However, practice on a single passage was not as effective as practice on a series of passages. That is, there was a cumulative practice effect as children practiced across multiple stories.

The authors conclude that their findings substantiate claims that comprehension is positively affected by RR. Indeed, both groups of students (assisted and unassisted) demonstrated statistically significant score gains in comprehension for practiced passages. However, beyond this effect, there is variability in the statistical significance of comprehension score gains. In terms of within-story transfer, students in both groups had score gains in comprehension, but these gains were not statistically significant. Measures for across-story transfer showed significant gains in mean comprehension scores for students in the assisted group, but gains in comprehension scores for students in the unassisted group were not significant. In contrast, measures for overall transfer effect showed significant gains in comprehension scores for the unassisted group while score gains for the assisted group were not significant, but the authors also report that between-group differences were not significant and, if the scores for both groups are combined, they show gains. Specifically, the percentage of comprehension questions answered correctly rose from 66% to 81%--however, there is nothing that indicates if this increase is statistically significant. These differences are not addressed in the conclusion and the implications section does include implications for RR and comprehension.

Key Points:
- RR can be an effective strategy for students to learn to read a passage faster, more accurately, and with more understanding.
- Transitional readers' rate, accuracy, comprehension, and prosodic reading were significantly improved by RR practice regardless of the specific procedure employed.
- Gains in RR of practiced passages transferred to unpracticed, similar passages.
- Practice on a single passage was not as effective as practice on a series of passages.
- Findings from the study suggest that prosodic reading and comprehension are related, but this relationship has not been explored.
- The authors conclude that their findings substantiate claims that comprehension is positively affected by RR, but the data reveal the only statistically significant score gains for both groups were in comprehension of practiced passages. The assisted group had statistically significant comprehension score gains in across-story transfer while the unassisted group had statistically significant comprehension score gains in overall transfer. The authors do not unpack these mixed findings.
- This study does not answer the question of how much RR is effective for transitional readers. It is still unknown whether RR should be used on a regular basis (daily or weekly) or interspersed in units throughout the year.
- Initial exposure to RR procedures can be demanding, especially for very slow readers (under 45 WPM). The initial passages should be kept short; frequent feedback should be given, and the children should be prepared for the likelihood that it may take a number of rehearsals for them to reach the target reading rate.

Ehri, L. C. (2014). Orthographic Mapping in the Acquisition of Sight Word Reading, Spelling Memory, and Vocabulary Learning. *Scientific Studies of Reading, 18*(1), 5-21.

Rosenthal and Ehri (2008) investigated whether showing students the written forms of newly encountered words would improve vocabulary learning. The study's results suggest that presenting students with the spellings of spoken vocabulary words will improve their ability to learn the word meanings compared to having students only hearing and saying the words. The authors argue that when students are shown spellings as they hear and pronounce words, meanings became better connected.

Rosenthal and Ehri (2008) found that orthographic mapping better explained the acquisition of new vocabulary words, including their pronunciations, than did phonological working memory. The results of the study suggest that once students become literate, greater ability to connect spellings to pronunciations in memory explains why strong readers build larger vocabularies than weak readers.

Beyond their earliest years, children's vocabularies increase significantly from reading text (Nagy & Scott, 2000). However, when children read text silently and independently, they may skip over unfamiliar words and just infer their meanings without taking the time to pronounce them. Consequently, the connections that secure the new words in memory are not formed. Children with weaker decoding skills may be more likely to skip unfamiliar words. This tendency may slow the vocabulary growth of readers with poor decoding skills compared to strong readers.

Rosenthal and Ehri (2011) found that an oral word-reading strategy increased vocabulary learning significantly in both strong and weak readers compared to a silent reading condition. Children who spoke vocabulary words aloud learned the meaning–pronunciation associations of the words better than those who did not speak words aloud. Children exposed to the aloud condition included vocabulary words more often in their verbal retellings of stories than did students exposed to the silent condition. The authors conclude that students should be instructed to pronounce new vocabulary words aloud when the words are encountered in print. Transforming letters into sounds helps children form connections and memorize the meanings of words.

