The 32-Million Word Gap

By David Shenk

What is intelligence, and where does it come from?

In the mid-1980s, Kansas psychologists Betty Hart and Todd Risley realized that something was very wrong with Head Start, America's program for children of the working poor. It manages to keep some low-income kids out of poverty and ultimately away from crime. But for a program that intervenes at a very young age and is reasonably well run and generously funded -- $7 billion annually -- it doesn't do much to raise kids' academic success. Studies show only "small to moderate" positive impacts on three- and four- year- old children in the areas of literacy and vocabulary, and no impact at all on math skills.

The problem, Hart and Risley realized, wasn't so much with the mechanics of the program; it was the timing. Head Start wasn't getting hold of kids early enough. Somehow, poor kids were getting stuck in an intellectual rut long before they got to the program -- before they turned three and four years old. Hart and Risley set out to learn why and how. They wanted to know what was tripping up kids' development at such an early age. Were they stuck with inferior genes, lousy environments, or something else?

They devised a novel (and exhaustive) methodology: for more than three years, they sampled the actual number of words spoken to young children from forty- two families at three different socioeconomic levels: (1) welfare homes, (2) working-class homes, and (3) professionals' homes. Then they tallied them up.

The differences were astounding. Children in professionals' homes were exposed to an average of more than fifteen hundred more spoken words per hour than children in welfare homes. Over one year, that amounted to a difference of nearly 8 million words, which, by age four, amounted to a total gap of 32 million words. They also found a substantial gap in tone and in the complexity of words being used. As they crunched the numbers, they discovered a direct correlation between the intensity of these early verbal experiences and later achievement. "We were astonished at the differences the data revealed," Hart and Risley wrote in their book Meaningful Differences. "The most impressive aspects [are] how different individual families and children are and how much and how important is children's

cumulative experience before age 3."

Not surprisingly, the psychological community responded with a mixture of interest and deep caution. In 1995, an American Psychological Association task force wrote that "such correlations may be mediated by genetic as well as (or instead of) environmental factors." Note "instead of." In 1995, it was still possible for leading research psychologists to imagine that better-off kids could be simply inheriting smarter genes from smarter parents, that spoken words could be merely a genetic effect and not a cause of anything.

Now we know better. We know that genetic factors do not operate "instead of" environmental factors, they interact with them: GxE. Genetic differences do exist. But those differences aren't straitjackets holding us in place; they are bungee cords waiting to be stretched and stretched. When positive environmental triggers such as parental speaking are discovered, the appropriate response is not to caution against their possible irrelevance, but to embrace their influence on our genes -- and our lives. And now we know what some of those triggers are:

Speaking to children early and often

This trigger was revealed in Hart and Risley's incontrovertible study and reinforced by the University of North Carolina's Abecedarian Project, which provided environmental enrichment to children from birth, with the study subjects showing substantial gains compared with a control group.

Reading early and often

In 2003, a national study reported the positive influence of early parent- to- child reading, regardless of parental education level. In 2006, a similar study again found the same thing about reading, this time ruling out any effects of race, ethnicity, class, gender, birth order, early education, maternal education, maternal verbal ability, and maternal warmth.

Nurturance and encouragement

Hart and Risley also found that, in the first four years after birth, the average child from a professional family receives 560,000 more instances of encouraging feedback than discouraging feedback; a working- class child receives merely 100,000 more encouragements than discouragements; a welfare child receives 125,000 more discouragementsthan encouragements.

Setting high expectations

As Sherman and Key found in 1932, "children develop only as the environment demands development."

Embracing failure

Coaches, CEOs, teachers, parents, and psychologists all now recognize the importance of pushing their charges to the limit, and just beyond. Setbacks must be seen as learning tools rather than signs of permanent built- in limitation.

Encouraging a "growth mindset"

Stanford psychologist Carol Dweck has built her prestigious career on the importance of individ-uals believingthat their own abilities are malleable -- not fixed from birth. Many studies show that the more a person believes that abilities can be developed, the greater the success that person will eventually enjoy.

Recognizing the value of these and other environmental inputs doesn't take away from the importance of genetics. In the new GxE paradigm, to embrace environmental influences is also to embrace the importance of genes: Reading expresses genes. Speaking expresses genes. Mentoring expresses genes. With GxE, intelligence is not a thing, but a process. Why do some kids do better in school right from the start? Why are they earlier talkers, earlier achievers, and ultimately more creatively and financially successful in their adult lives? It's because from day one, they are trained to be.

