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## Conventional Schools and Their Contexts

I used to consider myself an education expert. I had, after all, spent years in school as a student. What more is needed? My former expert-self carried certain assumptions, perhaps ones you share. Schoolchildren master fundamentals as they progress through proven curriculum. Test scores and grades tell us how much they are learning. A school's average test scores measure its quality. Children need to perform to rigorous academic standards, since life prospects hinge on a college degree. The more elite the college, the better the life. All this seemed evident.

The very first school I visited on this trip was quite conventional—not surprising since most U.S. schools are. Like all schools, it straddles two contexts—its nineteenth-century education model and its twenty-first-century dynamic world. One pulls it back in time, the other pulls it forward. In U.S. education today, the past is winning this tug-of-war. This school happens to be a high-performing suburban public high school. It could just as easily be a charter or private school. For reasons that will become clear, I'm giving it a fictitious name—Eisenhower High.

This school excels on every conventional metric. In the eyes of many, including my former expert-self, this school is the gold standard for American education.



**Any Affluent Suburb, USA**—As you approach Eisenhower High, you immediately recognize it as a high school—a sprawling two-story red-brick building surrounded by parking lots and expansive athletic facilities. A main entrance marked by flagpoles. An entry foyer lined with glass cabinets for sports trophies. Locker-filled corridors that oscillate between forty-five minutes of eerie quiet and three minutes of bedlam.

Comprehensive suburban schools like Eisenhower educate about half of America's 16 million high school students. Another 4.5 million go to urban high schools, many labeled "dropout factories." Some 3.5 million attend rural schools. A half million go to private high schools, mostly religious; a comparable amount go to charter high schools. A few hundred thousand homeschool. At least another million would be categorized as dropouts, although the number's elusive since many disappear from the system after middle school.

Eisenhower's students work hard, posting test scores consistently at the top of their state. Class sizes are reasonable, and teachers are articulate and knowledgeable. The principal is committed to the school's success. Eisenhower offers two dozen Advanced Placement (AP) courses, along with myriad after-school programs. All Eisenhower students graduate on time and go on to college, many to the Ivy League. Sports teams are a source of school pride, and athletic facilities are enviable. No metal detectors as you enter. By all traditional measures, this is a high-performing school.

When observing classes, I saw teachers imparting their domain expertise as they cover material. Students diligently take notes. Every so often, teachers pose questions to students, who raise their hands with answers retrieved from handouts or texts. Class participation affects their grade, so students are on their toes. Occasionally, a student asks a question of their teacher—invariably something like, "Will this be on the test?"

Administrators here wanted me to see their innovative practices. I visited two classrooms with students sitting in small groups

instead of in rows of desks, although class discussion was controlled by the teacher. In a chemistry class, students were memorizing the periodic table with a “cool” iPad app. Their new community service program requires students to log twenty hours each year, choosing from three faculty-defined options. Student infractions are punished by adding more hours of required service.

I was able to meet informally with a group of seniors, all quite busy with classes, extracurriculars, and college applications. I asked why they come to school—“We have to,” “To get into a good college,” “To play on the football team,” “To hang with my friends.” Daily schedules were traditional—two were taking the exact classes I took my senior year forty-seven years ago. Regarding their studies, I asked which topics they found exciting. Blank stares, as though I was speaking a foreign language. Speaking of which, a few were taking Spanish IV but were at a loss when asked, “¿Por qué es importante estudiar una lengua extranjera?” When I inquired about interests pursued in their free time, silence punctuated by a few nervous giggles. No signs of absorbing hobbies, internships, projects, or jobs.

At the end of the session, one student lingered. He explained that Eisenhower’s students feel pressure to get into the “right college.” He described Adderall-assisted all-nighters cramming for tests. Many have SAT or ACT tutors, and feel stressed about their scores. He likened school to “being one of those hamsters on a wheel. We keep running faster and faster, but it doesn’t feel like we’re getting anywhere.” As he was leaving, he remarked, “We know school is just the game we have to play. But, hey, we don’t make up the rules. You do.”

He’s right. So what are these rules, and where do they come from?



To understand what rules the day at Eisenhower, or any standard school, we need to go back in time. Way back. To 1893, when education leaders anticipated that the U.S. economy would shift from

agrarian to industrial. Farsightedly, they formed a Committee of Ten and proceeded to transform education from one-room schoolhouses to a standardized factory model. Teach students the same subjects, in the same way. Train them to perform routine tasks time-efficiently, without error or creative deviation. Produce a uniform workforce ready for lifetimes on the assembly line. The model worked, spectacularly. Over the course of the twentieth century, real U.S. per capita GDP soared from \$3,500 to \$23,000. A robust middle class emerged. Our nation rose to the top of every international measure of power.

