



EDGE

1

THE THINKING EDGE

GETTING SMARTER ABOUT LEARNING

From the standpoint of the child, the great waste in the school comes from his inability to utilize the experiences he gets outside the school in any complete and free way within the school itself; while, on the other hand, he is unable to apply in daily life what he is learning at school.

JOHN DEWEY, "WASTE IN EDUCATION,"
The School and Society, 1899

THE FIRST EDGE, the Thinking Edge, is the most fundamental: modernizing our *thinking* about education. The most basic prerequisite to creating an Education Nation is changing our thinking about the enterprise itself—the learning process, the role of students, teachers, and parents, and what is possible today given the opportunities afforded by technology. As we know from efforts to change politics, religion, and even our personal relationships, changing our thinking can be the most difficult thing we human beings can do, especially when our opinions are firmly rooted in personal experience. As my colleague, Dr. Allen Glenn, professor and dean emeritus of education at the University of Washington, puts it, "The biggest obstacle to school change is our memories." We all think we know what a school is and how a classroom is organized, since we spent eighteen years in them during our formative years. It's hard to imagine anything else.

Unfortunately, we're not very smart about learning. For a field devoted to improving the teaching and learning of children, we grownups aren't getting smarter fast enough about how to do this.

In this chapter, I discuss how updating our thinking can build on some well-known and articulated philosophies about how children learn best, such as the child-centered approach of John Dewey. While his beliefs are popular with progressive educators, they are still not widely shared, especially among policymakers who don't have much time or appetite for readings from the history of education. Dewey's views stand in marked contrast to a top-down system of education, in which policymakers prescribe what, when, and how information is to be transmitted to young minds. If futurist and computer scientist Alan Kay is right, that "point of view is worth 80 IQ points" is true, we need to "regrind our lenses" to adopt some new points of view to boost our educational IQ. We need to know where to look.

I also discuss moving beyond ten simplistic "either/or" ways of thinking toward "both-and" syntheses and recent research by Carol Dweck at Stanford on imbuing children with mental models of their own learning: "mindsets," as described in Dweck's book *Mindset: The New Psychology of Success*. Maybe it shouldn't be so hard. We instinctively use the correct mindset when we think about sports and the arts. We just need to apply those views to education.



From Dewey to Duncan

Chicago, Illinois

John Dewey is often referred to as the father of the progressive education movement for his advocacy of child-centered teaching and connecting "school life" to real life. John Mergendoller of the Buck Institute for Education calls him "St. John." I like to connect Dewey to the history of his time and his arrival in the 1890s as a young professor of philosophy and

psychology from New York at a newly created University of Chicago. The university had been founded by John D. Rockefeller, whose oil fortune had grown rapidly, as a Baptist institution of higher learning for that burgeoning city on what was then the “western” edge of the American frontier. Dewey started an elementary school called the University Elementary School, which he later renamed the Laboratory School, known for many decades for its quality education for children of university faculty and other residents of the Hyde Park neighborhood. Dewey intentionally used the word *laboratory* for his school, intending it to resemble other university labs where the most promising theoretical ideas could be developed into classroom practices.

In 1899, John Dewey articulated his ideas on schooling in a series of three lectures called “The School and Society” to parents of the Lab School.¹ Since he was speaking to parents rather than to a more academic audience, his points are especially clear and concise. In my own talks, I recommend these speeches, republished in 1990 by the University of Chicago Press, to parents and education students. The modernity of Dewey’s writings is striking, expressing the sentiments of many education leaders, especially teachers, today. Dewey spoke to two key themes that resonate powerfully with the role of school in this twenty-first century.

The first is the critical importance of schools to larger societal goals and especially the success of the American democracy. Only thirty years after the Civil War, Dewey described the importance of equal educational opportunity for all children and how the success of our still-fledgling democracy would hinge upon it: “What the best and wisest parent wants for his own child, that must the community want for all of its children. Any other ideal for our schools is narrow and unlovely; acted upon, it destroys our democracy. All that society has accomplished for itself is put, through the agency of the school, at the disposal of its future members.”²

He connected individual growth to societal growth: “Here individualism and socialism are at one. Only by being true to the full growth

of all the individuals who make it up, can society by any chance be true to itself. . . . Nothing counts as much as the school, for, as Horace Mann said, ‘Where anything is growing, one former is worth a thousand re-formers.’”³

