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It was a powerful symbolic moment—an inescapable reminder that the challenge of teaching low-income children has become the central issue in American education.

The truth, as many American teachers know firsthand, is that low-income children can be harder to educate than children from more-comfortable backgrounds.

Educators often struggle to motivate them, to calm them down, to connect with them. This doesn't mean they're impossible to teach, of course; plenty of kids who grow up in poverty are thriving in the classroom. But two decades of national attention have done little or nothing to close the achievement gap between poor students and their better-off peers.

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In recent years, in response to this growing crisis, a new idea (or perhaps a very old one) has arisen in the education world: Character matters. Researchers concerned with academic-achievement gaps have begun to study, with increasing interest and enthusiasm, a set of personal qualities—often referred to as noncognitive skills, or character strengths—that include resilience, conscientiousness, optimism, self-control, and grit. These capacities generally aren't captured by our ubiquitous standardized tests, but they seem to make a big difference in the academic success of children, especially low-income children.

My last book, *How Children Succeed*, explored this research and profiled educators who were attempting to put it into practice in their classrooms. Since the book's publication, in 2012, the idea that educators should be teaching grit and self-control along with addition and subtraction has caught on across the country. Some school systems are embracing this notion institutionally. In California this spring, for example, a coalition of nine major school districts has been trying out a new

school-assessment system that relies in part on measurements of students' noncognitive abilities, such as selfmanagement and social awareness.

But here's the problem: For all our talk about noncognitive skills, nobody has yet found a reliable way to teach kids to be grittier or more resilient. And it has become clear, at the same time, that the educators who are best able to engender noncognitive abilities in their students often do so without really "teaching" these capacities the way one might teach math or reading—indeed, they often do so without ever saying a word about them in the classroom. This paradox has raised a pressing question for a new generation of researchers: Is the teaching paradigm the right one to use when it comes to helping young people develop noncognitive capacities?

Students at Middle School 45, in the Bronx, discuss their work with their teacher Susan Mula. (Gillian Laub / Getty)

What is emerging is a new idea: that qualities like grit and resilience are not formed through the traditional mechanics of "teaching"; instead, a growing number of

researchers now believe, they are shaped by several specific environmental forces, both in the classroom and in the home, sometimes in subtle and intricate ways.

The process begins in early childhood, where the most important force shaping the development of these skills turns out to be a surprising one: stress. Over the past decade, neuroscientists have demonstrated with increasing clarity how severe and chronic stress in childhood—what doctors sometimes call toxic stress—leads to physiological and neurological adaptations in children that affect the way their minds and bodies develop and, significantly, the way they function in school.

Each of us has within us an intricate stress-response network that links together the brain, the immune system, and the endocrine system (the glands that produce and release stress hormones). In childhood, and especially in early childhood, this network is highly sensitive to environmental cues; it is constantly looking for signals from a child's surroundings that might tell it what to expect in the days and years ahead. When those signals suggest that life is going to be hard, the network reacts by preparing for trouble: raising blood pressure, increasing the production of adrenaline, heightening vigilance. Neuroscientists have shown that children living in poverty experience more toxic stress than middle-class children, and that additional stress expresses itself in higher blood pressure and higher levels of certain stress hormones.

In the short term, these adaptations may have benefits, especially in a dangerous environment. When your threat-detection system—sometimes referred to as your fight-or-flight response—is on high alert, you can react quickly to trouble. But in the longer term, they can cause an array of physiological problems and impede development of the prefrontal cortex, the part of the brain that controls our most complex intellectual functions, as well as our ability to regu

more subtly, going through each day perpetually wary of connection with peers or teachers.

On a cognitive level, chronically elevated stress can disrupt the development of what are known as executive functions: higher-order mental abilities that some researchers compare to a team of air-traffic controllers overseeing the workings of the brain. Executive functions, which include working memory, attentional control, and cognitive flexibility, are exceptionally helpful in navigating unfamiliar situations and processing new information, which is exactly what we ask children to do at school everyday. When a child's executive functions aren't fully developed, school days, with their complicated directions and constant distractions, can become a never-ending exercise in frustration.

Executive functions also serve as the developmental building blocks—the neurological infrastructure—underpinning the noncognitive capacities that educators are now so focused on. What this suggests is that if we want to help children demonstrate these qualities in school, there are two places where we need to change our approach. One is the classroom, where right now many fundamental practices of modern American pedagogy ignore this science of adversity. The second is where children's neurological identity begins to be formed, long before they ever set foot in kindergarten: the home.

