

What Science Tells Us About Reading Instruction: An American Perspective

For the All Children Read Project of the Fundația Noi Orizonturi in Romania.

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The origins of interest in educational research.

In the United States, research into the learning and teaching of reading has a relatively long history. The American Educational Research Association was founded in 1913 to encourage studies of educational matters and to disseminate results, and the National Council of Teachers of English appeared in 1916 with a similar mission, targeting the teaching of reading, writing, and the study of literature in secondary schools. It was not until 1956 that the International Reading Association (now the International Literacy Association) combined some smaller professional groups to investigate issues related to reading in *primary* schools and to disseminate best practices. I suspect that the delayed emphasis on reading in primary grades can be linked to the history of teacher training in the United States.

Primary school teachers were long trained in “normal schools” (what in Romania are called *magisteriums*) that concerned themselves with teaching curriculum and pedagogy rather than conducting research into learning issues. In the 1940’s, normal schools became four-year teachers’ colleges, and in the 1960’s and 70’s many teachers’ colleges became universities¹, where producing research was a requirement for employment. Research into reading in the primary years advanced greatly as teacher educators in universities joined forces with psychologists, linguists, literary theorists, and other scholars to investigate reading issues.

Research into beginning reading did have a few strong practitioners in the first half of the Twentieth Century. William S. Gray (1885-1960) brought statistical reasoning to choosing words in an immensely popular whole-word oriented basal textbook series (basal textbooks are a set of anthologies of graduated reading materials for children, accompanied by guidance for teachers). Gray conducted surveys of adult literacy in the United States, surveyed reading instruction around the world for UNESCO, and laid the theoretical groundwork for developing readability inventories.

¹ <https://education.stateuniversity.com/pages/2479/Teacher-Education.html#:~:text=By%20the%201940s%2C%20most%20normal%20schools%20had%20expanded%2C,in%20the%201960s%20and%201970s%2C%20into%20state%20universities.>

Emmett Betts (1903-1987) pioneered the idea of setting up reading clinics in teachers' colleges to study children's learning and experiment with best ways to teach them (reading clinics later moved into universities where teacher educators were trained on the graduate level and grounded their research in practical experiences with learners). Betts developed the Informal Reading Inventory in the 1920's and was a spirited advocate of honoring individual differences in children's reading abilities. He mapped out what we use today as the *independent*, *instructional*, and *frustration reading levels* in service to the goal of differentiating instruction to help all children succeed. There were relatively few such researchers, though, before the 1960's and 1970's.

University-based reading clinics.

Emmett Betts, as just noted, set up one of the first college-based reading clinics in the 1930's. This was a new idea at the time. A few universities already had laboratory schools as general training grounds for teachers-in-training², but clinics focused specifically on reading came into existence to serve somewhat like teaching hospitals (though they were more cheerful places), where graduate students and future teacher educators could intensively

² Most notably at the University of Chicago and at Teachers College Columbia University. The philosopher John Dewey taught at both schools.

study children's struggles and successes as they tried to learn to read, and faculty could collect insights and data for research. In the 1980's, there were some 200 university-based reading clinics in the United States³, and though today there are probably far fewer, their influence on the reading field of study has been tremendous⁴.

Phonics and whole words.

The earliest book-length work in the United States on the science of reading was E.B. Huey's *The Psychology and Pedagogy of Reading*, published in 1908⁵. Huey noted that a heated debate between advocates of teaching

³ Bader, L.A., Wiesendenger, K.D. (1986). University Based Reading Clinics: Practices and Procedures. *The Reading Teacher*, Vol. 39, No. 7, pp. 698-702.

⁴ One of Betts' students, Russell Stauffer, set up and directed a reading clinic at the University of Delaware, where he elaborated what we know as the Language Experience Approach, and created active means of teaching reading comprehension, including the strategy we call the Directed Reading-Thinking Activity or the predictive method. Stauffer trained Edmund Henderson in his clinic, and Henderson later directed the McGuffey Reading Center at the University of Virginia. Henderson's students included a host of influential scholars including Elizabeth Sulzby and William Teale, who were leaders in the study of emergent literacy; Darrell Morris, who developed the tutoring procedures we used in the REFINE project in six countries in Central Europe and you continue to use in the New Horizons' All Children Read project in Romania; Donald Bear (Donnie was an RWCT volunteer trainer in Romania), Shane Templeton, and Marcia Invernizzi, who developed a widely popular contextualized approach to teaching phonics based on developmental principles; Richard Gentry and Kathy Ganske, both of whom showed teachers how to teach spelling, vocabulary, and reading in step with children's developmental learning; and (at the risk of immodesty) the present writer, whose co-authored books on invented spelling and early writing, the diagnosis and treatment of reading disabilities, reading instruction for diverse students, and children's literature have been published in many editions since the 1980's and 1990's.

⁵ See a biography of Huey at https://www.readinghalloffame.org/sites/default/files/deceased_member_files/a_brief_life_with_an_enduring_legacy.pdf

reading by **whole words** rather than via **phonics or decoding** (relating the letters of a written words to speech sounds) had been waged for generations before his time. The debate continued for nearly a century after Huey wrote.