Secretary of Education Arne Duncan has a little-known personal connection to John Dewey. His mother ran an after-school tutoring program in a church, serving African American families. In an article in *Parade* magazine, Secretary Duncan described his own family’s preparation for that day: “No day of the year held more anticipation for my sister, brother, and me than the first day of school—and our mom and dad made sure we never took it for granted. Every year, we had to neatly lay out our new pencils and notebooks the day before school. On my first day of kindergarten, my dad strapped me into a child seat on the back of his bicycle and pedaled to the schoolhouse door to guide my first step into the brave new world of teachers, principals, and classmates.”⁴

That schoolhouse was, in fact, John Dewey’s Lab School at the University of Chicago, where Duncan’s father was a professor of psychology. As a boy, Arne Duncan literally walked in Dewey’s footsteps. More than a century after Dewey’s lectures to parents, as secretary of education, Duncan went on to closely echo Dewey’s words: “While much has changed since then, the singular impact of education has not. Education still holds the unique power to open doors in American society—and parents today, as in earlier generations, have the ability to help make those dreams of opportunity a reality. Education remains ‘the great equalizer’ in America. No matter what your zip code, race, or national origin, every child is entitled to a quality education.”⁵

A second major theme urged by Dewey was to connect school learning to children’s lives, a theme that underlies each of the six edges of this book. As early as the 1890s, the institution of school was already isolating the classroom from the rest of society and undermining the natural curiosity of children, leading to a long century of censoring student

interest that continues today. In a section called “Waste in Education,” Dewey wrote:

While I was visiting in the city of Moline a few years ago, the superintendent told me that they found many children every year who were surprised to learn that the Mississippi River in the textbook had anything to do with the stream of water flowing past their homes. . . . It is more or less an awakening to many children to find that the whole thing is nothing but a more formal and definite statement of the facts which they see, feel, and touch every day. When we think that we all live on the earth, that we live in an atmosphere, that our lives are touched at every point by the influences of the soil, flora, and fauna, by considerations of light and heat, and then think of what the school study of geography has been, we have a typical idea of the gap existing between the everyday experiences of the child and the isolated material supplied in such large measure in the school.⁶

Dewey knew what so many educators know today: if we just allowed children to ask and seek answers to questions they naturally ask, they would lead their own learning into many domains. Back in 1977, I was research director for a major new project that would become the PBS children’s science series, *3–2–1 Contact*. In the early stages, we thought of it as “the curiosity show” and sought to build the series around children’s questions. We went out to local schools in New York City and gathered questions from eight- to twelve-year-olds. Here is a sampling of them:

Why do people get sick?

How does your body know when it’s time to grow?

How do we talk?

How is a chimpanzee smarter than a porpoise?

How does a kangaroo jump?

Who is the tallest man or woman in the world?

How hot is a volcano?

How do you make: paper, chalk, glass, cartoon characters, telephones, buildings?

How does it work: calculator, camera, light bulb, magnet, clock, TV?

It is amazing how an obvious question children naturally ask can lead to many threads of investigation and increasingly sophisticated answers. One more question a child asked us, “What makes spring and summer?,” was posed in a film to Harvard seniors, on the day of their commencement, phrased as, Why is it hotter in the summer and colder in the winter?

This innocent question, which we experience every year for as long as we’ve been on the planet, stumps many adults and even our supposedly best and brightest college graduates. In the film, *A Private Universe*, produced by the Harvard-Smithsonian Observatory, the Harvard seniors clearly had no idea, although some were quite glib in giving wrong answers. Having been in their position, wearing my graduation robe in Harvard Yard on a sunny June day in 1974, I guarantee I would have stumbled through an uncertain reply, as well.

I won’t divulge the answer but encourage you to take this chance to investigate it. Before you race to Google it, see if this question doesn’t take you back to a sense of being a human being living on this Earth and how far our educations have taken us from Dewey’s admonition that children should investigate “the facts which they see, feel, and touch every day.”

Try mulling it over with some friends. Comparing ideas with other people and seeing how they think energizes the learning process. Group work is an important feature of student-centered classrooms. Students benefit from hearing and reading how other learners are thinking. Unfortunately, most of us were schooled in classrooms where “No Talking” and “Do Your Own Work” were the dominant rules. Just as

Robert Putnam chronicled the decline of American community in his best-seller, *Bowling Alone*, our schools have mandated “learning alone.”