This 1893 factory model was so successful that it remains with us to this day. Over the decades, an education infrastructure has grown up around it. This system, with its myriad interlocking parts, provides context to schools across America. If you aspire to being an informed citizen, you need to understand this context, dry as it might be.



**All Over, USA**—Eisenhower operates in the context of governmental rules and regulations, governance bodies, financial constraints, and community expectations. And it sits amid a complicated web of other schools—the ones that feed it, the ones it competes with, and the colleges its seniors apply to. This context drives Eisenhower’s daily regimen.

These graduating seniors have taken more standardized tests than any other students in their state’s history. Annual state-mandated testing began in kindergarten. They’ve taken the PSAT, the SAT, and ACT (often multiple times), AP and SAT subject tests. Recently the PARCC assessment was added. Pick a few letters at random, and they probably took that test. Over their K–12 years, each student has taken more than one hundred standardized tests. The No Child Left Behind generation.

This school's community takes test scores seriously. They have no choice. The United States is a competitive society with a short attention span. Scores provide an efficient way to measure a person's aptitude, and a school's quality. So Eisenhower and its K–8 feeder schools train students to rip through questions like:

*Math: Which of the following expressions is equivalent to  $3x^2 + 6x - 24$*

- a.  $3(x + 2)(x - 4)$
- b.  $3(x - 2)(x + 4)$
- c.  $(3x + 6)(x - 12)$
- d.  $(x - 6)(x + 12)$

*Verbal:*

POEM

Some random poem  
About schedules and trains

The kind of poem  
That dulls kids' brains

*Dividing the poem into two stanzas allows the poet to:*

- a. compare the speaker's schedule with the train's schedule
- b. ask questions to keep the reader guessing about what will happen
- c. contrast the speaker's feeling about weekends and Mondays
- d. incorporate reminders for the reader about where the action takes place

There's a recipe for excelling on these tests. Practice, practice, practice so you answer questions quickly, without thinking. Skip anything unfamiliar, rather than waste time trying to figure it out. Don't think creatively, since that costs time and points. Perform like a machine.

While there's no evidence that these tests have consequential predictive value or equip students with useful skills, they are widely accepted as the measure of learning, intelligence, and worth. Not exactly uplifting, but the stuff of these tests has become the stuff of our schools.

Eisenhower prides itself on producing "college-ready" graduates. Students, teachers, local businesses, and especially parents care about college. Every student goes on to a four-year college, with counselors and consultants guiding the way. Parents fight fiercely to give their child every college advantage. They see it as the key to their child's future and the defining marker of their parenting success.

The school's principal reports to a district superintendent, who in turn reports to the local school board. Superintendents have clout. Some encourage their schools to innovate; others push for better numbers (e.g., test scores, graduation rates, attendance). School boards hire, oversee, and at times fire their superintendent. Boards manage facilities, negotiate with subchapters of the state teachers' union, oversee budgets, and adopt policies and curriculum. Serving on a school board can require five to fifteen hours *each week*, making it hard to attract qualified members. Boards can make or break the success of a district and its children. Pay attention. During my trip, I asked top superintendents about the key to turning around a broken district. To a person they said, "The right school board."

Schools and districts interact with their state's Department of Education and its commissioner. Commissioners set goals and strategy, monitor progress, ensure governance, and advocate to the legislature for resources. During this travel year, I met with twenty-three commissioners—evenly divided between those more focused on policing schools and those prioritizing supporting schools.

Governors influence schools in their state. The dozen I met care particularly about workforce development. State legislatures specify standard-of-learning testing policies, curriculum, and the courses needed to graduate (typically algebra, history, and a science class).



State legislators generally aren't paid well (typically \$35,000/year or less) and are required to be in the state capital during session (often several months a year), an enormous burden for those whose families and jobs are afar. I met some sixty of these legislators this year. They recognize that our education model isn't working, and some have supported legislation that encourages innovation. Few, though, have the time, staff, or passion to lead any charge.

Like all public schools in America, Eisenhower is funded by taxpayer dollars from federal, state, and local sources. Most federal dollars come from the U.S. Department of Education Title I program and the U.S. Department of Agriculture's "free and reduced lunch" program. While federal funds cover just 10% of national K–12 public school expenditures, they're deployed in ways to ensure compliance with federal regulations. A heavy stick.

