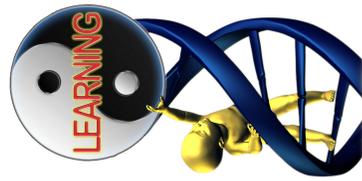


The code is the most powerful invention in the history of history. It profoundly affects how we think, remember, abstract, categorize, codify, and coordinate. We are all children of the code. For some of us the code is an invisible, mind-enabling, platform. For others it's a painful, shameful, ever-present, life-diminishing ceiling.

"The problem is our society's lack of insight into what is involved in acquiring literacy." - Dr. Louisa Moats

"We need to reconceptualize what it means to learn to read and who's responsible for its success if we're going to deal with the problem." - Dr. Grover Whitehurst

"If I had my druthers, instructional methods wouldn't be the big deal. What would be the big deal is if teachers could ask themselves: what does it take to learn to read?" - Dr. G. Reid Lyon



The Children of the Code Project is one component of the case for: **Stewarding the HEALTH of our Children's LEARNING**

See: <http://www.learningstewards.org>

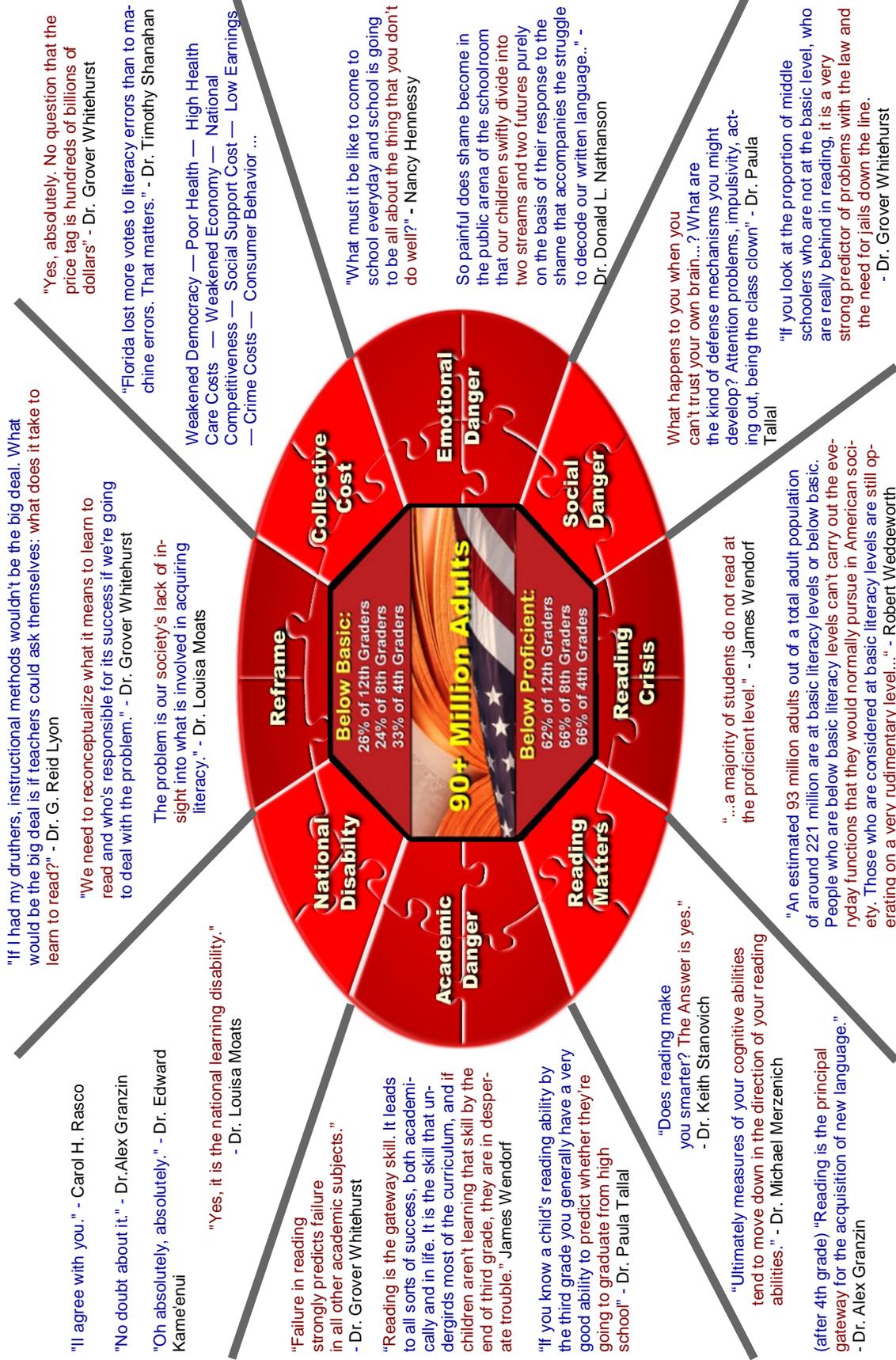
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Please share your feedback with us. It's how our work evolves. It's vital to our case to donors and to keeping us going.
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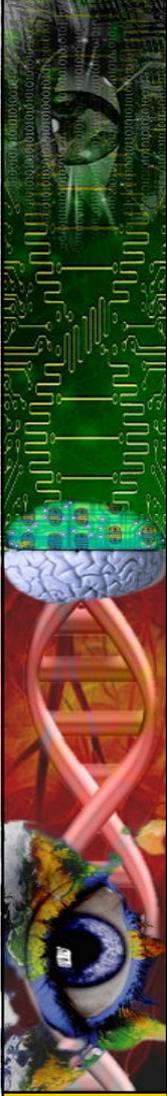
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WE HAVE A PROBLEM



