

Introduction to The Science of Reading, What has been learned.

“To completely analyze what we do when we read would almost be the acme of the psychologist’s achievements, for it would be to describe very many of the most intricate workings of the human mind.”

(Huey, 1908/republished, 1968)

It’s been nearly 60 years since the first rush of research that led to the scientific study of reading. Although the chapter on reading research in John Gage’s historic Handbook of Research on Teaching (1963) tells about studies by scientists, they changed when Cognitive Science became an established discipline in the 1950s. It brought about a different perspective. National funding also greatly increased with the 1963 establishment of the National Institute of Health.

The most important points made in this new surge of research, during the last three decades of the century, have served as the foundation for what became known as The Science of Reading. From its modern beginnings, the number of published studies grew exponentially each decade, similar to growth in other sciences during the late 20th century. The increase in studies can be observed by noting the number of references cited in landmark reports published during this time. (This will be noted in this website.) This growth resulted in a new understanding and teaching of reading.

First, What is the Science of Reading?

A definition offered by The Reading League, 2022:

“The **science of reading** refers to a vast, interdisciplinary body of scientifically-based research about reading and issues related to reading and writing. This research has been conducted over the last five decades across the world, and it is derived from thousands of studies conducted in multiple languages. The science of reading has culminated in a preponderance of evidence to inform how proficient reading and writing develop; why some have difficulty; and how we can most effectively assess and teach and, therefore, improve student outcomes through prevention of and intervention for reading difficulties.” (The Reading League Defining Guide: <https://www.thereadingleague.org/what-is-the-science-of-reading/>)

Mark Seidenberg’s definition of the Science of Reading on his blog, Reading Matters.

“The ‘Science of Reading’ is a body of research in developmental psychology, educational psychology, cognitive science, and cognitive neuroscience on reading, one of the most complex human behaviors, and its biological (neural, genetic) bases. This research has been conducted for decades in the US and around the world. The research has important implications for helping children to succeed, but it has not been incorporated in how teachers are trained for the job or how children are taught.” (Mark Seidenberg, Reading Matters, Connecting Science and Education.

<https://seidenbergreading.net/science-of-reading/>

In Seidenberg’s words: “The Science of Reading is a body of research produced from a scientific study of reading. It produced a much needed theoretical base for understanding and

teaching reading. It seeks to explain what is important and why it's important. It helps decide what must be learned and why it's important. **It must scientifically establish what the essential components of reading are and how they are coordinated in the act of reading.**"

This science "is about all the types of knowledge that underlie skilled reading and how they are learned."

According to Seidenberg, the science addresses questions such as:

- How does reading work: what are the important component skills and knowledge, and how do they work together:
- How is reading related to spoken language? How does it relate to spelling and writing?
- Which experiences are most important at different points in development?
- What factors promote or interfere with children's progress?
- Why do some children struggle with reading? How can they be helped?
- What are the brain circuits and operations that support reading? How can understanding the brain bases of reading be used to improve children's learning?

"The Science of reading is a work in progress". (as a movement) <https://seidenbergreading.net/2022/03/22/the-science-of-reading-is-a-work-in-progress/>

In his side-bar, Seidenberg points out that "Connecting research and educational practice is essential. The ongoing effort to make this happen (which I've called the 'science of reading movement') is a landmark development in the history of reading pedagogy. However, it is also a work in progress."

"The science of reading movement has been enormously successful in raising awareness about the existence of basic research relevant to reading instruction. The science of reading movement hasn't even gotten to the good stuff yet.... (However, it still) will provide a set of principles or guidelines that can be used in making educational choices and designing curricula and activities."

Because of the demand for practical, everyday how-to-do-it details, assumptions have been drawn from this body of knowledge in search of best applications and practices before being fully verified as part of The Science of Reading. The science has decidedly narrowed the options around several large ideas about what needs to be taught and why, but key questions about instruction remain unsolved.