In the United States, William S. Gray advocated the method of teaching reading via whole words, and promoted whole-word reading instruction via the widely-used basal reading series, *Dick and Jane*, in print from 1930 through 1965⁶. In 1967, Jeanne Chall published *Learning to Read, The Great Debate*⁷, in which she asserted the superiority of teaching beginning reading via phonics. That same year, Guy Bond and Robert Dykstra published *The First Grade Studies*⁸, a carefully coordinated series of studies from many sites that reached essentially the same conclusion: code-centered approaches (i.e., phonics) were more effective than whole-word approaches for teaching beginning readers. Dick and Jane could retire at last.

In the same year the just-mentioned works were published, seeds were being sewn for a new whole-word approach that would eventually take the name “Whole Language” (a term that may be familiar to Romanian readers as

⁶ Remembering Dick and Jane from my first and second grade years, I’m reminded of a line from the old Paul Simon song “Kodachrome.” It’s a wonder I can read at all.

⁷ Chall, J. (1967). *Learning to Read, The Great Debate*. McGraw-Hill.

⁸ See Readance, J.E., and Barone, D. M., (Ed.). (1997). Revisiting the First-Grade Studies. *Reading Research Quarterly*, v32 n4.

the Global Method⁹). Its chief advocates were Kenneth Goodman¹⁰, a teacher educator, and Frank Smith¹¹, a psycholinguist. Both drew on the emerging field of **psycholinguistics**, that was leading researchers to view children's language acquisition as a process of discovery, in which young curious minds tacitly examined the speech of adults, sifted out the patterns and rules that governed it, and used closer and closer approximations of those patterns and rules to structure their own sentences. Smith and Goodman reasoned that if discovery learning was at work in spoken language acquisition, it must be a natural way to learn to read written words, too. They persuaded many thousands of teachers, hundreds of school governing boards, and many publishers of reading materials to adopt their Whole Language approach. (A great many of them went on to regret it, too¹²).

⁹ But not to be confused with el método global of Cestín Freinet, the French educator.

¹⁰ Goodman, K. S. (1967). Reading: A psycholinguistic guessing game. *Journal of the Reading Specialist*, 6(4), 126-135. <https://doi.org/10.1080/19388076709556976>

¹¹ Smith, Frank (1978). *Understanding Reading*. Holt, Rinehart, and Winston.

¹² For a poignant illustration, consider the sad tale of William Honig, the State Superintendent of Schools in California during the 1990's. Honig initially adopted the Whole Language approach wholeheartedly, but later when reading scores sagged, he campaigned against it with just as much passion. [EJ682505.pdf \(ed.gov\)](#)

The “Whole Language” debate.

Whole Language had many valuable ideas. It encouraged teachers to allow children to write freely using invented writing¹³ and invented spelling¹⁴, in the belief that early writing would motivate young children to examine the features of writing and spelling and progress developmentally. The Whole Language advocates’ practice of “Kidwatching”¹⁵ was guided by Vygotskian theory¹⁶ to locate the “cutting edge” of children’s efforts to learn and help them face those challenges successfully.

Whole Language ushered in the practice of stocking classroom libraries with many titles of interesting children’s books, and the production of hundreds of titles of engaging and colorful “little books,” which were illustrated works of eight to sixteen pages written on gradually escalated levels of challenge, beginning with books for kindergarten children that had one or two words on a page accompanied by an illustration that showed what the words said, and culminating at the late second grade level in books with several lines of print per page and less picture support. The first and most successful publisher of such books was Wendy Pye¹⁷ of New Zealand, whose Sunshine

¹³ Ferreiro, E., & Teberosky, A. (1982). *Literacy before schooling*. Heinemann; and Clay, M.M. (1975). *What did I write?* Heinemann.

¹⁴ Temple, C., Nathan, R., and Burris, N. *The beginnings of writing*. Allyn and Bacon.

¹⁵ Goodman, Y., and Owacki, G. (2002). *Kidwatching: Documenting Children’s Literacy Development*. Heinemann.

¹⁶ Vygotsky, L.S. (1962). *Thought and language*. MIT Press.

¹⁷ wendypye.co.uk

Books gained popularity in many Anglophone countries. Her fellow New Zealander, Donald Holdaway¹⁸, developed the idea of producing “big book” versions of the little books that teachers could read with a group of children with everyone’s eyes on the same page at the same time (a significant improvement over having teacher and students looking at different books). Holdaway believed big books had an advantage over Language Experience charts that had been produced by children and teachers, because their prose, created by professional writers, was often more pleasingly structured. Also, big books provided a nice transition to reading children’s books. Following Holdaway’s example, and using his **shared reading** method¹⁹, teachers first produced big books themselves, and then publishers began printing them, too.

Advocates of the Whole Language approach stressed meaning first—so far, so good. But then the Whole Language theorists overreached. They posited that if children had the beginning of an idea of what a text was about, they would puzzle out the words by sampling only a letter or two from each word, in what Goodman called the “psycholinguistic guessing game.” Holdaway explained the process this way: "(a) go back and read from the beginning of the sentence and/or read further on; (b) check the first letter or letter cluster; (c) make a prediction (an informed

¹⁸ [donald holdaway - who are these people .pdf \(readinghalloffame.org\)](#)

¹⁹ Holdaway, D. (1984). *Foundations of Literacy*. Heinemann.

guess).²⁰ K. Goodman and Y. Goodman had previously written in 1975, "The art of becoming a fluent reader lies in learning to rely less and less on information from the eyes."²¹ But, alas, research that used modern means to track readers' eye movements rebutted this description. Good readers, it turns out, look at all the letters²².