When you’ve figured this one out, noting the importance of diagrams and visual models for understanding this phenomenon, pick a few of the other questions posed by the children we studied. Better yet, ask today’s children for questions they’re curious about or find your own “inner child” and come up with your own. Some of my favorites, which I’m still investigating, relate to items I carry around in my pocket and use every day. How does a cell phone work? A digital camera? An iPod? You can begin to appreciate how an entire curriculum could be built around a sequence of these investigations. Advocates of project-based learning call these “driving questions,” questions that may seem simple in phrasing but lead to deep and complex investigations.

Kids ask obvious questions related to history and the humanities, too. As a boy driving about town with his parents in Modesto, California, George Lucas noticed many different types of churches. He asked his mother, “If there is only one God, why are there so many different religions?” This simple yet profound question could occupy weeks of investigation into history and comparative religion, whether the questioner is ten, twenty, or fifty years old. While the question was off limits in George’s school in the 1950s and might be in most schools today, its relevance to the pressing issues of today’s domestic and global conflicts could not be overstated.

Dewey’s own question remains a driving question for creating an Education Nation: Could we design a school system in which every child could investigate the “facts which they see, feel, and touch every day”?

EDUCATION AND ECSTASY

George Leonard was a senior editor for *Look* magazine in the 1960s and reported on topics ranging from brain physiology to schools. A common thread was the untapped reserves of human potential. “In 1964,” he wrote, “I spent six months interviewing leading psychologists and brain researchers on the subject of the human potential. They all

agreed that most of the innate capability of most people is routinely squandered. It was clear that our mode of education itself was a major cause of this tragic waste.”⁷

He cofounded Esalen, which continues today at Big Sur, California, as a community devoted to mindfulness. He served as an Army Air Corps pilot and was an aikido master. Leonard could have been the intellectual descendant of John Dewey three generations later. They shared the same DNA about learning. Leonard not only communicated that education should serve the natural curiosity of children, he also emphasized that learning is fundamentally a joyful activity, something that activates our higher impulses. As human beings, we are meant to love learning.

His 1956 account, “What Is a Teacher,” based on weeks spent in Decatur, Illinois, with second-year teacher Carolyn Wilson and her students, accompanied by photographs by Charlotte Brooks, became a classic.

A yellow haired boy flings up his hand. A tearful boy with a crew cut pulls away from Carolyn Wilson’s embrace, resisting forgiveness. A doleful little girl nestles in the curve of Carolyn’s body. And, on page after page, the teacher is there, struggling cheerfully against impossible odds, bolstered by unsubstantiated hope, saying “There is good in every child.”⁸

This experience was one of many that led Leonard to call for a radical change in schooling. After writing trenchant pieces for *Look*, Leonard compiled his ideas in a 1968 book whose title married two words rarely spoken together, before or since: *Education and Ecstasy*. He wrote:

The most common mode of instruction today, as in the Renaissance, has a teacher sitting or standing before a number of students in a single room, presenting them with facts and techniques of a verbal-rational nature. Our expectation of what the human animal can learn remains remarkably low

and timorous.... All that goes on in most schools and colleges today... is only a thin slice of what education can become.

Leonard foresaw the dawn of a new age of learning, in which:

Average students learn... present day subject matter in a third or less of the present time, pleurably rather than painfully.... Provide a new apprenticeship for living, appropriate to a technological age of constant change.... Many new types of learning having to do with crucial areas of human functioning that are now neglected... can be made part of the educational enterprise. Much of what will be learned tomorrow does not today even have a commonly accepted name.... Almost every day will be a "teachable day," so that almost every educator can share with his students the inspired moments of learning now enjoyed by only the most rare and remarkable. Education in a new and greatly broadened sense can become a lifelong pursuit for everyone. To go on learning, to go sharing that learning with others.... Education, at best, is ecstatic.⁹

The book was serialized in three issues of *Look* and reached 34 million readers. Leonard received more than 5,000 letters from them, many wanting to start new kinds of schools. Nearly twenty years passed from the book's first publication to its second edition in 1987. Leonard wrote that he had resisted updating it, since the school system had proven remarkably resistant to change and so little change had come to pass. However, in the Foreword of the second edition, he wrote:

In the late 70s, something quite unexpected happened. I began getting letters, phone calls, and visits from computer experts at universities, in Silicon Valley, at AT&T Information Systems. A new technology was coming online that

would make . . . the visionary school . . . possible, not in the realm of science fiction, but in the near future. . . . I'm also happy that some truly innovative computerized systems are presently coming on line. The Education Utility, for example, is designed to beam an electronic information system into schools, just as telephone service is wired into our homes. . . . The Utility could provide individualized, self-paced computer learning programs along with a classroom management system and access to a wide variety of reference materials.¹⁰

That Utility is now the Internet, providing students around the globe with access—far beyond the early, text-based networked systems—to the world's best sources of knowledge, including films, music, and presentations by experts in many languages. Technology has surpassed even Leonard's vision two decades later.

In a 1984 article in *Esquire*, entitled "The Great School Reform Hoax," Leonard laid out an eleven-point agenda for schools that, a quarter-century later, could easily be a manifesto for many groups creating twenty-first-century schools. It included:

- Start individualizing education as soon as possible, in every responsible way possible.
- Initiate a large-scale curriculum development program.
- Pay teachers more and treat them as masters.
- Use computers to teach more than just how to use computers.
- Institute tough, consistent rules concerning dangerous or disruptive behavior.
- Get parents and the community involved in the schools.

But his eleventh point stands as the key to the previous ten:

Make school exciting, challenging, and vivid. This is the most important point of all. The preschooler is a voracious

natural learner. Having just performed the most awesome learning feat known on this planet—the mastery of spoken language—the child goes off to school, only to get some stunning news: In this place, far too often, learning is dull! Here is the underlying truth that few expert observers are willing to confront: Most schools are dreary, boring places. . . .

We must consider the possibility that students are justified in being bored, that we have been too cautious and unimaginative, that we have let our schools stagnate in the backwaters of our national life. Perhaps the moment has come to show our young people that school is where the action is, intellectually and physically, that the classroom as well as the playfield is a vivid place, a place of adventure and surprise, of manageable ordeals, of belly laughs—a place, in short, of learning. . . . Education is hard work, and that is true. But it is also great fun, an everlasting delight, and sometimes even ecstasy.¹¹

I agree. In the halls of Congress, state capitols, district offices, and school hallways, the education conversation has been far too “cautious and unimaginative.” About ten years ago, after I had joined the Lucas Foundation, I invited George Leonard, who lived not far from our campus in Marin County, to attend one of our foundation’s events. He clearly saw the connection between his writings from the 1960s through the ’80s with our work at Edutopia. Later, my wife and I had the chance to take a workshop led by him and his wife, Annie, at Esalen. In an aikido demonstration, he asked the young men in our class to form a line and charge at him. Even in his eighties, he deftly maneuvered around them and flipped them onto the mats.

George Leonard passed away in early 2010, as I was writing this book. We owe him a debt of gratitude. So, thank you, George Leonard, for proclaiming a Declaration of Independence from timid words and modest thinking about education, teachers, and students.

TEN EDUCATION WARS TO CEASE FIRE: FROM EITHER/OR TO BOTH-AND THINKING

Many worn-out ideas can be found in the turf battles, political disputes, and “education wars” that continue today. Albert Einstein is credited with this statement: “The definition of insanity is doing the same thing over and over again and expecting different results.” The past few decades of roundabout school reform should be enough to drive most people who care about education insane.

While test results have made it abundantly clear for decades that the academic performance of American students has been declining, especially during secondary school, under No Child Left Behind, the United States stepped up its testing regime to report these sad results, over and over again. Or as Robin Williams puts it, “Redundant, redundant, redundant.” School districts have responded to poor test results by subjecting students to more intensive drilling, tutoring, and staring at the same worksheets, textbooks, and whiteboards that didn’t work in the first place. In many classrooms, trading chalk for dry-erase markers might be the biggest change one could point to. Even that shift might be hard won. Years ago, my colleague, John Richmond from the U.K.’s Channel 4, was visiting classrooms, checking on whether teachers were using their award-winning educational programs. One of them politely told him, “My dear Mr. Richmond, here in our school, we’re still getting used to colored chalk.”