Key Points:

- Presenting students with the spellings of spoken vocabulary words will improve their ability to learn the word meanings compared to having students only hearing and saying the words.
- Once students become literate, greater ability to connect spellings to pronunciations in memory explains why strong readers build larger vocabularies than weak readers.
- Children who spoke vocabulary words aloud learned the meaning–pronunciation associations of the words better than those who did not speak words aloud.

Foorman, B., Beyler, N., Borradaile, K., Coyne, M., Denton, C. A., Dimino, J., Furgeson, J., Hayes, L., Henke, J., Justice, L., Keating, B., Lewis, W., Sattar, S., Streke, A., Wagner, R., & Wissel, S. (2016). *Foundational Skills to Support Reading for Understanding in Kindergarten Through 3rd Grade* **(NCEE 2016-4008). Washington, DC: National Center for Education Evaluation and Regional Assistance (NCEE), Institute of Education Sciences, U.S. Department of Education. Retrieved from the NCEE website: http://whatworks.ed.gov.**

The NCEE Practice Guide recommends that students read connected text daily in order to support reading comprehension. A review of the evidence showed that 18 studies found positive effects on word reading, oral reading accuracy, oral reading fluency, and/or reading comprehension outcomes. However, eight of these studies reported no significant effect on other outcomes in these areas. In addition, three of the reviewed studies found no significant effects for any of these outcomes, with one study actually finding a negative effect for one outcome. Furthermore, the evidence suggested that the recommendation had no significant effect on listening comprehension outcomes.

Reading connected text accurately and with appropriate comprehension requires students to identify words quickly, to integrate ideas in the text with background knowledge, to self-monitor their understanding of what they read, and to apply strategies to support comprehension. The National Reading Panel (2000) found evidence that instruction designed to increase reading fluency has beneficial effects on reading comprehension. The NCEE Practice Guide confirms the NRP conclusions. Having students read connected text daily, with and without constructive feedback, supports the development of reading comprehension and should commence once students can identify words. Furthermore, the Guide suggests that students interact with a variety of connected texts of varied levels, genres, and content.

The Guide recommends that academic vocabulary be taught in the context of other reading activities. Teachers should introduce students to academic vocabulary that is relevant to many subjects. It is suggested that schools develop a common set of vocabulary words that align with selections to be read throughout the school year. These vocabulary words should occur frequently throughout the school year in a variety of contexts and should be unfamiliar to most students.

When introducing new vocabulary, teachers should present a clear and concise definition along with meaningful sample supportive sentences that include the learned word. Alternatively, teachers can read a sentence with the new vocabulary word, and then replace the vocabulary word in the sentence with its definition. After having been introduced to new words, students should be provided with additional opportunities to use and discuss the words. New vocabulary words should be reviewed often and incorporated into conversations and writing assignments.

Key Points—Comprehension:
- The NCEE Practice Guide recommends that students read connected text daily in order to support reading comprehension.
- Reading connected text with appropriate comprehension requires students to identify words quickly, to integrate ideas in the text with background knowledge, to self-monitor their understanding of what they read, and to apply strategies to support comprehension.
- Instruction designed to increase reading fluency has beneficial effects on reading comprehension.

Key Points—Vocabulary:
- The NCEE Practice Guide recommends that students be taught academic language skills, including inferential and narrative language, and vocabulary knowledge.
- Academic vocabulary should be taught in the context of other reading activities.
- New vocabulary words should be reviewed often and incorporated into conversations and writing assignments.