Meanwhile, Whole Language-oriented educators developed an assessment tool, the Reading Miscue Inventory²³, that was consistent with the psycholinguistic guessing game model. Wrote one enthusiastic contemporary reviewer,

The Reading Miscue Inventory (RMI) is a diagnostic instrument based on the assumption that reading is not letter or word decoding, but rather a process of predicting, selecting, and sampling of cues that are subsequently tested by syntactic and semantic information within both the reader and the text.²⁴

If you have been paying attention so far, however, you might be asking, "What if reading *is* word decoding, at least to a substantial extent?" The Reading Miscue Inventory gradually faded from the scene after the National Reading Panel Report was published in 2000 (see below), with the last RMI published in 2005, but the idea of

²⁰ Holdaway (1986), cited in Hornsby, D., Sukarna, D., & Parry, J., *Read on: A conference approach to reading*. Heinemann.

²¹ Goodman, K.S., and Goodman, Y. (1975). Learning to read is natural. In Resnick, L, and Weaver, P. *Theory and Practice of Early Reading: Volume 1, Volume 1*. Routledge.

²² Rayner, 1989, cited Hempenstall, K. Part 1: Whole Language! What was that all about?
<https://www.dropbox.com/sh/olxpifutwcvvg8j/AABU8YNr4ZxiXPXzvHrrirR8a?dl=0>

²³ Goodman, Y., and Burke, C. (1972). *Reading miscue inventory: procedures for diagnosis and evaluation; complete kit*. MacMillan.

²⁴ Feeley, Joan T. Adding the Reading Miscue Inventory to the Reading Case Study. ERIC: [ERIC - ED158227 - Adding the Reading Miscue Inventory to the Reading Case Study., 1977-May](https://eric.ed.gov/?id=ED158227)

categorizing children's misreading of words according to the "three cuing system"-- deciding whether a misreading of a word is caused by graphophonic, syntactic, or semantic cues-- is still in some teachers' repertoires²⁵. But to what end?

The psycholinguistic guessing game explanation of word recognition was called into question through the 1980's by many researchers, some of whom had been sympathetic at first to the Whole Language movement, but whose studies failed to bear out the validity of the guessing game model²⁶. By the 1990's, critics of Whole Language were vocally asserting that children not only read all the letters in a word, but that they should be systematically taught about phonics, the relationships between letters and sounds²⁷.

Concerns about early reading.

Meanwhile, pressure in the United States was mounting to improve the effectiveness of beginning reading. An influential study by Connie Juel showed that 86% of children in a first grade in one school who struggled to learn to read had made almost no progress four years later, while their classmates had greatly improved²⁸. Keith Stanovich

²⁵ From Adams, M. J. (1998). "The Three-Cueing System." In F. Lehr and J. Osborn (Eds.), *Literacy For All: Issues In Teaching And Learning*, pp. 73-99. Guilford Press.

²⁶ K. Stanovich (1997), personal communication.

²⁷ Adams, M.J. (1994). *Beginning to read: Thinking and Learning About Print*. MIT Press.

²⁸ Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Educational Psychology*, 80(4), 437-447.

ventured the “**Matthew Effects**”²⁹ metaphor as an explanation: relatively small difficulties encountered in the early months, typically problems with phonological processing or letter-to-sound matches, discourage children from practicing reading; and for lack of practice, troubled readers fail to grow their vocabularies, or gain reading fluency, or acquire the background knowledge needed to comprehend texts. Moreover, they often get discouraged and lose the willingness to apply themselves to the tasks of learning. With accumulated failures, four years later they may appear to be seriously disabled readers.

Faced with research evidence that countered their “guessing game” model of word recognition, however, many Whole Language advocates firmly stuck to their beliefs about children’s learning to read words. Indeed, a study of the rhetoric of prominent articles and books about teaching reading from a Whole Language perspective pointed out that their reasoning was more like religious writing, urging teachers to keep the faith in their beliefs despite the slings and arrows of the critics, rather than making scientific arguments that marshalled evidence toward valid conclusions³⁰.

²⁹ “Matthew effects” were an allusion to St. Matthew’s Gospel, where it is said in effect that “the rich will get richer and the poor will get poorer.” See Stanovich, K.E. (1986). Matthew Effects in Reading: Some Consequences of Individual Differences in the Acquisition of Literacy. *Reading Research Quarterly* 21(4):360-407.

³⁰ Moorman, G. B., Blanton, W. E., & McLaughlin, T. (1994). The rhetoric of whole language. *Reading Research Quarterly*, 29(4), 308–329.

Weighing in on the phonics side of the debate, in 1986 Phillip Gough and William Tunmer began publishing works on the **Simple View of Reading**, which proposed that reading ability could be explained by (1) the ability to decode words, using phonics, and (2) the ability to comprehend spoken language, especially the language of texts³¹. Those two skills were thought to be performed independently and sequentially, with decoding coming first. The Simple View of Reading had much influence on the reading field, which continues to this day (More on the Simple View below).