The average school district in America gets 50% of its funds from its state, an amount trending down as budgets tighten. On average, 40% of funds come from local property taxes, with *enormous* variation. In most states, affluent districts have ample budgets (\$20,000/student-year or more), while poor districts struggle (\$10,000/student-year or less). Those who need the least get the most, and those who need the most get the least. Why? In the landmark 1953 *Brown v. Board of Education* Supreme Court decision, Chief Justice Earl Warren ruled that education "is a right which must be made available to all on equal terms." But a less-heralded 1973 Supreme Court decision, *San Antonio Independent School District v. Rodriguez*, drives inequity. Demetrio Rodriguez's children attended a poor school in San Antonio, while rich kids in adjacent neighborhoods were getting a better deal. He brought suit, but the U.S. Supreme Court ruled in a 5–4 decision that states aren't obligated to provide equal funding to schools. While *Brown v. Board of Education* promised America's children an education on "equal terms," *Rodriguez* makes clear that America is fine with vast disparities in *rich v. poor*. This matters.

The federal government played no role in education until 1965, when President Lyndon Johnson's War on Poverty included the Elementary and Secondary Education Act to fund programs for low-income and disabled children, bilingual education, and libraries and curriculum. In 1979, President Jimmy Carter created the U.S. Department of Education, which has grown to 4,400 employees administering a \$68 billion annual budget. The 1984 Vocational and Technical Education Act provides modest funding of about \$25 per student annually for career and technical education (CTE) programs.

In 2002 with bipartisan support, President George W. Bush signed into law the No Child Left Behind (NCLB) Act. It proclaimed that all U.S. children would be proficient by 2014, a patently ludicrous objective. Further, the act uses test scores as the sole measure of school "success." A school is a failure if even one child is left behind or if its students fail to post Adequate Yearly Progress on tests. Data hawks loved NCLB because it put testing at the center of education. Civil rights leaders loved it, believing that test scores would show that poor kids are getting shortchanged. Organizations selling tests, texts, curriculum, and test-prep materials salivated over prospects for more revenue—and unleashed their lobbyists to get this bill passed. The average citizen went along; who wants to leave a child behind? In 2009, the Obama administration doubled down on NCLB, offering waivers to states with subpar NCLB performance if they complied with Race to the Top (RTTT) accountability measures. Together, Bush and Obama made U.S. education the global leader in standardized testing.

In 2015, President Obama signed into law the Every Student Succeeds Act (ESSA), shifting some education control back to the states. Annual testing for grades 3–8 is still mandated, but states have more responsibility for test design and accountability. Under ESSA, states can obtain waivers allowing local performance- and competency-based standards. Obama commented, "One thing I

never want to see happen is schools that are just teaching the test because then you're not learning about the world. . . . All you're learning about is how to fill out a little bubble on an exam and little tricks that you need to do in order to take a test and that's not going to make education interesting. . . . And young people do well in stuff that they're interested in. They're not going to do as well if it's boring." Truer words were never spoken, but they came late in his presidency.

Eisenhower High doesn't operate in a vacuum. No school does. It sits in a maze of local, state, and federal control, managed by officials often lacking classroom experience. Eisenhower is constantly compared to other schools on the basis of test scores, graduation rates, and college placements. A nearby expensive private school feeds its graduates into elite universities, pressuring Eisenhower. This state, like forty-two others, allows for charter schools. Here, charter schools focus on producing superior test scores, pushing Eisenhower to keep pace. It's generally agreed that this test-score competition is healthy. Schools in an adjacent low-income district emulate Eisenhower and its successful peers. As stakes rise for high schools, the community's K–8 schools are pressed to raise their game.

Eisenhower High reflects the reality and the aspirations of most of America's 130,000 schools—private, public, and charter. As Eisenhower High goes, so goes the nation.



A decade ago, I would have admired Eisenhower High. Their students excel on what our education system demands: committing content to short-term memory, sprinting from hoop to hoop, playing the game of school. We shouldn't criticize Eisenhower High's educators. They're conforming to the context imposed on them by an archaic system. This type of school made sense in the era of Dwight D. Eisenhower. Prepare young adults for an economy

dominated by large, hierarchical organizations with employees performing to job descriptions. Equip students with citizenship skills suited to a democracy with trusted news sources informing us about civic-minded leaders. But Dwight D. Eisenhower died in 1969, taking a simpler era with him to his grave.