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CAUSES AND CONTRIBUTING FACTORS



"The vast majority of the assessment that occurs is focused almost entirely on the child. So, the failure is localized .. as if there is something wrong with the child, and only with the child. ...it is certainly unfair to assume that all of the responsibility for that failure rest on that child's head, the person least equipped to bare the responsibility for that and the least able to adapt to it." - Dr. Alex Granzin

"Around second or third grade there's an assumption we make in education, which can be very damaging to our kids. And that is that in American education you spend the first three years learning how to read. From then on, you're not learning to read, you're reading to learn." - Rick Lavoie

"Children are being exposed to an enormous amount of image information that is competing with the kind of linear sequential ingraining that has to happen in order to teach people how to read and write." - Dr. Leonard Shlain

"High poverty communities have virtually no print available even if you had the money to buy it. High poverty schools have the lowest quality and smallest libraries." - Dr. Richard Allington

"A huge number, 90 million of them, who say 'we don't have literacy skills' are also the parents of the children who are having so much trouble in our schools. They are the ones that we need to reach, they're the ones we need to help, they're the ones we need to nurture if they're to be able to nurture their own children." - Sharon Darling



"Third problem is instructional confusion... teachers who don't understand what the code really is or how it needs to be conveyed." - Dr. Grover Whitehurst

"The toughest challenge we have is in moving the science to the development of teachers and their preparation, such that what they learn is actually objective and is based upon converging evidence rather than philosophies, belief systems, or appeals to authority." - Dr. Reid Lyon

"There's the born again phonics people, there's the reborn again whole language people, there more like cults then religions." - Dr. Martin Haberman

"We have early childhood programs where the kids go and develop good social competencies and emotional health, but the programs are bereft of any kinds of systematic interactions to do what middle and upper-middle class parents do all of the time, and the social and the emotional positives that come out of that nurturing environment go straight downhill once those kids get in school and do not learn to read." - Dr. Reid Lyon

"The percentage of children in the school age population who have learning disabilities right now is about five percent." - James Wendorf

READINESS

"So, you've got kids coming into pre-school, kindergarten and first grade who are already behind the curve in vocabulary. Even if we could teach them to read print, what are they going to relate it to?" - Dr. G. Reid Lyon

... "the children of professional parents -- I mean, talkative families ... heard forty-eight million words addressed to them by the time they were four. Children in families who were taciturn heard thirteen million words addressed to them by the time they were four. Those are massive differences in language experience way before children enter school." - Dr. Todd Risley

"Between 12 and 36 months the kids learn to talk the way their parents do. They learn the vocabulary, grammar, and syntax and they use their minds with the language to deal with the real world in the way their parents do." - Dr. George Farkas

"...if children don't have the right experiences during these sensitive periods for the development of a variety of skills, including many cognitive and language capacities, that's a burden that those kids are going to carry; the sensitive period is over, and it's going to be harder for them. Their architecture is not as well developed in their brain as it would have been if they had had the right experiences during the sensitive period." - Dr. Jack Shonkoff

"The processing equipment that we call the neocortex does not start to operate until the emotion system, or what we call the affect system, aims the cognitive mechanism." - Dr. Donald Nathanson

"...if a child can't sit still, if a child is preoccupied with feelings of sadness or anxiety, or if a child can't control his or her impulses, or is dealing with unresolved aggressive feelings, they all interfere with the ability to sit and master the skill of reading." - Dr. Jack Shonkoff

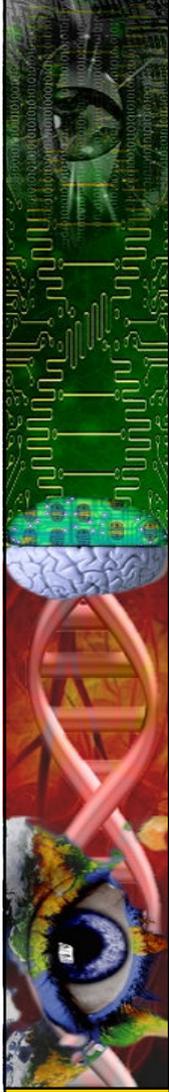


"...brains come in to the world, so to speak, expecting to be bombarded with language at an early age as part of its organizing principle, and human brains that don't get that experience, in effect, are not getting the normal nutritive." - Dr. Terrence Deacon

"People don't just get born into how to live as human beings, they have to learn how to live as human beings. Much of their learning -- indeed, almost all of their learning is by way of language." - Dr. John Searle

"...written language must stand on the shoulders of oral language... [they] come together to form what I consider to be an oral to written language continuum." - Dr Paula Talal

UNNATURAL CONFUSION



Our children are experiencing a form of confusion that is unnatural to their organism.

