

[Home](#) [Publications](#) [Educational Leadership](#) [February 1998](#)

Educational Leadership Vol. 55, No. 6, March 1998

G. Reid Lyon

Why Reading Is Not a Natural Process

Nearly four decades of scientific research on how children learn to read supports an emphasis on phoneme awareness and phonics in a literature-rich environment. These findings challenge the belief that children learn to read naturally.

I am frequently asked why the National Institute of Child Health and Human Development (NICHD) conducts and supports research in reading, given that the NICHD is part of the National Institutes of Health, a federal agency that emphasizes basic biomedical science and health-related research. A primary answer is that learning to read is critical to a child's overall well-being. If a youngster does not learn to read in our literacy-driven society, hope for a fulfilling, productive life diminishes. In short, difficulties learning to read are not only an educational problem, they constitute a serious public health concern.

The NICHD has been studying normal reading development and reading difficulties for 35 years. NICHD-supported researchers have studied more than 10,000 children, published more than 2,500 articles, and written more than 50 books that present the results of 10 large-scale longitudinal studies and more than 1,500 smaller scale experimental and cross-sectional studies. Many of the longitudinal research sites initiated studies in the early 1980s with kindergarten children before they began their reading instruction and have studied the children over time. Researchers have studied some children for 15 years, with several sites following the youngsters for at least 5 years. Additional research sites have joined within the past 3 years to investigate the effects of different reading instructional programs with kindergarten and 1st grade children. At most research sites, multidisciplinary research teams study cognitive, linguistic, neurobiological, genetic, and instructional factors related to early reading development and reading difficulties.¹

Reading Research and Scientific Tradition

The NICHD reading research has centered on three basic questions: (1) How do children learn to read English (and other languages)? What are the critical skills, abilities, environments, and instructional interactions that foster the fluent reading of text? (2) What skill deficits and environmental factors impede reading development? (3) For which children are which instructional approaches most beneficial, at which stages of reading development? Before summarizing findings related to these questions, I would like to explain the NICHD research process.

First, the NICHD reading research program is rooted in scientific tradition and the scientific method. The program rests on systematic, longitudinal, field-based investigations, cross-sectional studies, and laboratory-based experiments that are publicly verifiable and replicable. Second, the research integrates quantitative and qualitative methods to increase the richness, impact, and ecological validity of the data. However, using qualitative research

methods requires the same scientific rigor employed in quantitative studies. Third, the NICHD reading research program is only one of many programs dedicated to understanding reading development and difficulties. The U.S. Department of Education's Office of Research and Improvement, the Office of Special Education Programs, and the Canadian Research Council have supported many outstanding reading researchers (see Adams 1990 for a research review).

The cumulative work of federally and privately funded researchers illuminates how children develop reading skills, why some children struggle to learn to read, and what can be done to help all readers reach proficiency. Although much remains to be learned, many findings have survived scrutiny, replication, and extension.

The Critical Role of Phonemic Awareness

How do children learn to read English? Reading is the product of decoding and comprehension (Gough et al. 1993). Although this sounds simple, learning to read is much tougher than people think. To learn to decode and read printed English, children must be aware that spoken words are composed of individual sound parts termed phonemes. This is what is meant by *phoneme awareness*.

Phoneme awareness and phonics are not the same. When educators assess phoneme awareness skills, they ask children to demonstrate knowledge of the sound structure of words *without any letters or written words present*. For example, "What word would be left if the /k/ sound were taken away from *cat*?" "What sounds do you hear in the word *big*?" To assess phonics skills, they ask children to link sounds (phonemes) *with letters*. Thus, the development of phonics skills depends on the development of phoneme awareness.

Why is phoneme awareness critical in beginning reading, and why is it difficult for some children? Because to read an alphabetic language like English, children must know that written spellings systematically represent spoken sounds. When youngsters figure this out, either on their own or with direct instruction, they have acquired the alphabetic principle. However, if beginning readers have difficulty perceiving the sounds in spoken words--for example, if they cannot "hear" the /at/ sound in *fat* and *cat* and perceive that the difference lies in the first sound--they will have difficulty decoding or sounding out new words. In turn, developing reading fluency will be difficult, resulting in poor comprehension, limited learning, and little enjoyment.

We are beginning to understand why many children have difficulty developing phoneme awareness. When we speak to one another, the individual sounds (phonemes) within the words are not consciously heard by the listener. Thus, no one ever receives any "natural" practice understanding that words are composed of smaller, abstract sound units.

For example, when one utters the word *bag*, the ear hears only one sound, not three (as in /b/-/a/-/g/). This is because when *bag* is spoken, the /a/ and /g/ phonemes are folded into the initial /b/ sound. Thus, the acoustic information presented to the ears reflects an overlapping bundle of sound, not three discrete sounds. This process ensures rapid, efficient communication. Consider the time it would take to have a conversation if each of the words we uttered were segmented into their underlying sound structure.

However, nature has provided a conundrum here: What is good for the listener is not so good for the beginning reader. Although spoken language is seamless, the beginning reader must detect the seams in speech, unglue the sounds from one another, and learn which sounds (phonemes) go with which letters. We now understand that specific systems in the brain recover sounds from spoken words, and just as in learning any skill, children understand phoneme awareness with different aptitudes and experiences.