Among the first big ideas established by The Science, identified by [Reid Lyon, the first postings on this website](#), concerns basic questions about word reading accuracy and fluency. Questions of this nature have existed for over a half century before this rise in the newer science. The answers to these questions clearly revealed the importance of learning the **alphabetic principle that links letters to the sounds they represent in speech**, otherwise known as phonics. At the base of this learning, the Science has established the importance of acquiring skills with speech sounds in order to connect an alphabetic written language to the sounds of speech. This is known as the phonology of reading, which means that reading, at the word level, is accomplished more by the ear than the eye. (See postings on The History of Language by Ear and by Eye) Establishing this importance is considered the

most important accomplishment in the modern era of the science of reading. It is the big idea that set the foundation for future advancements in teaching.

“In the course of 30 years or so, the idea that reading words requires phonology [speech sounds] has ascended from a minority view to one with such substantial majority that it now amounts to a conventional wisdom. This sweeping change of opinion can be celebrated as a triumph of reading science” Charles Perfetti (2011).

“Cognitive scientists have found that as a child reads a word, the networks in the brain associated with vision activate first, followed by the areas of the brain associated with speech. There are also subtle but detectable changes in the brain as children learn to read, primarily a growth in the fibers that connect the areas associated with speech and vision. French neuroscientist Stanislas Dehaene, in his 2009 book *Reading in the Brain*, calls this area “the letterbox.” His studies suggest that the brain never really learns to read a whole word, it just gets really, really fast at decoding. He believes that any type of learning that does not emphasize the sound of words is inefficient.” (Belinda Luscombe, *TIME* Aug, 2022)

However, this majority view among scientist has not been widely adopted in wide practice. The dominant response to the new science for instruction has been one of balance, called “balanced literacy—a philosophy that promises to balance phonics instruction with literature that instills a love of reading”. It, and its predecessor Whole-language, encouraged children to guess at words, using context or pictures. Scientific evidence has clearly shown, however, that many, if not most children, will struggle to become fluent readers unless they get clear instruction in the phonology of reading or phonics. (Wexler, see below) **Phonics is the process of learning the relationship between the spelling of words and their speech equivalent.** It starts with the eyes, for visual stimulus from letters, but is driven by the ears from what the letters represent from speech. (see postings on “Language by Ear and by Eye”.)

"Balanced literacy was a way to defuse the wars over reading," said Mark Seidenberg, a cognitive neuroscientist and author of the book "[Language at the Speed of Sight](#)." "It succeeded in keeping the science at bay, and it allowed things to continue as before."

This story is told by Emily Hanford in the podcast called "[Sold a Story](#)."

And reported on in Forbes magazine by Natalie Wexler,

<https://www.forbes.com/sites/nataliewexler/2022/10/20/new-podcast-examines-why-teachers-have-been-sold-a-story-on-reading-instruction/?sh=7721770776b0&fbclid=IwAR1eSxg2bDnQuCBCQ65Yk3Y7XmmcgRbxKeSicfisMxkne4gTU p2yPVA22kk>

Wexler reports that “together, four women (from the company [Heinemann](#), a leading curriculum publisher, and its authors Marie Clay, Irene Fountas, Gay Su Pinnell, and Lucy Calkins) might be seen as the founding mothers of what is now the dominant approach to reading instruction, ‘balanced literacy’—a philosophy that promises to balance phonics instruction with literature that instills a love of reading. The theory sounds appealing, but its inadequate attention to phonics leaves many kids, and especially those from less educated and lower-income families, unable to read fluently. It’s hard to love reading if you can’t read.”

“Balanced literacy and its similar predecessor, ‘whole language,’ have left us with a staggering number of citizens who are not only unable to do the kind of reading that enables them to hold down well-paying jobs but also unable to understand many newspaper and

magazine articles. Democracies can't function without a reasonably literate citizenry. And 54% of American adults read [below the equivalent](#) of a sixth-grade level". *Follow me on [Twitter](#) or [LinkedIn](#). Check out my [website](#) or some of my other work [here](#).* **Natalie Wexler Podcasts**

[On my website](#), there are two headings: The Science of Reading and The Science of Teaching. I believe that this separation is useful because there is far more research on theory, which is necessary, than on its application. The knowledge gained by the science is long on theory and short on practical application. This was necessary because little was known about the theory. [Jeanne Chall, a pioneer in this field](#), stated that there had been little "basic" research on reading before her study was published in 1967. Seidenberg states, (The science is) "a work in progress. which has not been incorporated in how teachers are trained for the job or how children are taught." (Seidenberg, see above)

Postings on my website, [under the first heading](#), tell about what needs to be taught and why. The Science had to determine what children must know and be able to do and why it is important. This is the theoretical foundation that describes how reading is done. Therefore, the theoretical foundation describes what the child needs to learn and why. The [second heading, on my website](#), tells about the particulars of instruction, on how to achieve the kind of reading described. This is the practical side of the science, which has some critical work yet needed.