By the mid-1990's, the Reading Wars in the United States were in full blaze. The quote below from a neophyte teacher trainer evokes the tension many teachers felt when faced with choosing between Whole Language and the phonics alternative (Full disclosure: the "neophyte teacher trainer" went on to become a devoted practitioner of phonics instruction):

At this [Whole Language] conference, I was told that the best way to help students read was to encourage them to predict words using pictures, surrounding context, and their own prior knowledge... They said we should teach students to read the same way they learned to speak, which is to say they will learn if they grow up in a literature-rich environment, with exposure to predictable books. I wanted so much to help my students, but ...doubts kept nagging me... It's the reader who constructs meaning, they said. I wanted to believe this was my answer. But the doubts were there too... Writers select words for a reason.

³¹ Gough, P. B., & Tunmer, W. E. (1986). Decoding, Reading, and Reading Disability. *Remedial and Special Education*, 7, 6-10.

Don't they? If readers create meaning, why can't we just read a blank page? ...How would this work if you're a pharmacist?³²

In order to settle the debate between the Whole Language advocates and proponents of phonics instruction, and to refocus early reading instruction in a single effective direction, the federal government of the United States commissioned a National Reading Panel in 1997 to survey "evidence-based" research studies and make recommendations.

The panel's report, published in 2000³³, reviewed all relevant research studies they could find that used control and experimental groups and employed reputable methods for drawing conclusions.

³² Shapiro, H. A. *Questioning the authority of whole language*. <https://raviniareadingcenter.com/questioning-the-authority-of-whole-language/>. Downloaded January 20, 2022.

³³ National Institute of Child Health and Human Development (NICHD) and U.S. Department of Education (2000). *Report of the National Reading Panel: Teaching Children to Read*.

The “Big Five.”

The Nation Reading Panel’s report recommended the teaching of five aspects of reading ability, often called “the Big Five:” **phonemic awareness, phonics, reading fluency, vocabulary, and comprehension**. All are described below, along with some discussion of the research that led up to them.

Phonemic awareness. Phonemic awareness is the recognition that spoken words can be decomposed into meaningful sounds. Until relatively recently, though, its importance in beginning reading was not understood in the United States. Like outer space, at least one Russian got there first³⁴.

Dyslexia is a term for children’s failing to learn to read even while they have been taught adequately. Up until the 1970’s, the dominant explanation traced the problem to confused processing in the brain. Samuel Orton, a neuropsychiatrist and pathologist who worked with adult patients suffering from physical brain damage, claimed that a disability called **strephosymbolia** caused troubled readers to see words backwards: dyslexic children read *was* and

³⁴ The Russian researcher D.B. Elkonin discovered the importance of awareness of phonemes long before the Americans did. Elkonin introduced the idea of having children to manipulate physical objects in boxes on paper as they slowly pronounced words, to call their attention to phonemes. See Elkonin, D.B, (1963). The psychology of mastering the elements of reading. In B. Simon and J. Simon (eds.), *Educational psychology in the USSR*. London: Routledge and Kegan Paul, pp. 165-179.

said *saw*³⁵. They reversed the letter **S** when they wrote. In the 1970's, however, psychologists began to suspect that not confused visual perception, but children's awareness of sounds in spoken words, especially the smallest units of sound called **phonemes**, might be a cause of failure to learn to read.

A phoneme is "any of the perceptually distinct units of sound in a specified language that distinguish one word from another..."³⁶ Phonemes, though, are an elusive concept. We know that the word **cat** is made up of the three phonemes /k/, /æ/, and /t/, but we can't pronounce the word **cat** so slowly that those three phonemes are distinctly heard. We know that /k/ is a phoneme because it distinguishes **cat** from **chat** and **sat**. We know that /æ/ is a phoneme because it distinguishes **cat** from **kit** and **cot**. Likewise, /t/ is a phoneme because it distinguishes **cat** from **cad** (a disagreeable person) and **cap**.

³⁵ Orton, S.T. (1963). *Word-blindness in school children and other papers on strephosymbolia. (specific language disability-dyslexia) 1925-1946*. The Orton Society.

³⁶ [definition of phoneme - Bing](#)

Being aware that a spoken word is made up of phonemes is essential if children are to succeed in lessons that link letters to sounds in words (at least it is in English and Romanian, though perhaps not in Kiswahili or Spanish)³⁷, but some children develop such awareness more slowly than others, and some have great difficulty.³⁸³⁹

Frank Vellutino demonstrated that reversing letters while reading and writing is a sign of underdeveloped learning rather than a dysfunction in the brain⁴⁰. He found that younger normally developing learners reversed letters with the same frequency as older disabled readers. Then he disputed the very definition of dyslexia; most so-called “dyslexic” children who had not learned to read *could* learn, if they were taught properly.

Benita Blachman and Eileen Ball⁴¹ showed that teaching kindergarten children to be aware of and manipulate phonemes in spoken words was an effective method for avoiding later difficulties in learning to read, and by the late

³⁷ In Spanish, and presumably in other languages such as Kiswahili that build words out of relatively few syllables, Goldenberg, et. al., have shown that teaching children to relate groups of letters to spoken syllables may be more efficient than relating letters to phonemes. This is important, because it means teachers can bypass the difficult task of breaking words down into phonemes. Breaking words into syllables is a far easier task; we can hear syllables. We can even dance to them! See Goldenberg, C., Tolar, T.D., Reese, L., Francis, D.J., Bazan, A.R., and Mejia-Arauz, R. (2014). How Important Is Teaching Phonemic Awareness to Children Learning to Read in Spanish? *American Educational Research Journal*, 51, 3.