"What has to happen is your phonological processor, your orthographic processor, your meaning processor and your context processor all have to work in concert to identify the written word." - Dr. Louisa Moats

"The truth is that reading is one of the more complicated of the higher cognitive functions using attention and rate-of-processing and sequencing and memory and the linguistic systems and the visual system and it's having to coordinate this dance that's going on. And the more complicated the translation from the orthography to the phonology is to a particular language, the more complicated this processing dance has to be within the brain". - Dr. Paula Tallal

It's a real puzzle and a very arbitrary exercise in orthography to figure out what is what. - Dr. Louisa Moats

"I don't know of anything that has more exceptions than reading in English. I mean, English seems to be a total monster." - Seigfried Englemann

"Learning to read an alphabetic orthography is a very artificial and unnatural act." - Dr. Louisa Moats

"It's one of the most complex, unnatural, cognitive interactions that brain and environment have to coalesce to produce" - Dr. G Reid Lyon

"It's an enormous task just to get started, just to get to square one—to use the machine so to speak—in this case reading and writing." - Dr. Terrence Deacon

"The alphabet is a technology in the sense that it is a contrived device for conveying information." - Dr. David Olson

"It is in a sense a technological artifact, absolutely." - Dr. Michael Merzenich

"When we read, we are taking a code and we are getting instructions from that code to do a series of cognitive processes. And so what we are actually doing is enacting a cognitive performance in response to a set of instructions." - Dr. Johanna Drucker,



"In the English language the code is made extraordinarily difficult by exceptions and rules and rules that are exceptions to rules." - Dr. Grover Whitehurst

"Inconsistencies, absurdities, facts contrary to the etymology that show up in the writing system — it's a mess." - Dr. Thomas Cable

SHAME

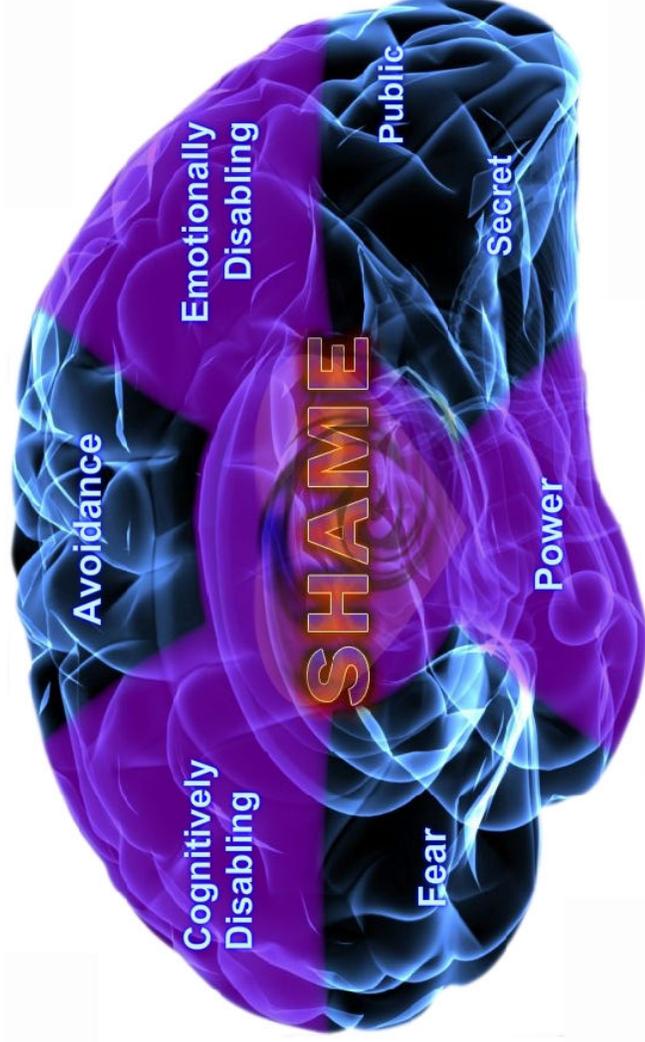


“So, they don’t read well, so they don’t read.” - Dr. Grover Whitehurst

“When kids are hesitant, disfluent, inaccurate, slow and labored in reading, that is very visible to their peers and remember the peers, the other kids, again look at reading as a proxy for intelligence. ... lousy reading produces a perception of stupidity and dumbness to peers and clearly to the youngster who is struggling. That is the shame. They feel like they’re failures; they tell us that.” - Dr. Reid Lyon

