

## GUEST ESSAY

# We Are Leaving 'Lost Einsteins' Behind

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Mr. Edsall contributes a weekly column from Washington, D.C., on politics, demographics and inequality.

In the international competition to produce a work force equipped to cope with accelerating rates of technological innovation, the United States is leaving hundreds of thousands of highly capable people by the wayside, perhaps even millions.

“Current talent search procedures focus on the assessment of mathematical and verbal ability,” wrote David Lubinski of Vanderbilt and Harrison J. Kell, a senior researcher at the Educational Testing Service, in “Spatial Ability: A Neglected Talent in Educational and Occupational Settings.” Lubinski and Kell stress the failure of many of such searches to test for the cognitive skill known as spatial ability.

This omission, they continue, leads to

a substantial missed opportunity. Many spatially talented adolescents may never approach their full potential due to a lack of opportunities to develop their skills. A great loss occurs at talent searches that identify intellectually precocious young adolescents.

What is spatial ability?

“Spatial ability, defined by a capacity for mentally generating, rotating, and transforming visual images, is one of the three specific cognitive abilities most important for developing expertise in learning and work settings,” wrote Gregory Park, an independent researcher, Lubinski and Camilla Benbow of Vanderbilt in *Scientific American*.

They go on:

Two of these, quantitative and verbal ability, are quite familiar due to their high visibility in standardized tests like the Scholastic Aptitude Test. A spatial ability assessment may include items involving mentally rotating an abstract image or reasoning about an illustrated mechanical device.

“While those with verbal and quantitative strengths have opportunities to be identified by standardized tests or school performance,” Park, Lubinski and Benbow argue, “someone with particularly strong spatial abilities can go unrecognized through these traditional means.”

In his paper, “Spatial ability and STEM: A sleeping giant for talent identification and development,” Lubinski further explains that the failure to test for spatial ability has left a reservoir of potentially productive workers untapped, people who would not only thrive in the marketplace but who would also make significant contributions to the national economy:

“Spatial ability is a powerful systematic source of individual differences that has been neglected,” according to Lubinski. “It has also been neglected in modeling the development of expertise and creative accomplishments.”

In a separate 2020 paper, “Understanding educational, occupational, and creative outcomes requires assessing intraindividual differences in abilities and interests,” Lubinski writes:

There are several essential occupations that all modern societies require and for which outsourcing is not possible. Master carpenters, electricians, mechanics, and plumbers, among others, are needed to maintain and build complex infrastructures.

Spatial ability testing could, then, prove effective in identifying the “many (people) with talent in spatial/mechanical ability (who) possess ability/interest patterns that are ideally suited to these occupations.”

In “Spatial Ability for STEM Domains,” Jonathan Wai of the University of Arkansas, Lipinski and Benbow make three claims:

First, spatial ability is a salient psychological characteristic among adolescents who subsequently go on to achieve advanced educational and occupational credentials in STEM. Second, spatial ability plays a critical role in structuring educational and occupational outcomes in the general population as well as among intellectually talented individuals. Third, contemporary talent searches miss many intellectually talented students by restricting selection criteria to mathematical and verbal ability measures.

Interestingly, some studies link spatial ability with superior performance in sports. In “Relation between sport and spatial imagery: comparison of three groups of participants,” Sylvie Ozel and Corinne Molinaro, both of the University of Caen, and Jacques Larue of the Université d’Orléans found that when comparing the spatial skills of athletes with those of non-athletes, the athletes “obtained significantly shorter response times than those of the non-athletes. We suggest that the regular practice of spatial activities, such as sports, could be related to the spatial capacities of the participants.”

There are other forces at work in academia and the workplace that result in a failure to recognize talent.

In “Lost Einsteins: How exposure to innovation influences who becomes an inventor,” Alex Bell, Raj Chetty, Xavier Jaravel, Neviana Petkova and John Van Reenen, economists at U.C.L.A., Harvard, the London School of Economics, the U.S. Treasury and M.I.T., argue:

Children at the top of their 3rd grade mathematics class are much more likely to become inventors, but only if they come from high-income families. High-scoring children from low-income or minority families are unlikely to become inventors. Put differently, becoming an inventor relies upon two things in America: excelling in mathematics and science and having a rich family.

Bell and his co-authors graphed patent rates, looking at inventors who were children in families from the top income quintile compared with the rate for those who were children from the bottom four quintiles. Guess who won.

The failure to “harness the underutilized talent” of mathematically inclined children from middle-class and working-class families, the authors argue, results in a substantial loss of innovation and economic growth. In order to remedy the situation, they call for policies providing those with strong math scores with “greater exposure to innovation” through “mentoring programs to internships to interventions through social networks.” Targeting exposure programs “to children from underrepresented groups who excel in mathematics and science at early ages is likely to maximize their impacts.”