³⁸ See Liberman, I., Shankweiler, D., Fischer, F.W., and Carter, B. (1974). Explicit syllable and phoneme segmentation in the young child. *Journal of Experimental Child Psychology*. 18, 2, 201-212.

³⁹ [Students Experiencing Reading Difficulties: Phonological Skills - Evidence Based Early Literacy \(mass.edu\)](#)

⁴⁰ Vellutino, F. R. (1979). *Dyslexia: Theory and research*. The MIT Press.

⁴¹ Ball, E. W., & Blachman, B. A. (1991). Does Phoneme Awareness Training in Kindergarten Make a Difference in Early Word Recognition and Developmental Spelling? *Reading Research Quarterly*, 26, 49-66.

1990's, teaching children to separate spoken words into phonemes, to substitute new phonemes, and to delete phonemes from words, was becoming widespread practice in kindergarten and first grade classrooms.

Phonics. Arguments in support of teaching phonics explicitly and systematically had been waged for several decades before 2000, most notably in *The First Grade Studies*⁴² and in Jeanne Chall's work⁴³. There were counter-arguments, of course. As you know if you speak another language and have studied English, phonics in this language is not easy to teach. The English language has what is called a **deep orthography**, meaning that there are complex relationships embedded in the spelling that go beyond relations between letters and sounds. *Sign* and *signal* are pronounced differently but spelled similarly because they share origins and meanings. So are *sane* and *sanity*. English spelling is notorious for its eccentricities, given its mixed history that combines Germanic and Romance origins⁴⁴ and the decisive influence of Samuel Johnson's *Dictionary of the English Language* (1785) that locked in the historical spellings of words even when their pronunciations had changed radically over time. Theodore Clymer could argue in the 1970's that "of 45 [phonics] generalizations commonly used by elementary teachers to teach children to read ... only 18 of them were

⁴² Bond, G. L. (1966). First-Grade Reading Studies: An Overview. *Elementary English*. Vol. 43, No. 5 (MAY, 1966), pp. 464-470 .

⁴³ Chall, J. S. (1966). *Learning to read: the great debate*. McGraw-Hill, 1976.

⁴⁴ See Scragg, D. (1974). *A history of English spelling*. Manchester: Manchester University Press, and Venezky, R. (1999). *The American way of spelling: the structure and origins of American English orthography*. New York: Guilford Press

accurate more than 75 percent of the time.”⁴⁵ Nonetheless, the National Reading Panel found a preponderance of evidence that advocated for explicit and systematic instruction in phonics, or letter-to-sound correspondences, to every child in the early grades.

Note that phonics knowledge has value not only in decoding or “sounding out” words, but also in recognizing them. Linnea Ehri hypothesized that being able to decompose words into phonemes and matching phonemes to letters gives children more differentiated and nimble memory storage for words, so that they can more easily recognize words automatically⁴⁶ without decoding them⁴⁷.

Vocabulary. The words whose meanings we know are building blocks of understanding⁴⁸, and the size of a child’s vocabulary is a strong predictor of her comprehension ability⁴⁹. But children differ tremendously in the size of their

⁴⁵ obit_theodore_clymer_77_expert_on_early_reading_education_-_the_new_york_times.pdf (readinghalloffame.org)

⁴⁶ 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.

⁴⁷ Naturally, there is much more to be said about phonics than we have space for here. Especially noteworthy is Uta Frith’s description of stages of word recognition. In alphabetic languages, **Logographic readers** use random features of words to guess what they are. Then at the **alphabetic stage** they may shout out sounds they associate with individual letters, even though the sounds don’t combine to make a meaningful word. Then at the **orthographic stage** they begin “chunking” groups of letters and read by spelling patterns (such as -at, -ape, and -ight), and even morphemes (re-, un-, and -ful). See Frith, U. (1986).

⁴⁸ Smith, C.B. (1997). Vocabulary Instruction and Reading Comprehension. ERIC Clearinghouse on Reading English and Communication Bloomington IN.

⁴⁹ Nation, K. (2009). Reading comprehension and vocabulary: what’s the connection? In R.K. Wagner, C. Schachneider & C. Phythian-Sence (Eds.), *Beyond Decoding: The Behavioural and Biological Foundations of Reading Comprehension*. Guilford Press.

spoken vocabularies. In young children, the differences have been directly related to their home experiences⁵⁰, specifically the number of words adults address to children in their preschool years which can vary four-fold between less and more affluent and better educated families.

While it is true that we can learn word meanings from their contexts when we read, contexts vary widely in quality; therefore reading itself is not enough to teach children the words they need to know. And there are many words to be learned! A team of scholars counted all the different words a typical student would encounter in the textbooks she read from kindergarten through ninth grade and came up with 88,500.⁵¹

Beck, et. al., argue that we should explicitly teach word meanings every day, but not all 88,500. The corpus of words can be divided into three “tiers.” Tier 1 words are those children know already without being taught, such as *mother, love, cat, and dog*. Tier 3 words are technical terms that are best studied in the context of disciplinary subjects, such as *bicameral, cotyledon, or parliamentary*. Tier 2 contains the words in between: useful words that are encountered in many contexts, but that many students might not know, such as *ironic, misleading, and exaggerate*.