**T**HE MOST IMPORTANT environmental factor in children's early lives, researchers have shown, is the way the parents and other adults interact with them. Beginning in infancy, children rely on responses from their parents to help them make sense of the world. Researchers at Harvard's Center on the Developing Child have labeled these "serve and return" interactions. An infant makes a sound or looks at an object—that's the serve—and her parents return the serve by responding to her babbles and cries with gestures, facial expressions, and speech. More than any other experiences in infancy, these rudimentary interactions trigger the development and strengthening of connections among the regions of the brain that control emotion, cognition, language, and memory.

Gnamakoran Koulibaly holds up a painting she made at MS 45. (Gillian Laub / Getty)

A second crucial role that parents play early on is as external regulators of their children's stress. When parents behave harshly or unpredictably—especially at moments when their children are upset—the children are less likely over time to develop the ability to manage strong emotions and respond effectively to stressful situations. By contrast, when a child's parents respond to her jangled emotions in a sensitive and measured way, she is more likely to learn that she herself has the capacity to cope with her feelings even intense and unpleasant ones.

But if a home environment can have a positive impact on a child's development, it can also do the opposite. One of the most influential studies of the long-term effect of a stressful early home life is the ongoing Adverse Childhood Experiences Study, which was launched in the 1990s by Robert F. Anda, a physician at the Centers for Disease Control and Prevention, and Vincent J. Felitti, the founder of the preventive-medicine department at Kaiser Permanente. Anda and Felitti identified 10 categories of childhood trauma: three categories of abuse, two of neglect, and five related to growing up in a "seriously dysfunctional household." They found that the number of these traumas a person experiences in childhood (a number that has come to be known as a person's ACE score) correlates in adulthood with health problems ranging from heart disease to cancer.

More recently, researchers using variations on Anda and Felitti's ACE scale have found that an elevated ACE score also has a negative effect on the development of a child's executive functions and on her ability to learn effectively in school. A study conducted by Nadine Burke Harris, a pediatrician and trauma researcher in San Francisco, found that just 3 percent of children in her clinic with an ACE score of zero displayed learning or behavioral problems. But among children who had an ACE score of four or more, 51 percent had learning or behavioral problems. A separate national study published in 2014 found that children with two or more ACEs were eight times as likely as children with none to demonstrate behavioral problems and more than twice as likely to repeat a grade in school. According to this study, slightly more than half of all children have never experienced a serious adverse event—but the other half, the ones with at least one ACE, account for 85 percent of the behavioral problems that children exhibit.

**F**OR CHILDREN WHO grow up without significant experiences of adversity, the skill-development process leading up to kindergarten generally works the way it's supposed to: Calm, consistent, responsive interactions in infancy with parents and other caregivers create neural connections that lay the foundation for a healthy array of attention and concentration skills. Just as early stress sends signals to the nervous system to maintain constant vigilance and prepare for a lifetime of trouble, early warmth and responsiveness send the opposite signals: You're safe; life is going to be fine. Lower your guard; the people around you will protect you and provide for you. Be curious about the world; it's full of fascinating surprises. These messages trigger adaptations in children's brains that allow them to slow down and consider problems and decisions more carefully, to focus their attention for longer periods, and to more willingly trade immediate gratification for promises of long-term benefits.

We don't always think of these abilities as academic in nature, but in fact they are enormously beneficial in helping kids achieve academic success in kindergarten and beyond. Without them, the transition from home or day care to kindergarten is likely to be fraught, and the challenge of learning the many things we ask kindergarten students to master can be overwhelming. In the classroom, neurocognitive difficulties



MS 45 eighth-graders doing science with William Alicea (Gillian Laub / Getty)

Fast-forward a few years, to the moment when those students arrive in middle or high school, and these executive-function challenges are now typically perceived to be problems of attitude or motivation. When teachers and administrators are confronted with students who find it hard to concentrate, manage their emotions, or deal calmly with provocation, the first instinct often is not to look at them as children who, because of a lifetime of stress, haven't yet developed a healthy set of self-regulation mechanisms. Instead, the adults see them as kids with behavioral problems who need, more than anything, to be disciplined.