In the education wars, such as the battle between emphasizing “basic skills” versus “higher-order thinking skills,” experts dig in their heels, sharpen their opposing points of view, hone their debating skills, and publish their op-ed pieces. Instead of spinning our wheels in these timeworn debates, it’s time to issue a cease-fire, step back, and think harder. In fact, as in most debates, both sides make good points. Practicing an important “twenty-first-century skill,” we need a greater consensus that synthesizes these “either/or” debates into a more inclusive and bigger-picture “both-and” understanding.

The table below lists ten “either/or” debates and their opposing points of view that continue to generate more heat than light, resulting in a waste of precious time, resources, and policies, and, most of all, little impact on student learning. The right-hand column reconciles these extreme views into a smarter synthesis, acknowledging both sides and integrating them into a bigger picture of learning.

Turning Ten Either/Or Debates into Both-And Syntheses

EITHER	OR	BOTH-AND: THE SMARTER SYNTHESIS
Phonics skills	Whole language	Both are critical to reading. What kinds of rich linguistic environments support both?
Computational skills	Mathematical thinking	Both are critical in mathematics. What types of problems and experiences engage students to want to calculate and think mathematically?
Tests	Authentic assessment	Both are important in assessing and improving student learning. What kinds of tests are useful? And what larger assessment programs can improve learning?
Teacher-centered instruction	Student-centered learning	Teachers are vital in a student-centered classroom, but they play a different role when technology is the platform for content and collaboration.
Academic learning	Social-emotional learning	Students’ heads are connected to their hearts. Both need to be engaged for productive student learning.

(continued)

Turning Ten Either/Or Debates into Both-And Syntheses (*continued*)

EITHER	OR	BOTH-AND: THE SMARTER SYNTHESIS
Learning in nature	Learning with technology	Understanding the natural world involves collecting and analyzing data. Handling data involves technology.
Reading	Media and technology	Media and technology can support reading, online and in print, in new ways, through enlivening text with images and music and aiding students in analyzing their own reading.
Face-to-face instruction	Online learning	The added value of face-to-face interactions becomes even more important in online learning. Face-to-face can happen online through videoconferencing and in person.
Twenty-first-century skills	Core curriculum	Exercise the “new skills” of creativity, collaboration, and global thinking within a redesigned core curriculum integrating the humanities and sciences.
Enjoyment in learning	Hard work of learning	If students have a choice and voice in what and how they learn, they’ll work harder at it. Find what they enjoy doing, such as arts or sports, and connect learning to it.

HYBRID THINKING FOR EDUCATIONAL INNOVATION

Just as the hybrid gasoline-electric motor has brought innovation to automobiles, turning either/or into both-and thinking can create new approaches to fuel educational performance. There are many examples of break-the-mold hybrids in education; many of them relate to media and technology. *Sesame Street*, which celebrated its fortieth anniversary in 2009, is perhaps the best known, but it confronted many doubters during its early years who thought only in terms of what had been. “Television is the enemy of learning,” they reasoned, setting up an extreme dichotomy. “It’s full of violence and kids spend far too much time with it. It would be foolhardy to use TV to teach.”

But *Sesame Street* presented an entirely new design for a children’s TV show, one that was unimaginable based on the past. It brought together new talent, from Jim Henson’s Muppets to TV writers, musicians, educators, and researchers who had never collaborated before. It combined humor, puppets, animation, songs, a diverse cast, and comprehensive preschool curriculum, focused on both cognitive and social skills. It used a TV format that relied on detailed “message design,” high production values, and repetition—the TV commercial—and applied it to sell numbers, letters, and learning.

That’s my definition of how innovation happens: take the best elements of what has been, integrate diverse sources of knowledge and talent, and create a breakthrough that hasn’t been imagined before. In its creative assembly of these factors, *Sesame Street* is a quintessentially American production that has gone around the world and back. Now seen in various formats in more than 100 countries, from translations of the American series to coproductions with producers, animators, and puppeteers from countries such as South Africa and China, as well as a unique partnership between Israel and Palestine, *Sesame Street* is “the longest street in the world.” Like a hybrid car, this TV vehicle may have outwardly looked like a TV show, but its inner workings fundamentally changed the future of media in education, returning enormous social benefit in the process. To paraphrase one of its most famous songs that

teaches classification, “One of these shows is very much not like the others.”