“It is a very maladaptive feedback cycle, that you approach a task with anxiety because of concerns about your own performance and that distracts your attention, your ability to focus on and process the information which is being provided, which impairs your performance more, which increases your anxiety and the cycle continues to amplify itself.” - Dr. Alex Granzin

... “this feedback loop begins where because it’s not pleasurable, because it’s difficult, they don’t engage in it and because they don’t engage in it as often they don’t develop the automaticity and on and on you go.” - Dr. Anne Cunningham



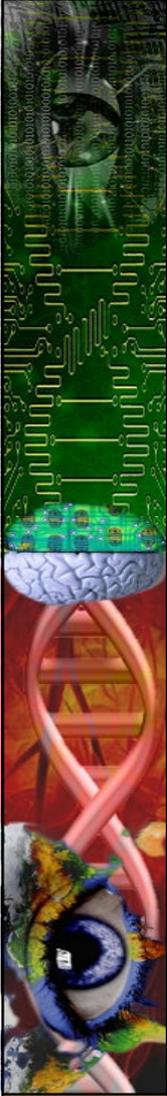
“Individuals who don’t read well definitely think its there fault. This is why they won’t talk about it, because they carry the shame and the guilt.” - Nancy Hennessy

“If not every time a child reads, but reliably once in a while when the child reads the child experiences shame, and that feels awful, and that codes reading as a powerful source of shame, wouldn’t the child be stupid to voluntarily do something that is going to humiliate him?” - Dr. Donald Nathanson

“When young children are learning a complex task like reading, the cognitive complexity of the task requires almost all of their bandwidth or attentional abilities. ... If they’re distracted by the feeling that they cannot do the task well, if they’re saying to themselves at the same time “I’m no good at this—I don’t like this—this is not fun, other children do this better than I do, I’m never going to learn it” — all that talk and emotional arousal... those distractions diminish their ability to actually do the task they’re struggling with.” - Dr. Mark T. Greenburg

“They don’t want to read because they’re not good at reading. They avoid reading. They’d rather clean the bathroom than read.” - Dr. Edward Kame’enui

WHAT IS READING?



Reading involves processing code into sounds. It depends on internal mental technology that is analogous to external technologies such as a modem or CD player.

"...most letters that are in your foveal view, the area right around your fixation, are probably being processed in parallel... but averaged over them its about 25 milliseconds. Very fast, staggeringly fast"
- Dr. Keith Rayner

Like the scroll of a player piano plays piano keys, the code of writing plays phonemes. If the piano doesn't have all the keys or can't play them in combinations fast enough the music will be unintelligible. Same for reading.

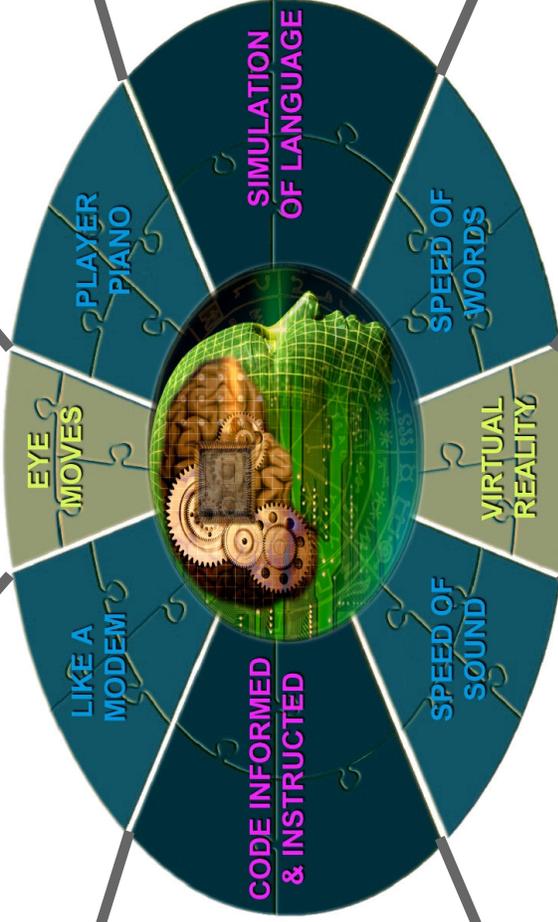
When we read, the higher-level brain processes involved in comprehension are being fed a *simulation* of language that has been constructed by lower-level brain processes according to the instructions and information contained in a code.

Reading depends on what could be called a 'language simulation assembler', an artificial module of brain functionality analogous to a software application that dynamically constructs virtual language streams according to the text being decoded.

"Bad and dad - acoustically they're almost identical...except for the first thirty or forty milliseconds. There are lots of words and lots of speech sounds that are different only in terms of one or two acoustic features."
- Dr. Paula Tallal

There is a temporal profile to oral language that (at least initially) the brain's reading assembly processes must produce within.