When children and adolescents misbehave, we usually assume that they're doing so because they have considered the consequences of their actions and calculated that the benefits of misbehavior outweigh the costs. So our natural response is to increase the cost of misbehavior, by ratcheting up punishment. One of the chief insights that recent neurobiological research has provided, however, is that young people, especially those who have experienced significant adversity, are often guided by emotional and psychological and hormonal forces that are far from

rational. This doesn't mean that teachers should excuse or ignore bad behavior. But it does explain why harsh punishments so often prove ineffective in motivating troubled young people to succeed.

Most American schools today operate according to a philosophy of discipline that has its roots in the 1980s and '90s, when a belief that schools would be safer and more effective if they had "zero tolerance" for violence, drug use, and other types of misbehavior led to a sharp rise in suspensions. In 2010, more than a tenth of all public-high-school students nationwide were suspended at least once. And suspension rates are substantially higher among certain de



Carlos Rodriguez, an 11th-grader at the Washington Heights Expeditionary Learning School (WHEELS) (Gillian Laub / Getty)

And yet in almost every case, Fryer's incentive programs have had no effect. From 2007 to 2009, Fryer distributed a total of \$9.4 million in cash incentives to 27,000 students, to promote book reading in Dallas, to raise test scores in New York, and to improve course grades in Chicago—all with no effect. "The impact of financial incentives on student achievement," Fryer reported, "is statistically 0 in each city." In the 2010–11 school year, he gave cash incentives to fifth-grade students in 25 low-performing public schools in Houston, and to their parents and teachers, with the intent of increasing the time they spent on math homework and improving their scores on standardized math tests. The students performed the tasks necessary to get paid, but their average math scores at the end of eight months hadn't changed at all. When Fryer looked at their reading scores, he found that they actually went down.

The stark fact that complicates incentive studies like Fryer's is that children who grow up in difficult circumstances already have a powerful set of material incentives to get a good education. Adults with a high-school degree fare far better in life than adults without one. They not only earn more, on average, but they also have more stable families, better health, and less chance of being arrested or incarcerated. Those with college degrees similarly do much better, on average, than those without. Young people know this. And yet when it comes time to make any of the many crucial decisions that affect their likelihood of reaching those educational milestones, kids growing up in adversity often make choices that seem in flagrant opposition to their self-interest, rendering those goals more distant and difficult to attain.

Within the field of psychology, one important body of thought that helps explain this apparent paradox is self-determination theory, which is the life's work of Edward L. Deci and Richard M. Ryan, two professors at the University of Rochester. Deci and Ryan came up with the beginnings of their theory in the 1970s, when the field was mostly dominated by behaviorists, who believed that people's actions are governed solely by their motivation to fulfill basic biological needs and thus are highly responsive to straightforward rewards and punishments.

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In early childhood, the most important force shaping the development of qualities such as grit and resilience turns out to be a surprising one: stress.

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Deci and Ryan, by contrast, argued that we are mostly motivated not by the material consequences of our actions but by the inherent enjoyment and meaning that those actions bring us, a phenomenon called intrinsic motivation. They identified three key human needs—our need for competence, our need for autonomy, and our need for relatedness, meaning personal connection—and they posited that intrinsic motivation can be sustained only when we feel that those needs are being satisfied.

In their writing on education, Deci and Ryan acknowledge that many of the tasks that teachers ask students to complete each day are not inherently fun or satisfying; learning anything, be it painting or computer programming or algebra, involves a lot of repetitive practice. It is at these moments, they write, that extrinsic motivation becomes important: when tasks must be performed not for the inherent satisfaction

maximize their future opportunities—to persevere through challenges, to delay gratification, to control their impulses—we need to consider wh

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Jackson's proxy measure allowed him to do some intriguing analysis of teachers' effectiveness. He subjected every ninth-grade English and algebra teacher in North Carolina to what economists call a value-added assessment. First he calculated whether and how being a student in a particular teacher's class affected that student's standardized-test score. Then, separately, he calculated the effect that teachers had on their students' noncognitive proxy measure: on their attendance, suspensions, timely progression from one grade to the next, and overall GPA.

Jackson found that some teachers were reliably able to raise their students' standardized-test scores year after year. These are the teachers in every teacher-evaluation system in the country, who are the most valued and most rewarded. But he also found that there was another distinct cohort of teachers who were reliably able to raise their students' performance on his noncognitive measure. If you were assigned to the class of a teacher in this cohort, you were more likely to show up to school, more likely to avoid suspension, more likely to move on to the next grade. And your overall GPA went up—at just your grades in that particular teacher's class, but your grades in your other classes, too.