Today the world of online learning is hybridizing the value of face-to-face (FTF) instruction with the potential of multimedia teaching. It is combining the value of what teachers and learners can do together in real, synchronous time with the added value of what can be done individually and in groups offline and online, asynchronously. The research on online learning is finding that FTF sessions continue to be valuable. When teachers and learners have a chance to meet in person, the learning bonds between them are strengthened, improving their online exchanges, motivation, and trust. Now that learners can actually see and talk to each other online through videoconferencing, this new type of virtual meeting—FTF online—will improve the educational and cost-effectiveness of online learning.

There are many more either/ors in education. You can turn this “Table of Ten” into a game for your next faculty, school board, or professional development meeting. Add to the list and come up with some new educational hybrids of your own that build on the strengths of seemingly opposite points of view and compensate for their weaknesses. This activity exercises some twenty-first-century thinking muscles that students need as well: the ability to evaluate differing, sometimes conflicting, points of view and create a new, more contemporary and powerful perspective. Create some new HEVs, hybrid educational vehicles, that can take us further down the road to designing new schools and dramatically increase the mileage we’ve been getting out of our educational thinking.

FEED THE ELEPHANT, DON’T WEIGH THE ELEPHANT

I was at a meeting in New York when a colleague told a story of visiting India, where an educator there asked her, somewhat skeptically, “In America, you test your students a lot, don’t you?” She replied that, indeed, the United States has a national policy that required testing of all students in certain grades. The Indian educator said, “Here, when



we want the elephant to grow, we feed the elephant. We don't weigh the elephant."

Now, I've never been to India and I've never tried to weigh an elephant. But this strikes me as the most concise and sound educational policy advice I've heard: concentrate on what we should be intellectually (and physically) feeding our children and not just on measuring their mental weight. As our nation has found, burdened by the regulations of No Child Left Behind, it's incredibly hard to weigh an elephant accurately. The obsession with testing is slowing down an already lumbering educational system, at a time when we need to be speeding up. (I promise only one more elephant metaphor.)

If we were to emphasize feeding our students' brains, what would we feed them? Most answers would focus on content in the language arts, science, or math and how it should be taught. But what about telling students something about the very nature of learning, intelligence, and brain development itself? Why not teach students about how their own brains develop, that the brain is the most marvelous and complex human organ, and how learning is the nourishment their brains need to grow and develop?

A "GROWTH MODEL" OF INTELLIGENCE

Research has found that teaching children to appreciate their brains motivates them to learn and expend greater effort, with improvements in mathematics learning. These profound results came from studies by Stanford psychologist Carol Dweck and her colleagues, Lisa Blackwell at Columbia and Kali Trzesniewski at Stanford, published in *Child Development* and promoted in a story on National Public Radio.^{12,13}

Dweck and her colleagues conducted two studies, the first showing relationships between students' theories of intelligence, their motivation to learn, and their academic achievement. In the first study, the sample included 373 junior high students in four successive groups from a New York City secondary school. The students were "moderately high achieving, with average 6th-grade math test scores at the 75th percentile



nationally; 53% were eligible for free lunch.” The sample was 55% African American, 27% South Asian, 15% Hispanic, and 3% East Asian or white.

Those students who held a “growth model” of intelligence agreed more often with statements such as “You can always greatly change how intelligent you are” and disagreed with statements such as “You have a certain amount of intelligence and you really can’t do much to change it.” They also valued learning more strongly (agreeing more often with statements such as “An important reason why I do my school work is because I like to learn new things”) and believed more strongly that effort leads to positive outcomes (“The harder you work at something, the better you will be at it”). Faced with academic difficulties, such as not doing well on a test, they were more likely to redouble their efforts rather than blame their lack of intelligence or the fairness of the test.

This growth model of intelligence was related to higher mathematics achievement in the fall of seventh grade and in the spring of eighth grade. That junior high math grades could be affected by students’ beliefs about themselves as learners should compel the attention of a nation anxious to improve mathematics achievement. The researchers related this potent relationship between students’ beliefs and their academic performance to this critical period of adolescence. It’s an important time to help teenagers develop a positive self-image about themselves as learners.