"Wow, that's interesting. I think that's a lovely description of it. It really is a virtual reality, it is a matrix...."
- Dr. Tim Shanahan



WRITTEN ENGLISH



"All of the long "l"s in English are "ice" and "nice" and "dice", always in French, Italian and Spanish, it's (pronounced) "eece" and "neece" and "deece" because they are still using the Latin "l" not the great vowel shift "i". " - John H. Fisher

"Imagine now the people trying to put them together (letters and sounds) sometimes not being very good at speaking the language they were supposedly mapping into." - Dr. Richard Venezky

"So we get "gh"s and "th"s and "ph"s that are supposed to sound like "f"s and other kinds of peculiar pronunciations." - Dr. Johanna Drucker

"It's amazing how often the chan-cery scribes established the spelling we still use today." - John H. Fisher

"No person wrote English as a first form of writing until after 1700. Up until that time everybody who wrote was educated in Latin and then he began to write in English. There is no such thing as a native English scribe until after 1700". - John H. Fisher

"So we have individual scribal variations and then we have dialect variations and then we have this mis-match with the sounds of the letters." - Dr. Richard Venezky

50+ Sounds

SPOKEN ENGLISH

VOWEL SHIFT

COST OF FONTS

HENRY V SCRIBES

The 1st Millennium Bug

PRINTING PRESS

LATIN DIVIDE

FRENCH RULES

ROMAN ALPHABET

26 Letters

"Several letters were lost from the English language ... simply because the printers came from the low countries and the actual typeface came from the low countries where they didn't use those letters... an accident of print." - Dr. Malcolm Richardson

"The Printing Press did more to standardize spelling than anything else." - John H. Fisher

"The accident of the printing press which in England served to freeze spelling in the 15th century so that you have these bizarre spellings." - Dr. Malcolm Richardson

"It was just at the wrong moment to freeze English ... the printing press came in at time when the language was changing as rapidly as we have ever known it to change." - Dr Thomas Cable

"The person who had the greatest influence on English was not Shakespeare it was William the Conqueror." (1066) - Dr. Thomas Cable

"The Anglo-Saxon was ignored for another 500 years." - John H. Fisher

"The patterning derives from the fact that we have fifty some sounds but only 26 letters so we have to adopt a whole variety of mechanisms to close the gap". - Dr. Richard Venezky

CONFUSING HISTORY



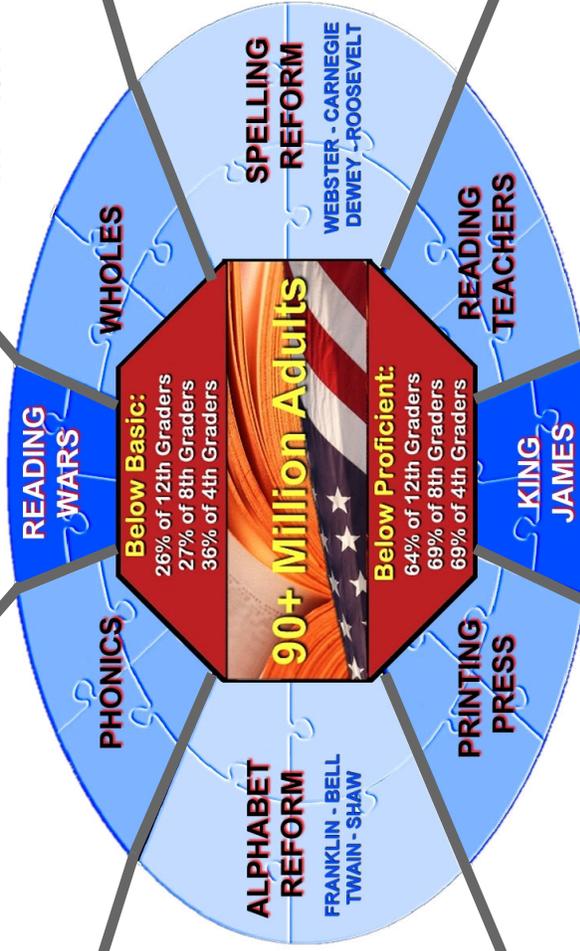
"English has evolved a very complex system for spellings and it has been a challenge to educators since the 16th century. This problem of an alphabetic representation of English led to the development of phonics as an effort to specifically teach the complex relation between English sounds and spellings." - William T. Stokes

"That was due to the Dewey revolt in the Twenties in which they threw out phonic reading and went to word recognition, as if you're reading Chinese pictographs instead of blending sounds of different letters. I think killing phonics was one of the greatest causes of illiteracy in the country." - Dr. Seuss

Friedrich Gedike (1754-1803) ...felt the rote learning of meaningless letters led to slow pronunciation of uncomprehended words. The child should listen to songs and stories suited to his age, draw pictures, and exercise his imagination. By the time he was about ten he would learn to read easily by going from "wholes" to their parts, from books to their elements, words then letters.
- Robert McCole Wilson

"...as every Letter ought to be, confin'd to one; the same is to be observ'd in all the Letters, Vowels and Consonants, that wherever they are met with, or in whatever Company, their Sound is always the same. It is also intended that there be no superfluous Letters used in Spelling, i.e. no Letter that is not sounded, and this Alphabet by Six new Letters provides that there be no distinct Sounds in the Language without Letters to express them". - Benjamin Franklin