Developing Automaticity and Understanding

In the initial stages of reading development, learning phoneme awareness and phonics skills *and* practicing these skills with texts is critical. Children must also acquire fluency and automaticity in decoding and word recognition. Consider that a reader has only so much attention and memory capacity. If beginning readers read the words in a laborious, inefficient manner, they cannot remember what they read, much less relate the ideas to their background knowledge. Thus, the ultimate goal of reading instruction--for children to understand and enjoy what they read--will not be achieved.

Reading research by NICHD and others reveals that "making meaning" requires more than phoneme awareness, phonics, and reading fluency, although these are necessary skills. Good comprehenders link the ideas presented in print to their own experiences. They have also developed the necessary vocabulary to make sense of the content being read. Good comprehenders have a knack for summarizing, predicting, and clarifying what they have read, and many are adept at asking themselves guide questions to enhance understanding.

Linguistic Gymnastics

Programmatic research over the past 35 years *has not* supported the view that reading development reflects a *natural process*--that children learn to read as they learn to speak, through natural exposure to a literate environment. Indeed, researchers have established that certain aspects of learning to read are highly unnatural. Consider the linguistic gymnastics involved in recovering phonemes from speech and applying them to letters and letter patterns. Unlike learning to speak, beginning readers must appreciate consciously what the symbols stand for in the writing system they learn (Lieberman 1992).

Unfortunately for beginning readers, written alphabetic symbols are arbitrary and are created differently in different languages to represent spoken language elements that are themselves abstract. If learning to read were natural, there would not exist the substantial number of cultures that have yet to develop a written language, despite having a rich oral language. And, if learning to read unfolds naturally, why does our literate society have so many youngsters and adults who are illiterate?

Despite strong evidence to the contrary, many educators and researchers maintain the perspective that reading is an almost instinctive, natural process. They believe that explicit instruction in phoneme awareness, phonics, structural analysis, and reading comprehension strategies is unnecessary because oral language skills provide the reader with a meaning-based structure for the decoding and recognition of unfamiliar words (Edelsky et al. 1991, Goodman 1996).

Scientific research, however, simply does not support the claim that context and authentic

text are a proxy for decoding skills. To guess the pronunciation of words from context, the context must predict the words. But content words--the most important words for text comprehension--can be predicted from surrounding context only 10 to 20 percent of the time (Gough et al. 1981). Instead, the choice strategy for beginning readers is to decode letters to sounds in an increasingly complete and accurate manner (Adams 1990, Foorman et al. 1998).

Moreover, the view some whole language advocates hold that skilled readers gloss over the text, sampling only parts of words, and examining several lines of print to decode unfamiliar words, is not consistent with available data. Just and Carpenter (1987), among others, have demonstrated consistently that good readers rarely skip over words, and readers gaze directly at most content words. Indeed, in contrast to conventional wisdom, less-skilled readers depend on context for word-recognition. The word recognition processes of skilled readers are so automatic that they do not need to rely on context (Stanovich et al. 1981). Good readers employ context to aid overall comprehension, but not as an aid in the recognition of unfamiliar words. Whether we like it or not, an alphabetic cipher must be deciphered, and this requires robust decoding skills.

The scientific evidence that refutes the idea that learning to read is a *natural process* is of such magnitude that Stanovich (1994) wrote:

That direct instruction in alphabetic coding facilitates early reading acquisition is one of the most well established conclusions in all of behavioral science. . . . The idea that learning to read is just like learning to speak is accepted by no responsible linguist, psychologist, or cognitive scientist in the research community (pp. 285-286).

Why Some Children Have Difficulties Learning to Read

Good readers are phonemically aware, understand the alphabetic principle, apply these skills in a rapid and fluent manner, possess strong vocabularies and syntactical and grammatical skills, and relate reading to their own experiences. Difficulties in any of these areas can impede reading development. Further, learning to read begins far before children enter formal schooling. Children who have stimulating literacy experiences from birth onward have an edge in vocabulary development, understanding the goals of reading, and developing an awareness of print and literacy concepts.

Conversely, the children who are most at risk for reading failure enter kindergarten and the elementary grades without these early experiences. Frequently, many poor readers have not consistently engaged in the language play that develops an awareness of sound structure and language patterns. They have limited exposure to bedtime and laptime reading. In short, children raised in poverty, those with limited proficiency in English, those from homes where the parents' reading levels and practices are low, and those with speech, language, and hearing handicaps are at increased risk of reading failure.

However, many children with robust oral language experience, average to above average intelligence, and frequent early interactions with literacy activities also have difficulties learning to read. Why? Programmatic longitudinal research, including research supported by NICHD, clearly indicates that deficits in the development of phoneme awareness skills not only predict difficulties learning to read, but they also have a negative effect on reading

acquisition. Whereas phoneme awareness is necessary for adequate reading development, it is not sufficient. Children must also develop phonics concepts and apply these skills fluently in text. Although substantial research supports the importance of phoneme awareness, phonics, and the development of speed and automaticity in reading, we know less about how children develop reading comprehension strategies and semantic and syntactic knowledge. Given that some children with well developed decoding and word-recognition abilities have difficulties understanding what they read, more research in reading comprehension is crucial.