Jackson found that these two groups of successful teachers did not necessarily overlap much; in every school it seemed, there were certain teachers who were especially good at developing cognitive skills in their students and other teachers who excelled at developing noncognitive skills. But the teachers in the second cohort were not being rewarded for their success with their students—indeed, it seemed likely that no one but Jackson ever realized that they were successful. And yet those teachers, according to Jackson's calculations, were doing more to get their students to college and raise their future wages than were the much-celebrated teachers who boosted students' test scores.



Jackson's study didn't reveal whether these teachers increased their students' grit or optimism or conscientiousness and by how many percentage points. Instead, it suggested that that's probably the wrong question to be asking. Jackson's data showed that spending a few hours each week in close proximity to a certain kind of teacher changed something about students' behavior. And that was what mattered.

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was skeptical of the idea that perseverance could be taught in the same way that we teach math, reading, or history. “There is little evidence that working directly on changing students’ grit or perseverance would be an effective lever for improving

In essence, what Farrington found was this: If you are a teacher, you may never be able to get your students to be gritty, in the sense of developing some essential character trait called grit. But you can probably make them act gritty—to behave in gritty ways in your classroom. And those behaviors will help produce the academic outcomes that you (and your students and society at large) are hoping for.

What makes a student persevere in any given classroom on any given day? Farrington's answer is that it depends on his academic mind-set: the attitudes and self-perceptions and mental representations that are bouncing around inside his head. That mind-set is the product of countless environmental forces, but research

Farrington has distilled this voluminous mind-set research into four key beliefs that, when embraced by students, seem to contribute most significantly to their tendency to persevere in the classroom:

1. I belong in this academic community.
2. My ability and competence grow with my effort.
3. I can succeed at this.
4. This work has value for me.

If students hold these beliefs in mind as they are sitting in math class, Farrington concludes, they are more likely to persevere through the challenges and failures they encounter there. And if they don't, they are more likely to give up at the first sign of trouble.

The problem, of course, is that students who grow up in conditions of adversity are primed, in all sorts of ways, not to believe any of Farrington's four statements when they're sitting in math class. This is in part due to the neurobiological effects of adversity, beginning in early childhood. Remember that one of the signal results of toxic-stress exposure is a hyperactive fight-or-flight mechanism, which does not encourage in students the soothing belief I belong here. Instead, it conveys opposite warnings, at car-alarm volume: I don't belong here. This is enemy territory. Everyone in this school is out to get me. Add to this the fact that many children raised in adversity, by the time they get to middle or high school, are significantly behind their peers academically and disproportionately likely to have a history of confrontations with school administrators. These students, as a result, tend to be the ones placed in remedial classes or subjected to repeated suspensions or both—none of which makes them likely to think I belong here or I can succeed at this.

**M**OST AMERICAN SCHOOLS don't do a particularly good job of creating environments that convey to students, especially low-income students, the four beliefs that

environment in their own classroom, regardless of the climate in the school as a whole. Until recently, though, school-wide strategies that encouraged these positive mind-sets in students were rare.

Now, however, some new, more comprehensive approaches are emerging. Many of them draw on the neurobiological research that explains how a childhood full of toxic stress can produce obstacles to school success. They take as their premise that in order to help students overcome those obstacles, it may be necessary to alter

One example of this comprehensive approach is Turnaround for Children, a school-transformation nonprofit that works in high-poverty schools in New York City; Newark, New Jersey; and Washington, D.C. According to research done by the organization, many of the behavior-management challenges that educators in high-poverty schools face are due to the combustible combination, in the classroom, of two cohorts of students. The first is a small group of students who have experienced high levels of toxic stress (and likely have high ACE scores) and as a result are angry and rebellious and disruptive. This group, Turnaround estimates, represents between 10 and 15 percent of the student body in most high-poverty schools. Students in the second cohort have also experienced adversity and stress but not to the same intense degree. These students are less likely to start trouble, but their highly sensitive fight-or-flight mechanisms are easily triggered when trouble arrives.