"Printing spread so rapidly that there were like 8,000 books in Europe in the 1450s and by the end of the Century their were 8,000,000 copies and the more books you have the more incentive there is for people to read them." - Dr. Leonard Shlain



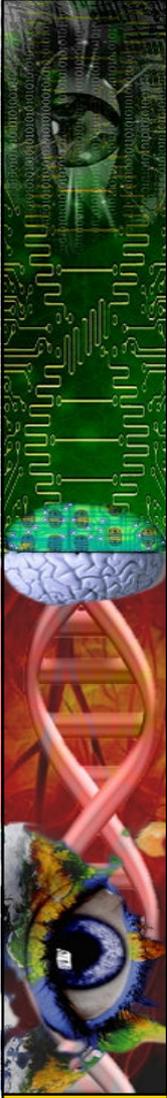
"Letters, the most useful invention that ever blessed mankind, lose a part of their value by no longer being the representatives of the sounds originally annexed to them. The effect is to destroy the benefits of the alphabet."

"Delay in the plan here proposed may be fatal ...a national acquiescence in error will follow, and posterity be doomed to struggle with difficulties which time and accident will perpetually multiply."
- Noah Webster

"(16th Century) Teachers were bewildered or angered when their pupils who had clearly learned their letters could not read." - Robert McCole Wilson

"The Bible was translated and the new invention, the printing press, meant books were available to many more people. In England, the monarchy wanted the boys "to read English intelligently instead of Latin unintelligently."
- Robert McCole Wilson

THE BRAIN'S CHALLENGE



Comprehension of the words generated by the 'language simulation assembler' depends on: a) the simulation quality of the words; b) whether the words are in the vocabulary of the reader; c) the efficiency of the assembly process in terms of its drain on the processing bandwidth available for subsequent comprehension and reflection, and d) processing all the above fast enough so that the simulation streams into comprehension processing at a rate roughly comparable to speech).

"You can learn to talk relatively well without becoming that phonologically aware. Without really needing to break the sounds down in your mind. It's only when you hit reading that you must become aware that words are made of smaller units."
- Dr. Paula Tallal

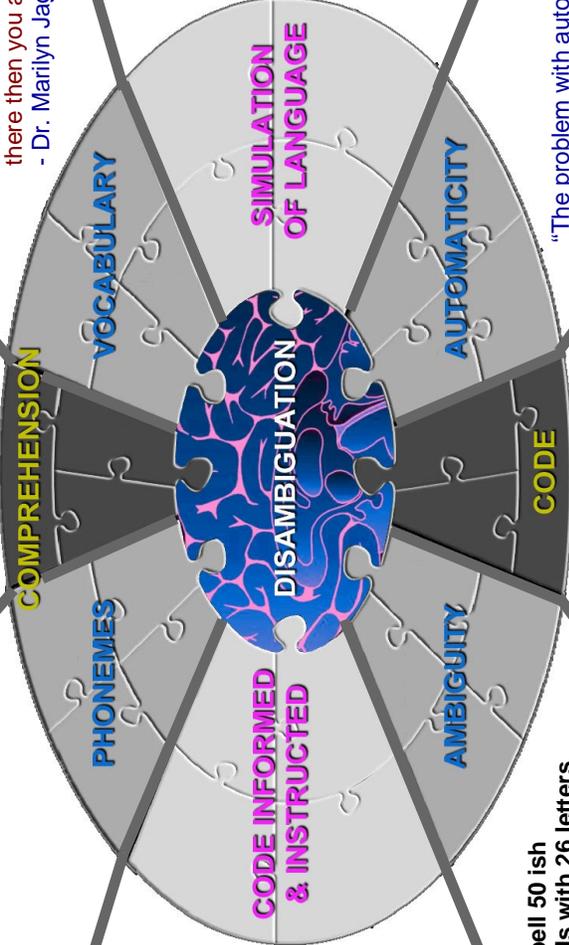
"It turns out I can't play phonemic awareness games if the words aren't in my vocabulary. I can't do it—I can't catch the syllables and phonemes."

"This transcription system as you call it, is an approximation. Whenever you read a word you have to search for what it might be. There is always this correction going on when you are groping for words. If those words aren't there then you are left hanging."
- Dr. Marilyn Jager Adams

The relationship between letters and sounds in the English language is not straightforward. Recognizing letters is fast. Recognizing sounds is fast. Putting them together to create the intended words requires DISAMBIGUATION—the working out of the right sounds for the letters — that takes mind time. The time it takes to process through the confusion in the code directly corresponds to the stutters we hear in the articulation of struggling readers.

We spell 50 ish sounds with 26 letters in hundreds of ways

"In this kind of literate culture—highly literate culture—it's easy to forget that the system that we have learned is a result of a series of accidents that result in layers of complexity."
- Dr. Thomas Cable



A stream of virtual words assembled from virtual phonemes (phonemic representations) that is assembled by the brain according to instructions and information in the code and at speeds approximating speech.