The students at Eisenhower High look good on paper. But their skill sets are useless in the innovation era, and they will be limited by their mind-sets. As toddlers, they brimmed with creativity, curiosity, and audacity. But these traits are gone, sacrificed in the crusade to produce transcripts that glimmer. These schools, these students, are the fool's gold of America's education system. They're museum artifacts in the innovation era, the context that will define the adult lives of these children. We need to understand it.



**Vancouver, British Columbia**—During my trip, I ventured briefly out of the United States to attend the annual TED Conference—the event where those famous TED talks come from. While there, I met with leading technologists to discuss the impact of machine intelligence on the future of our society. These people are the real deal—including chief technology officers of companies with global reach. They've spent decades helping create the digital economy through advances in machine intelligence—computer hardware, software, artificial intelligence, and robotics.

Before our meeting, a few of us chatted about the history of innovation and technology. While innovation is as old as civilization, its potential to transform society shifted dramatically in 1947 with the invention of the semiconductor transistor. This technology enables logic to be fabricated on dirt-cheap silicon and scale almost without limits. Gordon Moore, founder of Intel, predicted audaciously in 1965 that the raw compute power of silicon would increase exponentially for the foreseeable future. Six decades later,

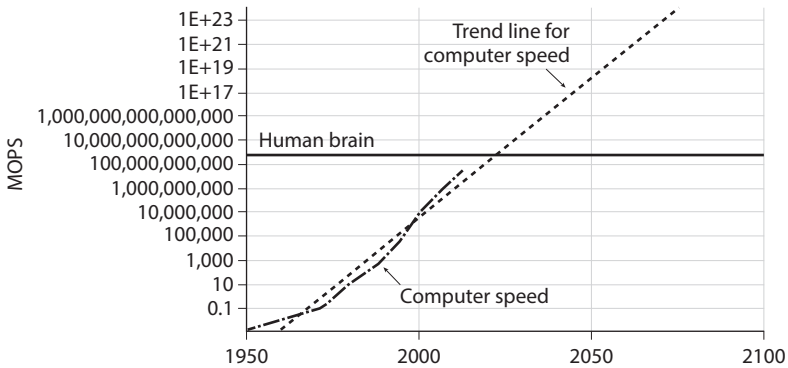


FIGURE 1.1. Race against the Machine. *Source:* Data from Mathspace.

his prediction still holds. Exponential growth is one of those high school math topics everyone studies but few ever use. In the context of innovation, it means that advances in the coming decade will be an order of magnitude more disruptive than since 2007, the year the smartphone's debut began reshaping society. Today's children will be adults in a world where the price-performance of machine intelligence is one hundred times as powerful as today. At least.

During our meeting, I asked the group if my message about innovation's accelerating impact is too alarmist. One pointed to our breakfast, predicting that within a decade most food we eat won't touch human hands in going from genesis to our tummies. Another observed, "Within twenty years, buildings the size of this sixty-story Fairmont luxury hotel will be 3D printed." Someone talked about a friend battling a rare and aggressive form of cancer; whose team of world-class oncologists referred his case to Watson, IBM's artificial intelligence software. A fourth shared a story about the founding team members at Google who bet their careers on being able to build the driverless car. When they started, the most optimistic

believed it would take *at least twenty years* before autonomous vehicles would be road worthy. It happened in five years.

As the meeting wrapped, a few of us chatted about the future. Will technology's productivity turn society into utopia or dystopia? Hard to say without understanding a country's tax and education policies. What's crystal clear is that machine intelligence profoundly changes how, or even whether, an adult can contribute meaningfully to an employer or community. If nothing else, it's screaming, "Children need to learn to leverage machine intelligence, not replicate its capacity to perform low-level tasks!"



To bring this to life, let's speculate on what our typical day might look like down the road.

#### WHAT THE FUTURE COULD BE



You're connected 24/7 to vast resources through tiny devices on your watch, clothes, glasses, and body implants. No need to carry around a clunky smartphone. Your day starts with a made-to-order breakfast, compliments of your personal kitchen robot. Your virtual assistant briefs you as you eat. With a quick voice command, you summon a driverless car to take you to a meeting.

On your drive, you pass teams of agile robots maintaining your neighborhood—collecting trash, repairing buildings, tidying yards, policing for safety. A swarm of drones passes overhead to address an emergency. A corner lot, vacant just a week ago, now has a beautiful home manufactured by 3D printers, listed by an online real-estate site, and sold with the help of a virtual lawyer.