In a second study, the researchers studied whether this positive “growth model” of intelligence could be taught. In a different New York City junior high, with a similar racial mix but involving students with lower achieving and poorer backgrounds, ninety-one students were assigned to experimental and control groups. Both groups received instruction during eight 25-minute sessions on brain physiology and study skills. The experimental group, however, was “taught that intelligence is malleable” through, for instance, “vivid analogies [of] muscles becoming stronger.” “The key message was that learning changes the brain by forming new [neurological] connections, and the students are

in charge of the process.”¹⁴ All students had the same math teacher, who was unaware of which students were assigned to which group.

Math grades typically decline during the junior high years, but students who were taught to think that their brains and greater effort could increase intelligence reversed the expected decline, while students in the control group continued to decline. In the NPR interview, Dweck described how seriously students took this neurological learning: “When they studied, they thought about those neurons forming new connections. When they worked hard in school, they actually visualized how their brain was growing.”¹⁵

Their math teacher gave these accounts of two students who had been taught the “growth model”:

L., who never puts in any extra effort and doesn’t turn in homework on time, actually stayed up late working for hours to finish an assignment early so I could review it and give him a chance to revise it. He earned a B+ on the assignment (he had been getting Cs and lower).

M. was [performing] far below grade level. During the past several weeks, she has voluntarily asked for extra help from me during her lunch period in order to improve her test-taking performance. Her grades drastically improved from failing to an 84 on her recent exam.¹⁶

Two sentences near the end of the *Child Development* article summarize its message to educators: “Children’s beliefs become the mental ‘baggage’ that they bring to the achievement situation. . . . A focus on the potential of students to develop their intellectual capacity provides a host of motivational benefits.”¹⁷

A note about elephants: one thing I do know is that their gestation period is about eighteen months. Let’s spend the next year and a half giving birth to a new “national educational mindset,” based on expanding students’ minds and their own understanding about how to use them.

STUDENTS: FEED YOUR BRAINS AND WATCH THEM GROW

The research by Carol Dweck and her colleagues and its implications for education and parenting has been published as a book, *Mindset: The New Psychology of Success*.¹⁸ It details how children can be taught to “feed their own brains” through understanding that their intelligence can be grown and how this mindset improves their academic performance. I asked Dweck about her recommendations of what teachers and parents can do. In an e-mail interview in February 2007, she recommended the following strategies:

- Teach students to think of their brain as a muscle that strengthens with use, and have them visualize the brain forming new connections every time they learn.
- When teaching study skills, convey to students that using these methods will help their brains learn better.
- Discourage use of labels (*smart*, *dumb*, and so on) that convey intelligence as a fixed entity.
- Praise students’ effort, strategies, and progress, not their intelligence. Praising intelligence leads to students to fear challenges and makes them feel stupid and discouraged when they have difficulty.
- Give students challenging work. Teach them that challenging activities are fun and that mistakes help them learn.

I asked Dweck to comment on implications for educational policies that would support this kind of teaching.

Teachers themselves should be seen as capable of growth and development, and policymakers should support teachers’ efforts to grow. Teachers should also receive within-school mentoring in areas in which they are weak. The idea should be that all teachers have strengths and weaknesses, but that all can develop their skills in weaker areas. Teachers should also be rewarded for motivating love of learning and improvement in low-achievement students, not simply playing to children who are already high achievers.

Teachers whose students improved most in our workshops were those who devoted extra time to students who asked for help. Teachers need the time and leeway to devote this kind of attention to their students. Finally, this kind of teaching is about learning. American curricula often try to jam too many different topics into each year. For example, American high schools try to teach fifty to sixty science topics per year, as opposed to nine in Japanese schools. To show students how to learn and how to appreciate the growth in their understanding, we need more depth in what we teach them.

I asked her to comment on the role of technology in helping children express their intelligences.

Because our workshop was so successful, we obtained funding to develop a computer-based version called Brainology.¹⁹ It consists of six modules teaching study skills and teaching about the brain. In the module on the brain, students visit a brain lab and do virtual experiments. For example, they could see how the brain formed new connections as it learned. They see online interviews with other students their age, keep an online journal, advise animated student characters how to study, and take mastery tests on the material at the end of each module.

We pilot tested this program in twenty New York City schools with considerable success. Virtually every student reported that they changed their mental model of learning and were doing new things to make their brains learn better, learn more, and make new connections.