Without sufficient phonemic differentiation the brain doesn't have the elements to construct the stream. Without sufficient vocabulary there isn't a basis for phonemic differentiation or word recognition.

"The problem with automatization is that at any step, if you've got a slowdown step, if any piece of that enterprise has a block, where you can't hold enough of the information, the whole house of cards falls apart."
- Dr. Terrence Deacon

"Its almost as if you to mesh with that code in a time sync so that that sequencing and processing can happen in a kind of parallel way — all those gears have to mesh—it's a lot of gears to mesh." - Dr. Johanna Drucker

"you wouldn't have to have much of a fault in this machine operating with high speed in this incredible processing efficiency that's required to see somebody be a little or a lot slower at it." - Dr. Michael Merzenich

"And that is the majority of our kids who have a tough time - they are slow they are labored in their reading."
- Dr. Reid Lyon

READINESS DEPENDENCY



"The further you go on the continuum of linguistic proficiency in the child population the more dependant they are on the ability of the teacher." —Dr. Louisa Moats

INSTRUCTION

"There is an inverse relationship between the amount of intensity the amount of systematization the amount of explicitness that goes into instruction—more of that, when you have a youngster who has limited to bereft foundational building blocks." - Dr. Reid Lyon

"The relationship with what we saw the parents doing, the extra talk before the children were three, and the Peabody Picture Vocabulary Test scores at age nine in the third grade, is .77"
- Dr. Todd Risley

"We're learning so much about how the wiring of the brain, how its architecture is very much shaped by experience and the environment. And what we've learned is that the active ingredient in the environment that's having an influence on development is the quality of the relationships that children have with the important people in their lives. That's what it's all about. That's where the action is." - Dr. Jack P. Shonkoff



HUMAN BRAIN

"It's an astounding neurological achievement to be able to process all of that information, to simultaneously consider multiple sources of information, both code related, phonological and semantic, and to keep all that in memory and produce something that's understandable to oneself or somebody else." - Dr. Grover Whitehurst

THE CODE

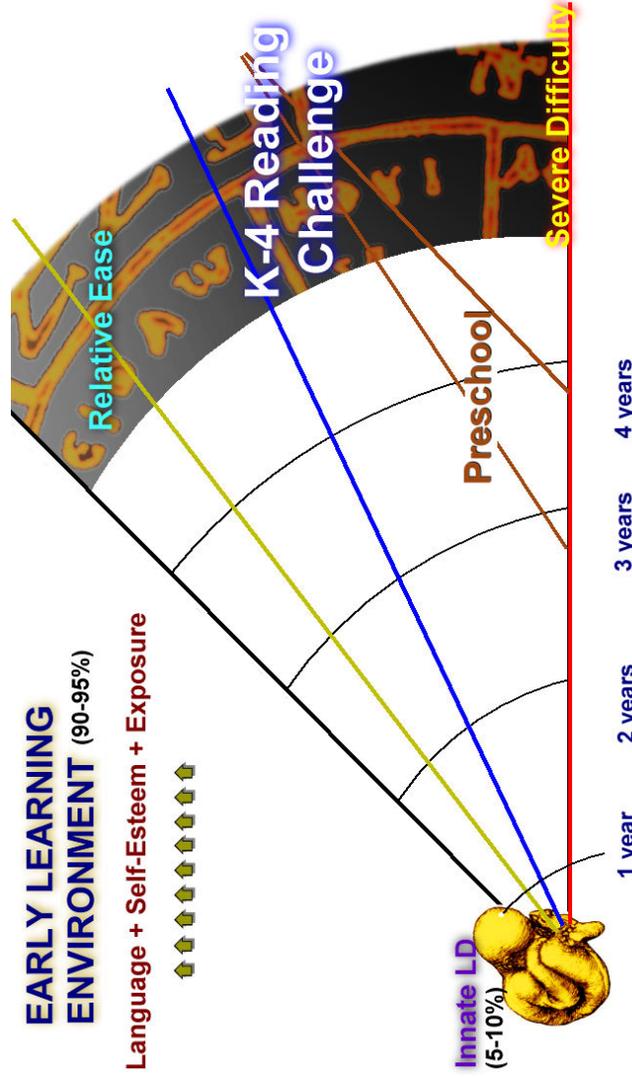
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LEARNING TRAJECTORIES