Your meeting includes a few people in person; most attend via lifelike holographic replicas. Each participant's virtual assistant tracks the conversation and provides relevant, curated observations in real time. Leveraging online resources, your group designs a complex initiative and implements it in a matter of days, for a few thousand dollars, and then continuously improves it with the help of big data.

Robots perform your errands. Your purchases are either 3D printed in your home or delivered in minutes by drones. To diagnose health challenges, you turn to artificial intelligence. An aging relative receives 24/7 care from an automated attendant. In your leisure time, virtual reality takes you to museums, cities, parks, or performances around the globe. The boundary between real and virtual life has blurred in ways that are uplifting, and disturbing.

This isn't science fiction. These advances are underway. We're heading into a world where machine intelligence excels in manual and cognitive tasks: a world stripped of the routine white- and blue-collar jobs that are the backbone of today's society. This is happening faster than we think, as automated solutions are already squeezing millions. Consider the Federal Reserve Board's data that 47% of adults in the United States can't pay an unanticipated bill of \$400 unless they sell off personal possessions or beg money from friends or family.<sup>1</sup> Given the cost of a basic funeral, half of U.S. adults today are too broke to die. It stands to get worse. For these folks, the American Dream has turned into a waking nightmare.

If adults are competing with smart machines for jobs, they need distinctive and creative competencies—their own special something. But think about those students at Eisenhower High. They're

memorizing bucketsful of definitions, formulas, and low-level procedures. They're becoming proficient at low-level tasks handled flawlessly by today's basic smartphone. They're being trained to follow the rules. These kids are sitting ducks in the innovation era.

That our education system is failing is hardly late-breaking news. Over three decades ago, the seminal *A Nation at Risk* report asserted,

If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war.<sup>2</sup>

You might think that words like “act of war” would spur us to think big, maybe form a bold modern-day Committee of Ten. Nope. We thought small. Wring incremental gains from an archaic model through standardized curriculum and testing. Raise the testing ante with No Child Left Behind. Double down on accountability with Race to the Top. The result? Flat scores. No change in the achievement gap. Bored, ill-prepared students. De-

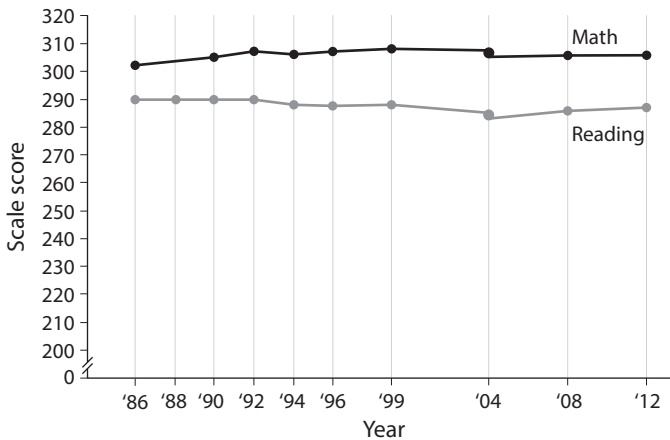


FIGURE 1.2. Three Decades of Flat Test Scores. *Source:* Data from National Center for Education Statistics.



moralized teachers. Focus on doing obsolete things better, not doing better things.

We're about to leave the land of conventional factory schools. But first, there's someone you need to meet. His story, his arc, speak volumes about education in America. Hear him out.



**Stonington, Connecticut**—He came up and said one short phrase: “February 6, 1992.” I’m sure I looked puzzled as hell. After a pause, he repeated, “February 6, 1992.” With most people, I would have promptly excused myself. But he didn’t look like an oddball. Tall, prematurely gray, and patrician, he could be a governor or an ambassador. So I took the bait: “And . . . ?”

Doug Lyons explained that February 6, 1992, is the date when the *New York Times* first published international test-score rankings.<sup>3</sup> In a study designed by the Educational Testing Service, nine- and thirteen-year-olds in different countries were tested in math and science. South Korea and Taiwan dominated. American nine-year-olds were a respectable third out of ten countries in science but ninth in math. Our thirteen-year-olds ranked a dismal thirteenth out of fifteen in science and fourteenth in math. To rub salt in the wound, South Korea creamed us while spending far less per student.