When Turnaround is contracted to work at a particular school, its intervention team, usually three or four people, begins by addressing the psychological needs of potentially disruptive students, sometimes offering them on-site counseling and mentoring, often referring them and their families to mental-health services. At the same time, the organization's team works to improve the classroom environment as a whole, coaching teachers in behavior-management techniques that dial confrontations down rather than up, and giving them strategies to help create a climate of belonging and engagement in the classroom.

Turnaround then expands its intervention to focus not just on the emotional atmosphere of the classroom but also on the teaching and learning that happens there. Last spring, I visited Middle School 45, in the Bronx, a high-poverty public school where Turnaround had been working for about a year. During my visit, much of the intervention team's focus was on encouraging teachers in what it called cooperative learning, a pedagogical approach that promotes student engagement in the learning process: less lecture time, fewer repetitive worksheets; more time spent working in small groups, solving problems, engaging in discussions, and collaborating on long-term creative projects. It's a style of teaching and classroom organization that is relatively common in independent schools and in wealthy suburbs but quite unusual in inner-city public schools.



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The central premise of EL schools is that character is built not through lectures or direct instruction from teachers but through the experience of persevering as students confront challenging academic work.

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Crew is the centerpiece of ELs strategy for immersing students in an environment of supportive relationships. But just as significant an element of the EL formula is its pedagogical strategy. Classrooms at EL schools are by design much more engaging and interactive than classrooms in most other American public schools. They are full of student discussions and group activities large and small; teachers guide the conversation, but they spend considerably less time lecturing than most other public-school teachers do. EL students complete a lot of rigorous and demanding long-term projects, often going through extensive and repeated revisions based on critiques from teachers and peers. They frequently work on these projects in collaborative groups, and many projects conclude with students giving a presentation in front of the class, the school, or even a community group. In addition, students are responsible, whenever possible, for assessing themselves; two or three times a year, at report-card time, parents or other family members come to the school for meetings known as student-led conferences, in which students as young as 5 narrate for their parents and teachers their achievements and struggles over the past semester.

The pedagogical guru behind EL's instructional practices and curriculum is Ron Berger, the organization's chief academic officer. Berger, who spent 28 years working as a public-school teacher in rural Massachusetts and an educational consultant before joining EL Education, clearly feels a special connection with those EL schools, like Polaris, that enroll high numbers of students growing up in adversity. When we spoke, he explained that this feeling of connection is rooted in his own childhood: He grew up with four siblings in a chaotic and unstable family. He knows firsthand how stress and trauma at home can unsettle and derail a child's development, and he understands that without the right intervention, the child may never recover from those early setbacks.



EL schools have been shown in independent studies to have a significant positive effect on academic progress. A 2013 study by Mathematica Policy Research revealed that students at five urban EL middle schools advanced ahead of peers at comparison schools by an average of 10 months in math and seven months in reading over the course of three years. The research also shows that an EL education has a greater positive impact on low-income students than it does on other students.

Berger said he is not surprised by that latter fact; he has a clear sense of the barriers

What's more, these students were among the most disadvantaged in the New York City public-school system. Eighty-eight percent of the student population at WHEELS h4-City publ.-frntaged

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educating low-income children—one rooted in what we're discovering about brain development, human psychology, and the science of adversity—might now be emerging.

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## A new approach to educating low-income children—one rooted in what we're discovering about brain development and the science of adversity—might be emerging.

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In December, the much-criticized No Child Left Behind Act, which dominated federal education policy for the past decade and a half was finally euthanized, replaced by a new law that mostly shifts down to the states the accountability for student success that No Child Left Behind centralized in Washington, D.C. For all its flaws, No Child Left Behind had as its guiding principle a noble and important idea: that the academic-achievement gap between low-income children and their better-off peers could and must be closed. The law was spectacularly unsuccessful at accomplishing that goal—the gap in eighth-grade reading and math test scores has barely budged since 2003—but the failure of its methods doesn't diminish the urgency of its central goal.

Here's a hopeful thought: Perhaps with the demise of the law, the education debates that raged so furiously during the No Child Left Behind era—on charter schools and Common Core, teacher contracts and standardized testing—might now give way to more-productive discussions about what low-income children need to succeed. We know a lot more than we did when the law was passed about the powerful environmental forces that are acting on many low-income children, beginning in infancy. And we know a lot more than we used to about what interventions and strategies—both at home and in the classroom—most effectively help these young people thrive in school and beyond. A national conversation about

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## ABOUT THE AUTHOR

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