⁵⁰ Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Paul H Brookes Publishing.

⁵¹ Nagy, William E.; Anderson, Richard C. (1984). How Many Words Are There in Printed School English? *Reading Research Quarterly*, v19 n3 p304-330.

Those researchers suggest that primary school teachers choose half a dozen or more Tier 2 words each day and teach them explicitly.⁵²

Reading Fluency. Fluency has been defined as reading words accurately, at a suitable rate, with appropriate prosody (emotional expression), and phrasing (For example, “Paris, *the capital of France*, is the home of the Eiffel Tower”). Along with the emphasis on phonemic awareness, reading fluency had drawn attention only in the few decades before the National Reading Panel released their report. Not until the 1970’s had American researchers recognized reading fluency as a separate factor in children’s success as readers, and as one that could be taught⁵³.

Reading fluently means reading most words without decoding them, and this **automaticity** in word recognition frees up attention for comprehension⁵⁴ (As an analogy, if you are a driver, think of how much early driving practice you needed before you could confidently look out the window at the scenery or wave to a friend on the street). Children can be taught to read fluently if they are challenged to read connected texts (not isolated words) repeatedly, striving for better accuracy, rate, expression, and phrasing⁵⁵. An engaging way to encourage repeated reading is to have

⁵² Beck, I.L., McKeown, M.G., and Kucan, L. (2002). *Bringing Words to Life*. Guilford.

⁵³ Samuels, S.J. (1979). The method of repeated readings. *Reading Teacher*. V32(4), 403-08.

⁵⁴ Walczyk, J.J., and Griffith-Ross, D. A. (2007). How important is reading skill fluency for comprehension? *The Reading Teacher* Vol. 60, No. 6 March 2007

⁵⁵ See Rasinski, T. (2003). *The Fluent Reader*. Guilford.

children read poems or chants in voice choirs, or read readers' theater texts aloud, and coach the children to read their lines repeatedly to improve their performance.

Comprehension. The importance of reading comprehension was not a new topic any time in the Twentieth Century, but our understanding of it got a tremendous boost beginning in the 1970's from cognitive psychology, that gave prominence to **schema theory** as an explanation of how comprehension works and how it should be taught. Schema theory holds that experience allows us to store up schemes or schemata (roughly like templates for ideas and concepts) in memory, and we use these schemata to interpret the world. The concept was greatly elaborated by two researchers, Richard Anderson and David Pearson⁵⁶ whose research on comprehension at the Center for the Study of Reading at the University of Illinois was generously supported by the United States government from the late 1970's through the 1980's. True, the antecedents of schema theory went well into the past⁵⁷, especially to the Swiss psychologist Jean Piaget's work in constructivism⁵⁸, but Anderson and Pearson's research gave the schema-theoretic

⁵⁶ Anderson, R. C., & Pearson, P. D. (1984). A schema-theoretic view of basic processes in reading comprehension. In P. D. Pearson, R. Barr, M. L. Kamil, & P. Mosenthal (Eds), *Handbook of reading research* (pp. 255-291). New York: Longman, Inc

⁵⁷ Bartlett, F. (1932). *Remembering: A Study in Experimental and Social Psychology*. Cambridge University Press,;

⁵⁸ Piaget, J. (1926). *The Child's Conception of the World*.

study of comprehension a vigorous push that had an enormous effect on reading instruction in the United States.

Aspects of comprehension were elaborated into

- Having and activating background knowledge
- Having vocabulary
- Actively searching for information
- Making inferences
- Following text structures
- Visualizing what sensory words suggest
- Rehearsing ideas
- Monitoring comprehension—knowing when reading is making sense, and going back and correcting when it isn't.
- Interpreting and applying new concepts⁵⁹

⁵⁹ Duke, N.K., and Pearson, P.D. (2002). Effective Practices for Developing Reading Comprehension. In *What Research Has to Say About Reading, Third Edition*. International Reading Association, Inc.

The “Big Five” left out significant matters.

At the time the National Reading Panel published their report, many educators were surprised at some important emphases that were left out. In defense of the panel, though, their stringent criteria for “evidence-based” research eliminated other studies and even topics from consideration. Moreover, in the decades since 2000, other factors have emerged that deserve the attention of reading educators. In light of those topics that the Panel’s criteria eliminated and research that has come to light since, it is prudent avoid concluding that the National Reading Panel’s “Big Five” are all we need to keep in mind when working with beginning readers—especially if we are working in languages other than English and in classrooms outside the United States, since those two important factors define the context the National Reading Panel was commissioned to address.

Emergent literacy. Research into emergent literacy, formerly called “reading readiness” and “pre-reading,” was in full bloom by the 1980’s⁶⁰, but only one aspect of it—phonemic awareness—qualified for coverage in the NRP report. In addition to phonemic awareness, important aspects of emergent literacy include—

⁶⁰ Teale, W.N., and Sulzby (1896), E. *Emergent literacy: Writing and reading*. Ablex.