The study explained that the rankings were suspect, largely due to differences in the student populations tested. But qualifying comments longer than *War and Peace* wouldn’t matter. We’re America, and our kids aren’t at the bottom of anything. This was education’s Sputnik moment. Given our hypercompetitive nature, we jumped into a standardized test race with both feet. February 6, 1992, marked the start of our educational *Groundhog Day*, repeating the cycle of mediocre test scores, collective angst over Asia’s superior education system, fears of becoming a second-class

nation, and doubling down on test preparation to close the gap. Nothing less than America's hegemony is at stake.

With a doctorate in education from Penn, Lyons has spent four decades in education. His first twenty years were in New Jersey's public school system as a teacher, coach, principal, and district superintendent. This "civil rights-era kid" was committed to public education, but plans changed. His district performed well on state-mandated tests—those tests whose scores get published in local newspapers. When an abutting district began closing the gap, "that made everyone nervous—parents and especially realtors—since part of what drives real-estate sales is the quality of the school system." The competing district, it turned out, was redirecting student time away from reading books. Instead, students were required to read hundreds of short passages and drill on the multiple-choice questions that populate our standardized tests—the passage's main idea, cause-and-effect relationships, signs of author bias, inferences, etc. Pressured to copy this program, Lyons quit. Even though this happened two decades ago, his sadness remains evident. "You know, my goal has always been to create lifelong readers—kids who love books, who feel a sense of loss when they've reached the end, who are moved, who cry."

Lyons moved to Connecticut to head a private school; in 2004, he became CEO of the Connecticut Association of Independent Schools. When it comes to school, he's seen it all. His side passion is the use of data in education. He cites Einstein: "Not everything that counts can be counted, and not everything that can be counted counts." But hard numbers inevitably crowd out qualitative nuance; people crave objective measures that facilitate comparison. Of many botched uses of data, correlations top the list, and Lyons challenges people to think through graphs like Figure 1.3. Thankfully, our country hasn't launched a massive mozzarella-eating campaign to produce more engineers. Yet we don't hesitate to push children to produce higher standardized test scores,

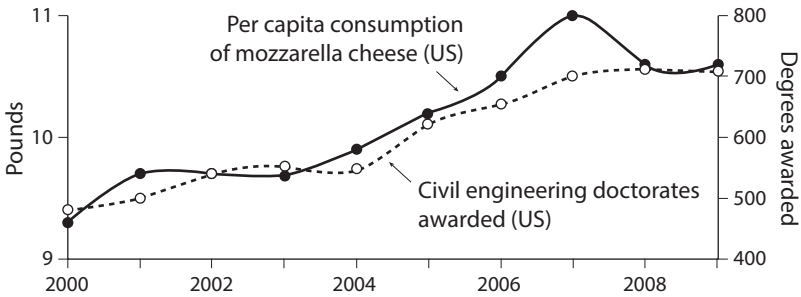


FIGURE 1.3. Spurious Correlations. *Source:* Data from National Center for Education Statistics.

despite no evidence that they're correlated to, let alone cause, anything consequential.

Lyons calls college admissions the “elephant in the room” that blocks high school innovation. “We know that the best education experiences are collaborative and social, where students are engaged and retain what they learn. But that is hard for a college to assess. They need us to rank-order kids.” An Ivy League admissions director addressed his association, claiming they look for kids with diverse backgrounds, with real-world experience, with mundane summer jobs requiring hard work. Lyons pushed back, “We love everything you just said, but we know who you accept. You don't accept the kids you just described. You take the kids who go to SAT test-prep summer camps.” Lyons is passionate about the need to “ratchet down the absurd expectations we have for young kids and eliminate family anxiety, even shame, over college acceptances.” He notes that one-third of our kids in elite colleges are on antidepressants. “That's a disgrace. It becomes a forever thing.” For our kids, “every achievement is a temporary high, which has to be followed by another achievement.”

Lyons describes AP courses as “mountains of content minutiae— a Manhattan phonebook of trivia.” He runs across many kids who work hard in AP, get a 4 or 5, and “never want to take another course

in this subject again.” He admires courageous schools willing to drop these standardized courses to challenge their students more authentically. He cites the work of the Independent Curricular Group or the Fieldston School, which replaced AP Biology with an Advanced Topics program where students collaborate via Skype with biologists around the world.

At the end of our conversation, Lyons observed, “We’re in a uniquely exciting time. We understand how to engage kids. We need to give them real-world challenges, have them work with other kids, and provide them with the right kind of adult support. Project-based learning is how people work in the real world. We need to let our kids create portfolios of joy.”

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