Both sides can be studied scientifically. However, studies on each side have different objectives of what they are attempting to demonstrate. The division is not sharp. They overlap. Each tends to blur into the other and refer to each other. The difference is a matter of emphasis and purpose. The first side tends to seek general truths and principles, principles about how reading works and what must be learned. The second side, that lags behind in research that has been universally accepted, seeks to find the practical details of instruction that will result in reading achievement. Many practices have been supported by empirical evidence. Others are still on the cutting edge, where science has yet to complete its work.

Reading requires knowledge from both sides. Under the first heading, I attempt to select studies and articles that represent pioneering works of scientists. Under the second heading, I have presented materials and articles that I have put into use in my experience. Most of these are from what is termed, [direct instruction programs and practices](#). This approach has research support and is consistent with the theoretical foundation. Yet, there are questions yet to be resolved. The Amplify group (https://amplify.com/wp-content/uploads/2020/02/Amplify_Booklet-Primer1_111919__Digital-Pages_.pdf?_gl=1*ane2vs*_ga*OTQ1NjMxODA2LjE2NTQ4MDkxMzg.*_ga_KB37BKPPF6*MTY3MjY0MTM5OS4xMS4xLjE2NzI2NDE1NDYuNTYuMC4w pg. 55) identifies the publication, [Direct Instruction Reading, by Douglas Carnine](#) et. al., as the Bible of instruction. I would agree.

Teaching procedures and programs derived from this textbook fill this second side of the website. They are all consistent with the Science of Reading at the theoretical level as well as having significant research support at the practical level. Because of the need to meet demands of teaching children, some of these practices go beyond a full consensus in the Science. They have yet to be confirmed by sufficient controlled research. They have been at the cutting edge of the Science from their beginning in 1969, anticipating much of what became known as The Science of Reading.

[Postings under the Science of Reading Heading](#)

These postings start with the last decade of the century and then jump to the current state of the science. After this, the postings return to the beginnings of the modern era, the 1960's and 70's, to work forward. This is to show how the science grew in setting the foundation for what is now known as the Science of Reading.

The first two postings, with an [Introductory Note](#), are summarizations of what had been learned by the time of the speech and writings of G. R. Lyon. Lyon had been a researcher before becoming the head of the department of Child Development and Behavior Branch of the National Institute of Health (NIH). This institution had supported, directed and managed most of the published studies since its beginning in 1963. Lyon was in a unique position to be able to summarize what had been learned.

The third posting is my Introductory Notes on an “action paper” and its companion “professional guide” from [The Learning First Alliance](#). (1998) This told about a massive effort by a consortium of organizations. It illustrates the amount of work that went on, during this time, in promoting the Science of Reading. The full original documents are linked within these notes to their sources.

From this, the [postings jump ahead to current times](#), twenty years later, when the story has once again become top news. This posting lists, with hyperlinks, various presentations being made by groups and organizations. This is to illustrate how this time around, in promoting the Science, is different. Hopefully, it will be more effective than the last movement at the turn of the century.

Beginning with Chall's, The Great Debate, the postings illustrate how the Science grew. The postings are on...

1. the 1967 publication, [The Great Debate](#), by the legendary, Jeanne Chall;
2. proceedings of an early conference on [Language by Ear and by Eye](#).
3. the work of Isabelle Liberman et.al. of the Haskins Laboratory, 1973-1990;
4. Chall's first up-date of 1983 of [The Great Debate](#) with several background articles;
5. Chall's second up-date of 1996 with several background articles;
6. The speech and writings by Alvin Liberman, the Haskin Laboratories;
7. Shaywitz and dyslexia;
8. and a final, up-to-date, summary, by Charles Perfetti, 2011.

Each posting will be preceded by Introductory Notes. The significant publications, that help tell the story, will be listed after each posting.