Paige, D. D., Rupley, W. H., Smith, G. S., Rasinski, T. V., Nichols, W., & Magpuri-Lavell, T. (2017). Is Prosodic Reading a Strategy for Comprehension? *Journal for Educational Research Online/Journal für Bildungsforschung Online,* **9(2), 245-275.**

Research on reading prosody has found that it contributes to comprehension processing in students across all grades. For example, in a study of fourth-grade students, Pinnell et al. (1995) found that as part of fluent reading, phrasing and oral expression were positively related to reading comprehension. Paige et al. (2014) found that reading prosody and word identification accuracy predicted 52.7% of the variance in a standardized test of reading comprehension (automaticity was not a significant predictor) administered to struggling ninth-grade readers. After controlling for word identification accuracy, Paige et al. (2014) found that prosody predicted around 7% of unique variance in reading comprehension.

Paige et al. (2014) provide an explanation of the role of prosody in reading comprehension. The tandem theory assumes that readers seek to understand the text being read and to invoke proper comprehension monitoring while reading. When a reader adequately decodes words and applies appropriate prosody to the text, he or she is freed to intentionally adjust his or her reading rate up or down according to the perceived level of reading comprehension. As a result, readers may increase their reading rate when reading comprehension occurs easily. On the other hand, if comprehension is difficult, the reader may decrease their reading rate.

The present study investigates the development of reading prosody and its effect on comprehension in first- through third-grade students. The study found that word identification accuracy and expressive phrasing (prosody) explained 64.9% of the variance in comprehension. Word identification accuracy explained 62.4% of the variance, while expressive phrasing explained an additional 2.5% of the variance in comprehension in early elementary students. In addition, the study found that prosody exercises a significant mediating effect on the relationship between automaticity and comprehension. Reading rate, smooth pacing, and automaticity were not significant predictors of comprehension.

Key Points:
- Research on reading prosody has found that it contributes to comprehension processing in students across all grades.
- When a reader adequately decodes words and applies appropriate prosody to the text, he or she is freed to intentionally adjust his or her reading rate up or down according to the perceived level of reading comprehension.
- The study found that word identification accuracy and expressive phrasing (prosody) explained 64.9% of the variance in comprehension.
- Reading rate, smooth pacing, and automaticity were not significant predictors of comprehension.

Schatschneider, C., Buck, J., Torgesen, J., Wagner, R., Hassler, L., Hecht, S., & Powell-Smith, K. (2004). *A Multivariate Study of Individual Differences in Performance on the Reading Portion of the Florida Comprehensive Assessment Test: A Brief Report.* **Florida Center for Reading Research.**

The present study sought to identify the principal reading, cognitive, and linguistic skills that contribute to individual performance differences on the reading portion of the Florida Comprehensive Assessment Test (FCAT) for third, seventh, and tenth grades. The study identified the primary skill and knowledge deficiencies that were associated with below-grade-level performance on the FCAT (Level 1 and 2 students).

The authors found that text reading fluency is the leading factor in explaining individual differences in third-grade performance on the FCAT. Verbal knowledge/reasoning was the second most important factor and was found to be significantly more important than nonverbal reasoning and working memory. Third-grade Level 1 and 2 readers performed substantially below average in reading fluency. In addition, the study found that Level 1 children had relatively poor phonemic decoding skills. On the other hand, Level 1 children performed only slightly below the average in verbal knowledge and reasoning.

Reading fluency and verbal knowledge/reasoning were equally important in explaining seventh-grade individual performance differences on the FCAT. Seventh-grade Level 1 and 2 students were significantly below average in reading fluency. Additionally, Level 1 students performed well below average on a measure of phonemic decoding ability. The study also found that Level 1 readers' verbal knowledge and reasoning skills fell further below average than did Level 1 third-grade students. Finally, Level 1 reading comprehension scores fell below what was predicted by their verbal knowledge/reasoning skills.

The study found that individual differences in verbal knowledge and reasoning was the most important factor in explaining tenth-grade test performance variability on the FCAT. Text reading fluency remained an important factor in accounting for FCAT performance. Tenth-grade Level 1 and 2 readers continue to score well below average in reading fluency. Furthermore, Level 1 and 2 readers performed significantly below average on a measure of phonemic decoding ability.