Around the same time, City University of New York research psychologist Sylvia Scribner came upon a very different (but no less striking) phenomenon that we might call "carton calculus." This oddity was quietly unfolding in a Baltimore dairy plant, where uneducated carton packers revealed remarkable mathematical abilities in their work. Though they were easily the least educated people in the factory, they could, without hesitation or discussion, determine exactly which of many orders to fill in precisely which sequence so as to minimize bending over and walking. For example:

If an order called for 6 pints of whole milk, 12 pints of two-percent milk, and 3 pints each of skim milk and buttermilk, an experienced assembler might select a case for 24 pints that was already half-filled with two- percent milk and one- third filled with whole milk, rather than try to prepare the order from scratch with an empty case. Using the half- filled case would enable the assembler to fill the order by removing 2 pints of whole milk and adding 3 pints each of skim milk and buttermilk, for a total of only three [back] bends. Moreover, when the orders were not evenly divisible into cases, the assemblers were able to shift between different representations of the order, a feat equivalent to shifting between different- base systems of numbers.

The math and mental effort involved was staggering, and yet the low-paid assemblers did this routinely all day long. "Assemblers calculated these least-physical effort solutions even when the 'saving' in moves amounted to only one unit (in orders that might total 500 units)," explained Scribner.

No signs of this ability showed up on IQ scores, math tests, or school grades. By any conventional academic measure, these laborers were thoroughly unintelligent. And yet, when the highly educated white- collar workers from the same factory occasionally filled in with assembler tasks, they couldn't

begin to match the case-filling expertise of an experienced low- IQ assembler.

Halfway around the world, in Kisumu, Kenya, Yale psychologist Robert Sternberg stumbled on exactly the same phenomenon in 2001 when studying the intelligence of Dholuo schoolchildren. First he measured their knowledge of local herbal remedies,then tested them according to their Western curriculum. Surprisingly, Sternberg found a "significantly negative" correlation. "The better the children did on the indigenous tacit knowledge," he noted, "the worse they did on the test of vocabulary used in school, and vice-versa."

Why -- and which test represented true intelligence?

Actually, none of these studies will likely come as a real shock to the reader. We're all familiar with the notion of "street smarts" as opposed to "school smarts." But the Baltimore carton packers and the Kisumu schoolkids did pose a serious challenge to research psychologists adhering to traditional definitions of intelligence. As Robert Sternberg watched studies like these pile up -- documenting the unusual, sometimes even untestable intelligence traits of Yup'ik Eskimo children, !Kung San hunters of the Kalahari Desert, Brazilian street youth,American horse handicappers, and Californian grocery shoppers -- he realized that the lack of correlation between their expertise and IQ scores demanded nothing less than a whole new definition of intelligence.

He saw another problem, too, that reinforced this conclusion: the increasingly flimsy distinction between "intelligence" tests and so- called achievement tests like the SAT II. The more Sternberg compared the two, the harder it was for him to find any real difference between them. Both test types measure achievements, Sternberg concluded -- skills that a person has developed.

All of this finally led Sternberg -- one of the leading authorities in the study of human intellect -- to tear down the wall that prevented the public from understanding the truth about intelligence.

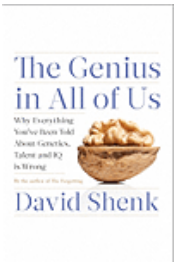
"Intelligence," he declared profoundly in 2005, "represents a set of competencies in development."

In other words, intelligence isn't fixed. Intelligence isn't general. Intelligence is not a thing. Intelligence is a dynamic, diffuse, and ongoing process. This finding fits perfectly with the earlier work of Mihály Csikszentmihályi and colleagues, who concluded that "high academic achievers are not necessarily born 'smarter' than others, but work harder and develop more self-discipline."

We can trick ourselves into thinking that measuring a person's intelligence is like measuring the length of a table. But in truth, it's more like measuring a five- year- old's weight. Whatever measurement you get applies only for today. How will that child measure up tomorrow? In large part, that is up to the child, and to all of us.

This post is excerpted from David Shenk's *The Genius in All of Us: Insights Into Genetics, Talent, and*

IQ.



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