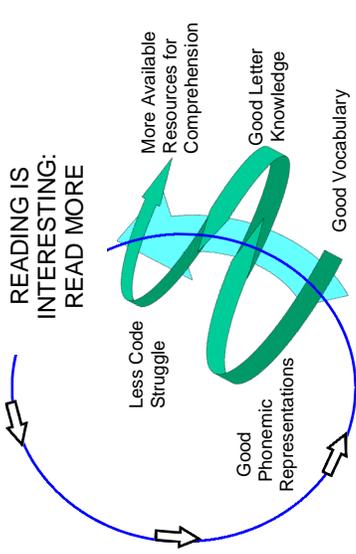
For most children the relative ease or difficulty they experience in learning to read is a result of their 'life learning trajectory', which has been developing since birth. There are three major contributors to a child's reading readiness: 1) Language: children who don't have sufficiently developed verbal abilities or have small vocabularies are at great risk of reading difficulty because their brains aren't ready for the challenge - reading sifts atop language. 2) Affect (self esteem): Learning to read is confusing and frustrating and requires 'emotional resilience' to avoid dropping into self-consciousness and/or shame which interferes with learning to read. 3) Print Exposure/Alphabet Insight—understanding that words can be written and that writing is made of the letters of the alphabet, and the knowledge of the alphabet's letters and their sounds are prerequisites to reading. The stronger the learning environments exercise these dimensions, particularly the first two, the less likely the child will suffer inordinate difficulty learning to read. Conversely, the weaker the early learning environments the greater the risk that the child will suffer difficulty.

EARLY LEARNING ENVIRONMENT (90-95%)

Language + Self-Esteem + Exposure



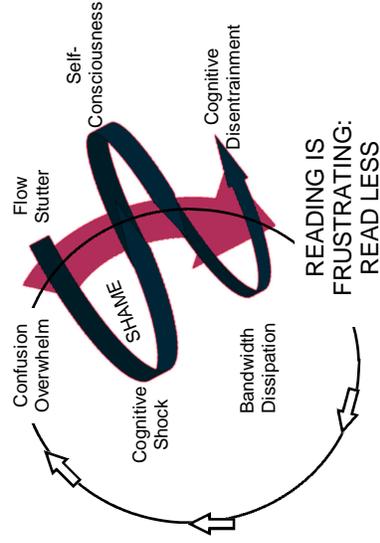
"So, if you go all the way back to the language problem and say, yeah, it's causing a reading problem, and the reading problem is causing the language problem, and the language problem is causing a behavior problem, and the fact that this kid can't read, and other people around him can read much better is eroding his self-esteem, making him feel pretty worthless." - Dr. Mei Levine



MATTHEW EFFECT

"There end up being vast differences in the exposure to the written language that are a function of underlying skills. The underlying skill effects motivation... So, it is a cycle of failure or success that feeds on itself." - Dr. Grover Whitehurst

DOWNWARD SPIRAL OF SHAME



FULCRUMS



REFRAME: "We have a problem" - more American children suffer long-term life-harm from the process of learning to read than from parental abuse, accidents, and all other childhood diseases and disorders *combined*. More than just lacking reading proficiency, prolonged difficulty with learning to read can cause learning disabling learning aversions. The learning limiting and disabling consequences of low literacy undermine our democracy, our international competitiveness, our economy, our health, and profoundly threaten our long term security. In purely economic terms, reading related difficulties cost our nation more than the war on terrorism, crime, and drugs

Warning: Protracted difficulty with learning to read can lead to maladaptive cognitive and emotional habits that endanger the general health of learning. **Above all else, do no harm.**

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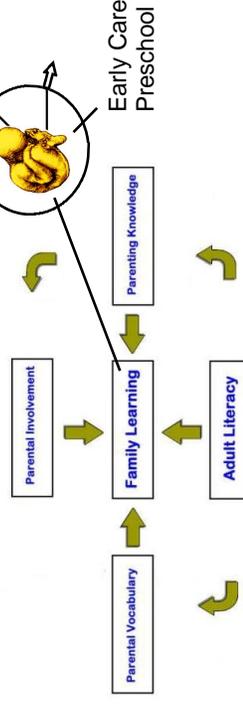
Learning to read involves an *unnatural form of confusion* that, depending on a child's life learning trajectory, can be relatively easy or dangerously difficult to work through. The root of the confusion is in large part the result of accidents, ignorance and negligence in our understanding the archaic legacy technology involved, the code. **It's not the fault of the children, parents or teachers. We are all responsible but there is no one to blame.** Profile and protocol driven systematic instructional methodologies while better than 'one size fits all' are still based on statistical probabilities. We need teachers who are **first-person learners** - who understand the challenges involved in learning to read and who can 'sync up' with the actual confusions their children are struggling with and from that sync choose among the methods and resources available to them that will optimally meet their learner's needs and trajectories. **More than silver bullets we need corrective glasses. We need to experience learning to read from the learner's perspective as the reference for applying our models and theories.**

INSTRUCTIONAL ORIENTATION:

- **ABOVE ALL ELSE DO NO HARM**
- **BUILD LANGUAGE READINESS** - Using principles of neuroplasticity exercise/compensate for underlying language weaknesses.
- **SYNC UP** - learn to connect with the learner's confusions as they are happening.
- **REFRAME THE SHAME** - Contextualize the confusion frustration so as to minimize learner's self-blame and shame.
- Intentionally, pedagogically-tactically, **orchestrate the learner's confusion** and meet them in it with real time feedback that helps them learn their way through the confusion.

SOCIAL FOCUS:

LEARNING TRAJECTORIES FORM IN EARLY LEARNING ENVIRONMENTS—improving early learning environments is neurologically and systematically the most cost-optimal fulcrum for improving readiness.



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