From Research to Practice

Scientific research can inform beginning reading instruction. We know from research that reading is a language-based activity. Reading does not develop naturally, and for many children, specific decoding, word-recognition, and reading comprehension skills must be taught directly and systematically. We have also learned that preschool children benefit significantly from being read to. The evidence suggests strongly that educators can foster reading development by providing kindergarten children with instruction that develops print concepts, familiarity with the purposes of reading and writing, age-appropriate vocabulary and language comprehension skills, and familiarity with the language structure.

Substantial evidence shows that many children in the 1st and 2nd grades and beyond will require explicit instruction to develop the necessary phoneme awareness, phonics, spelling, and reading comprehension skills. But for these children, this will not be sufficient. For youngsters having difficulties learning to read, each of these foundational skills should be taught and integrated into textual reading formats to ensure sufficient levels of fluency, automaticity, and understanding.

Moving Beyond Assumptions

One hopes that scientific research informs beginning reading instruction, but it is not always so. Unfortunately, many teachers and administrators who could benefit from research to guide reading instructional practices do not yet trust the idea that research can inform their teaching. There are many reasons for this lack of faith. As Mary Kennedy (1997) has pointed out, it is difficult for teachers to apply research information when it is of poor quality, lacks authority, is not easily accessible, is communicated in an incomprehensible manner, and is not practical. Moreover, the lack of agreement about reading development and instruction among education leaders does not bode favorably for increasing trust. The burden to produce compelling and practical information lies with reading researchers.

Most great scientific discoveries have come from a willingness and an ability to be wrong. Researchers and teachers could serve our children much better if they had the courage to set aside assumptions when they are not working. What if the assumption that reading is a natural activity, as appealing as it may be, were wrong and not working to help our children read? The fundamental purpose of science is to test our beliefs and intuitions and to tell us where the truth lies. Indeed, the education of our children is too important to be determined by anything but the strongest of objective scientific evidence. Our children deserve nothing less. *

¹ See Fletcher and Lyon (in press) and Lyon and Moats (1997) for reviews of NICHD

reading research findings. Contact the author for a complete set of references of published research from all NICHD reading research sites since 1963.

References

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

Edelsky, C., B. Altwerger, and B. Flores. (1991). *Whole Language: What's the Difference?* Portsmouth, N.H.: Heinemann.

Fletcher, J.M. and G.R. Lyon. (in press). *Reading: A Research-Based Approach*. Palo Alto, Calif.: Hoover-Institute.

Foorman, B.R., D.J. Francis, J.M. Fletcher, C. Schatschneider, and P. Mehta. (1998). "The Role of Instruction in Learning to Read: Preventing Reading Failure in At-risk Children." *Journal of Educational Psychology* 90, 1-15.

Goodman, K.S. (1996). *Ken Goodman on Reading: A Common Sense Look at the Nature of Language and the Science of Reading*. Portsmouth, N.H.: Heinemann.

Gough, P.B., J.A. Alford, and P. Holley-Wilcox. (1981). "Words and Contexts." In *Perception of Print: Reading Research in Experimental Psychology*, edited by O.J. Tzeng and H. Singer. Hillsdale, N.J.: Erlbaum.

Gough, P.B., C. Juel, and P. Griffith. (1992). "Reading, Spelling, and the Orthographic Cipher." In *Reading Acquisition*, edited by P.B. Gough, L.C. Ehri, and R. Trieman. Hillsdale, N.J.: Erlbaum.

Just, C., and P.A. Carpenter. (1980). "A Theory of Reading: From Eye Fixations to Comprehension." *Psychological Review* 87, 329-354.

Kennedy, M.M. (1997). "The Connection Between Research and Practice." *Educational Researcher* 26, 4-12.

Liberman, A.M. (1992). "The Relation of Speech to Reading and Writing." In *Orthography, Phonology, Morphology, and Meaning*, edited by R. Frost and L. Katz. Amsterdam: Elsevier Science Publishers B.V.

Lyon, G.R., and L.C. Moats. (1997). "Critical Conceptual and Methodological Considerations in Reading Intervention Research." *Journal of Learning Disabilities* 30, 578-588.

Stanovich, K.E. (1994). "Romance and Reality." *The Reading Teacher* 47, 280-291.

Stanovich, K.E., R.F. West, and D.J. Freeman. (1981). "A Longitudinal Study of Sentence Context Effects in Second-grade Children: Tests of an Interactive-Compensatory Model." *Journal of Experimental Child Psychology* 32, 402-433.

G. Reid Lyon is Chief of the Child Development and Behavior Branch of the National Institute of Child Health and Human Development, National Institutes of Health, U.S. Department of Health and Human Services, Bldg. 6100, Rm. 4B05, 9000 Rockville Pike, Bethesda, MD 20892 (e-mail: lyonr@exchange.NIH.gov).