- **The nature and purpose of reading and writing.** What are these things? What are they for? Exactly what are people doing when they read and write?
- **Decontextualized language.** Usually when someone talks to us—for instance, says, “Give me that!”-- we know who is talking, we know who she is talking to, we see what she or he is talking about, and the expression on her face tells us how she feels about it. But the words in books talk about people, things, places, and situations that are not in front of us. That language is decontextualized⁶¹ How are children who are not readers to make sense of such language?
- **The concept of word.** Before phonological or phonics can come into play, children need to be aware that speech is made up of individual words⁶². That fact is not obvious, because speech runs words together with only occasional pauses between them. Children further need to notice that in English and Romanian writing, written words are clusters of letters with spaces on both ends. These two kinds of recognition make it possible for a child to dictate a sentence to a teacher, watch the teacher write it down, and then “read” the words back,

⁶¹ Pellegrini, A., and Galda, L. (1998). *The Development of School-Based Literacy: A Social Ecological Perspective*. Routledge.

⁶² Morris, R.D. (1983). Concept of Word and Phoneme Awareness in the Beginning Reader. *Research in the Teaching of English* Vol. 17, No. 4, pp. 359-373.

by associating the words in her mind with the word units on the page. After much such practice, she will be able to attend to letters, speech sounds, and the relations between them. But not before.

- **Concepts about print.** Books contain interesting pictures. They also contain what to children are nonsensical squiggles. Children may be surprised that we want them to look at the squiggles. They will wonder which way to look--right to left? Left to right? Both ways? Bottom to top? Back to front? (By the way—what do we mean by the “back” and “front” of a book?). Especially if children’s families are not readers, concepts about print must be actively taught, and not assumed⁶³.
- **Alphabet knowledge.** If you have a computer, in the menu of fonts you will find a bewildering array of types. Some letters are decorated with serifs (the fat places at the ends of the letters that ancient stone carvers used to guide them) and some are “plain.” When does the change in a letter’s appearance turn it into a different letter? Children who are first learning about reading and writing regularly encounter letters that are new to them. In such cases, are they looking at variations on letters they know with slightly different appearances, or at new letters?

How should we teach letters? Upper and lower case at different times? Manuscript first and cursive later? In what order should we teach them? Many letters they see most often in print, such as S and T, come

⁶³ Clay, M.M. (2000). *Concepts about Print*. Heinemann.

far back in alphabetical order. Must Silvia and Tiberiu, not to mention Zenobia, wait until late in the year before they learn the first letters in their names? There are important questions here, and much disagreement about them!⁶⁴

- **Book language and story structure.** Children who have been read to, know that “Once upon a time...” signals that a story, a work of fiction, is about to be heard. They know that they will soon hear about a character with whom they will sympathize and who has a problem. The character likely will have a goal, and an antagonist who works against her. The character will make attempts to reach the goal (often three!) and in the end she is likely to succeed. Children will understand that phrases like “She said...” and “He groaned...” are ways of identifying speakers. None of these devices exist in everyday speech, though, so teachers of children who have not been read to at home will have work to do to orient those children to the language and structures of books⁶⁵.

More on phonics. The National Reading Panel stressed the importance of phonics instruction, but there were serious limitations in their treatment of it. Yes, we know that teaching phonics helps children learn to read. But we have also known for a long time that teaching phonics by itself, by pulling words out of the **contexts** that give them meaning, is

⁶⁴ Jones, C. D.; Clark, S. K.; Reutzel, D. R. (2013). Enhancing Alphabet Knowledge Instruction: Research Implications and Practical Strategies for Early Childhood Educators. *Early Childhood Education Journal*, v41 n2 p81-89.

⁶⁵ Stein, N. L., & Glenn, C. G. (1975). *An analysis of story comprehension in elementary school children: A test of a schema*. ERIC Document Reproduction Service, ED 121 474.

unnecessarily confusing (The Simple View of Reading most probably has it wrong on that score). Besides, we have learned more recently that word recognition contains more than letter-to sound relationships. **Morphemes** play an important role, too⁶⁶. Take the words *limitations, treatment, recently, unnecessarily, confusing, and recognition* from the immediately previous sentences. Each of those words has been derived from a (usually simpler) word, and perceiving that connection will help us not only recognize the word but also give us a clue to its meaning.

More on comprehension. The most significant recent addition to our knowledge of reading comprehension has been the recognition of the importance of **informational text**. Largely under the influence of one researcher, Nell Duke⁶⁷, by fourth grade schools in most of the United States are now aiming to teach reading 50% of the time in informational text. Publishers have heeded the call and produced fascinating and inviting informational books that even the youngest children will read pick up and read voluntarily.

Other factors. Speaking of Nell Duke, Duke and Cartwright recently proposed an **Active View of Reading**⁶⁸. In the title of their article, they challenged the Simple View, and then introduced evidence that counters the latter's main claims.

⁶⁶ Keiffer M., and Lessaux, N. (2007). Breaking Down Words to Build Meaning: Morphology, Vocabulary, and Reading Comprehension in the Urban Classroom. *The Reading Teacher*, 61(2), pp. 134–144

⁶⁷ [Informational Text | nellkduke.org](http://nellkduke.org)

⁶⁸ Duke, D.K., and Cartwright, K. (2021). The Science of Reading Progresses: Communicating Advances Beyond the Simple View of Reading. *Reading Research Quarterly*, 56 (1) pp. 25–44.

Decoding and comprehension do not occur sequentially and separately, but together at the same time.