The results of the study support the construct validity of the FCAT as a measure of reading comprehension. Across the three grades, skills on every reading and language measure were positively associated with higher FCAT scores. This suggests that FCAT scores consistently identify students who are stronger readers and who have more verbal knowledge and reasoning skills.

Key Points:
- The results of the study support the construct validity of the FCAT as a measure of reading comprehension.
- Across the three grades, skills on every reading and language measure were positively associated with higher FCAT scores.
- The study found a gradual increase in the relative importance of the verbal knowledge/reasoning factor in accounting for variance on FCAT performance.

Stanley, C., Petscher, Y., & Catts, H. (2017). A Longitudinal Investigation of Direct and Indirect Links Between Reading Skills in Kindergarten and Reading Comprehension in Tenth Grade. *Reading and Writing, 31*(1), 133-153.

In this study, the authors examined the extent to which a number of early elementary literacy skills were associated with reading comprehension in tenth grade while controlling for third grade vocabulary and oral reading fluency. The authors' findings suggest that fundamental measures of reading proficiency have a significant impact on reading comprehension in secondary school years.

The study found a direct effect of kindergarten vocabulary on reading comprehension in tenth grade. Vocabulary acquisition at each grade level likely supports vocabulary at the next level, with students increasing their lexicons and gaining an appreciation of linguistic elements. This process works to support further understanding. In addition, the study found that the path from third-grade vocabulary to tenth-grade reading comprehension was positive and significant. This finding further reveals that vocabulary may be a relatively durable skill with observable benefits that stretch well into secondary school. The study found that third-grade vocabulary mediates the association between kindergarten vocabulary and tenth-grade reading comprehension. These findings suggest that vocabulary acquisition in kindergarten is part of a long causal process ultimately linked with reading comprehension.

The authors found that overall reading fluency in elementary school readers is a good predictor of reading comprehension in the secondary school years. Fuchs et al. (2001) argued that overall reading fluency can be viewed as an indicator of reading comprehension due to the fact that overall reading fluency requires the ''translation of letters into coherent sound representations, utilizing those sound components into recognizable whole and automatically assessing lexical representation, processing meaningful connections with and between sentences, related text meaning to prior information and making inferences to supply missing information.''

The findings from this study lend support to the notion that indirect effects exist between basic literacy skills and vocabulary in early elementary school and reading comprehension in secondary school.

Key Points:
- Indirect effects exist between basic literacy skills and vocabulary in early elementary school and reading comprehension in secondary school.
- Vocabulary acquisition in kindergarten is part of a long causal process ultimately linked with reading comprehension.
- Overall reading fluency in elementary school readers is a good predictor of reading comprehension in the secondary school years.

Stanovich, K. (2008). Matthew Effects in Reading: Some Consequences of Individual Differences in the Acquisition of Literacy. *Journal of Education, 189*(1), 23-23.

Reading comprehension, the ability to extract meaning from what is read, is the ultimate goal of reading. Top-down theorists have found that readers need to allocate attentional capacity to comprehension rather than to word recognition in order to become fluent. Recently, cognitive and developmental psychologists have helped to specify the key mechanism that allows capacity to be allocated to comprehension. This key mechanism is efficient decoding, not context use.

Researchers have had difficulty showing that disrupting the word-recognition processes serves to reduce comprehension (Levy, 1981) or that making word recognition more efficient serves to increase comprehension (Fleisher, Jenkins, & Pany, 1979). Studies have increasingly found that variation in vocabulary knowledge is a causal determinant of differences in students' reading comprehension ability (Beck, Perfetti, & McKeown, 1982).

Key Points:
- Readers need to allocate attentional capacity to comprehension rather than to word recognition in order to become fluent.
- Studies have increasingly found that variation in vocabulary knowledge is a causal determinant of differences in students' reading comprehension ability