Dweck's research mirrors Edutopia's core concepts such as project-based learning, teacher development, and technology integration. The teacher behaviors Dweck recommends are frequently seen and described in our articles and videos, depicting teachers setting high expectations



for all students, with resulting strong achievement for students of all backgrounds. For example, in *Learning by Design*, our documentary on the Build SF Institute, teachers and architects are seen pushing San Francisco high school students to improve their building designs and devote greater effort and persistence.²⁰

Edutopia's coverage of teacher development also emphasizes policies that provide more time for teacher collaboration and focus on student work, as well as more support for teacher mentoring. Edutopia's column, "Ask Ellen," written by Ellen Moir, executive director of the New Teacher Center in Santa Cruz, California, highlights these practices and policies.²¹ Dweck's Brainology software illustrates a key benefit of technology in helping students visualize relationships and connect with other learners.

A NATIONAL CAMPAIGN TO TEACH BASKETBALL FROM TEXTBOOKS

If the United States has not yet earned the title of "Education Nation," it definitely qualifies as a sports-obsessed nation. The World Series, the Super Bowl, and the NBA finals all occupy a large portion of our nation's mindshare for months. Add in collegiate and high school sports, and you've got game, big time, on the brains of Americans. If we could get half as exercised about scholastics as sports, our schools would rapidly improve.

Until that happens, let's consider the lessons of sports for learning. While we may not be very smart about what real learning is, we're quite bright when it comes to sports.

Let's take the example of what we know about the teaching and learning of basketball and apply those lessons to schools. The shortcomings of what textbooks can teach and what "authentic learning" really is would quickly become apparent. I learned this analogy many years ago from an eminent science educator, Dr. Roger Nichols, who served as director of the Boston Museum of Science in the 1980s. Dr. Nichols felt so strongly about reaching children early with the excitement of science



that he gave up his faculty position at Harvard Medical School to lead the Museum of Science during the last chapter of his career.

As a young assistant professor of education at Harvard, I took my graduate students to visit the Museum of Science and meet with Dr. Nichols. In discussing the need for hands-on science learning, Nichols asked us to imagine parents at the dinner table asking their young son or daughter that perennial question, “What did you learn in school today?” The child shrugs, as they often do, and says, “We learned to play basketball.” The parents then ask, “How did you do that?” The child answers, “Well, we sat in the gym and the teacher passed out these books and we turned to chapter one, about passing the basketball. We learned there are three types of passes—the bounce pass, the chest pass, and the one-handed pass.”

“Okay,” parents would say, wanting to know more, “what happened next?” The child continues, “We read the next chapter about dribbling. And another chapter on shooting. We learned there’s the set shot, the bank shot, and the jump shot.” After a few minutes of this recitation, most parents, growing increasingly exasperated, would challenge: “But did the teacher ever give you a basketball and take you on the court to play?” “No,” the child sighs. “We just read the book until the bell rang.”

Nichols said that parents in America would never stand for this, for sports to be taught to their children solely through memorizing terms and reading about what athletes do. Sports require performance, watching others perform, and observing oneself performing. Sports coaches and athletes routinely make use of videotape analysis of games to improve performance. Yet millions of parents settle for science, mathematics, history, and other subjects taught through rote memorization of definitions from textbooks, while their children never get a chance to actively perform real science or history.

Powerful science and mathematics education moves students out of the classroom and into collecting data in fields and streams, at traffic intersections, and in their larger communities. Following the teachings of John Dewey, students could begin by seeking answers to the obvious questions they encounter every day in their own lives, such as, “Where



does the water in your house come from? Where does it go to? And how can you measure its quality?” The learning of history should immerse students in original documents, photographs, and music, as the Library of Congress’s American Memory collections do so well.²²

So, I humbly propose a new national campaign to teach basketball with textbooks. If the ensuing parental marches on school board meetings, mass expressions of outrage, and enraged school board debates lead to energetic discussions about active hands-on, minds-on learning in academic subjects, this short-lived campaign will have been very worthwhile. It will have made us smarter about what authentic learning is all about and moved us closer to creating the kind of curriculum an Education Nation needs.

In the next chapter, I discuss how the smarter thinking and ideas from this chapter are being translated into better approaches to curriculum and assessment—the Curriculum Edge.