Comprehending is a necessary part of reading words⁶⁹. In their DRIVE model of reading (Deploying Reading in Varied Environments)⁷⁰ Cartwright and Duke also introduced other factors that are important in acts of reading, including children’s enjoyment, their motivation, their purposes, their sense agency in learning to read, their background knowledge, their reading strategies, and their ability to follow the structures of texts and the morphological structures of words. In other words, reading isn’t simple and it shouldn’t be viewed simply.

Producing lifelong readers is another issue that the National Reading Panel did not address. We have long known that children learn to read by reading. People who work on literacy projects for international development agencies have long worried about **aliteracy**, the situation in which children are taught to read but do not practice reading. These children may forget how to read adequately within a short time. Whether the term aliteracy applies or not, though, the problem of children doing very little voluntary reading—an average of five minutes a day according to

⁶⁹ Note that Duke and Cartwright come close to supporting the “Three Cuing System” of the Whole Language advocates. Readers do often need context to help them disambiguate words they are trying to decode. But in Cartwright and Duke’s model, unlike the psycholinguistic guessing game, readers still must read the letters.

⁷⁰ Duke, D.K., and Cartwright, K. (2019). The DRIVE Model of Reading: Making the Complexity of Reading Accessible. *Reading Research Quarterly*. 73, 1, 7-15.

one study of fifth graders in the United States⁷¹--is of concern everywhere. The best way to prevent aliteracy is to provide to children on all ability levels and at all ages with their full range of interests plentiful reading materials, and encourage the children to read them.

Conclusion.

This summary of scientific research into learning to read and teaching reading is embarrassingly short, given the scores of academic journals that publish hundreds if not thousands of articles each month in English about reading and reading instruction. Thousands of monographs and hundreds of textbooks on all aspects of literacy are available in print. Amazon.com currently boasts 70,000 books with “reading” in the title and 60,000 more with “literacy.” Professional organizations such as the International Literacy Association work hard to keep abreast of new developments and make teachers aware of them. Periodically a new *Handbook of Reading Research*⁷² is compiled by dutiful scholars who read and report on new and significant studies in volumes that may approach 1000 pages.

⁷¹ Anderson, R., Wilson, P., and Fielding, L. (1988). Growth in reading and how children spend their time outside of school. *Reading Research Quarterly*, 23, 285-303.

⁷² [Amazon.com: Handbook of Reading Research, Volume V: 9781138937376: Moje, Elizabeth Birr: Books](#)

Why do we have so much? Part of the reason is the involvement of university faculty in preparing teachers. We have to publish to advance in our careers. Part of it, I suspect, is found in the largely decentralized nature of school governance in the United States, coupled with America's aggressively capitalist spirit, which make for an active marketplace of ideas. But part of the reason certainly is that there are still important things we can learn about reading, and also important older ideas we need to remember, so we can help children be successful students and become adults with happy life choices.

Lest the title of this article suggest total confidence in scientific research into matters concerning reading instruction, it is fair to ask if scientific knowledge should always be preferred over what teachers have learned from practice. That is a tough question. We have already seen in this paper the example of Samuel Orton's strephosymbolia model of dyslexia. Orton was trained in medicine and presumably in science, but he was wrong to suggest that many struggling readers' problems were caused by "minimal brain damage."⁷³ Another example is the "maturation theory" developed and advocated in the 1920's by Yale University psychologist Arnold Gesell⁷⁴. Maturation theory suggested that it was pointless to engage children in experiences that would help them learn to read before they were "ready,"

⁷³ In fairness to Dr. Orton, in the 1930's he joined forces with an educator and psychologist, Anna Gillingham, and between them they created a tutoring program that has become highly regarded. <https://www.ortonacademy.org/resources/what-is-the-orton-gillingham-approach/>.

⁷⁴ [Arnold Gesell Maturation Theory Explained - HRF \(healthresearchfunding.org\)](#)

which usually happened at around age 6. This idea caused many preschool and kindergarten teachers to waste children's precious time, until researchers into emergent literacy pointed out a more proactive approach. In the early 1980's, when emergent literacy research was beginning, the Gesell-inspired idea of "reading readiness" was still widely influential. And of course the Whole Language Approach was endorsed, if not enthusiastically promoted, by a psychologist from the Massachusetts Institute of Technology, one of the leading scientific institutions in the world.

On the other hand, we have noted that in the 1970s and 80's, cognitive psychologists alerted us to schema theory. Schema theory supported the practice of raising questions before, during, and after children read a passage. But Russell Stauffer, who originated the Directed Reading-Thinking Activity, had already been encouraging us to teach reading comprehension that way since the 1960's.

Much of the scientific research reviewed in this paper confirmed what good teachers already knew at the time the research was released. Then why do we need science? One major value of scientific research is to teach us disciplined skepticism: to question accepted practices (including our own) and test them fairly against alternatives. Another is to suggest approaches and tools that help us investigate important questions that arise from the learning and teaching of reading, and report out clearly and with confidence the results of our investigations.

Finally, guiding the selection of topics in this paper were my concern over the exporting of American ideas about reading instruction to the rest of the world, especially to countries with languages and classrooms that may differ greatly from those in the United States. The biggest export at this moment is the National Reading Panel's recommendations for teaching the "Big 5." Those recommendation were certainly important, but the were not sufficient for all settings.

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