Schools serving heavily minority, disproportionately poor urban neighborhoods exhibit a parallel pattern of lost opportunity for the most talented in those student bodies.

David Card and Laura Giuliano, economists at the University of California-Berkeley and U.C.-Santa Cruz, make the case in two 2016 papers — “Can Tracking Raise the Test Scores of High-Ability Minority Students?” and “Universal screening increases the representation of low-income and minority students in gifted education” — that gifted, low-income minority students often go unrecognized in urban school systems that are not equipped to identify talent and may instead be captured by a presumption that all students are low performers.

In one paper, Card and Giuliano examined “the experiences of a large urban school district following the introduction of a universal screening program for second graders.” The result, in the unidentified Florida school district:

Without any changes in the standards for gifted eligibility, the screening program led to large increases in the fractions of economically disadvantaged and minority students placed in gifted programs. Comparisons of the newly identified gifted students with those who would have been placed in the absence of screening show that Blacks and Hispanics, free/reduced price lunch participants, English language learners, and girls were all systematically “under-referred” in the traditional parent/teacher referral system. Our findings suggest that parents and teachers often fail to recognize the potential of poor and minority students and those with limited English proficiency.

Florida law — unchanged by the screening program — “dictates that students must achieve a minimum of 130 points on a standard IQ test to qualify for gifted status. English language learners and free- or reduce- price lunch participants are subject to a lower 116 point threshold, known as ‘Plan B’ eligibility,” Card and Giuliano wrote.

The screening process, which identified through testing all high scorers, substantially changed the demographic profile of the district’s gifted students from the 2004-5 school year to the 2006-7 school year, the authors write: The percentage of non-Hispanic African Americans rose from 12 to 17 percent, of Hispanics from 16 to 27 percent, while the white percentage fell from 61 to 43 percent.

In their paper on tracking, Card and Giuliano attempt to answer the question, “Is the low fraction of high-performing minorities at the end of high school due in part to the failure to identify and adequately serve minority students with high learning ability?” To do this, they studied “the impacts of a tracking program in a large urban school district that establishes separate ‘gifted/high achiever’ classrooms for fourth and fifth graders whenever there is at least one gifted student in a school-wide cohort.”

What did they find?

Participation in a gifted/high-achiever class leads to significant achievement gains for participants who are

concentrated among Black and Hispanic students, who gain 0.5 standard deviation units in fourth grade reading and math scores, with persistent effects to at least sixth grade. Importantly, we find no evidence of spillovers on non-participants.

The Card-Giuliano study is based on an examination of the results of the 2004 adoption in a major school district of a requirement that

schools establish separate classrooms for any fourth or fifth grade gifted students. Crucially, the extra seats in each class were allocated to non-gifted students in the same school who scored highest in statewide achievement tests in the previous year — a group known as high-achievers.

Card and Giuliano reach two main conclusions:

First, we find that placement in a fourth-grade GHA [Gifted/High Achiever] class has significant positive effects on the reading and math scores of high achievers, with the gains concentrated among Black and Hispanic students.

These positive effects “are in the range of 0.5 standard deviation units — comparable to the impacts of ‘best practice’ charter schools.” The effects for white students, in contrast, “are small and insignificant in all our specifications.”

Second, they write:

We find no evidence of either positive or negative spillover effects on other students in the same school/grade cohort, including those who narrowly miss the cutoff for admission to the GHA class.

What factors lie behind the gains for the minority students in the gifted class? The authors

hypothesize that higher-ability minority students face obstacles in the regular classroom environment that cause them to underperform relative to their potential, and that some of these obstacles — including low teacher expectations and negative peer pressure — are reduced or eliminated in a GHA class.

In addition, they point out that

minority students have lower achievement scores than white students with the same cognitive ability, and that placement in a GHA class effectively closes this minority under-achievement gap.

There are very different problems at the college level.

A team of scholars at Drexel University’s Center for Labor Markets and Policy — Paul Harrington, Neeta Fogg and Ishwar Khatiwada — has been analyzing a series of studies of high school and college test results, graduation rates and subsequent employment patterns in cooperation with the Educational Testing Service.

In an email, they describe some of their basic findings:

About two thirds of graduating high school seniors enroll in college right after graduation and 8 years later nearly 9 in 10 high school graduates will have enrolled in an institution of higher learning. Given the National Assessment of Educational Progress scores this implies that a considerable share of students are admitted into college with low reading, writing and math skills. But a large share of these students will not graduate.

Harrington, Fogg and Khatiwada “estimate that there are about 31 million adults in the U.S. who left college with no award.”

Not only that, but a substantial portion of those who do graduate do not have the basic skills for a job with college-level requirements: “more than one in five adults with a bachelor’s degree have literacy skills below level 3 (basic) and one in three have low numeracy scores.”

Why has this happened?

Many colleges and universities expanded their enrollment capacity to accommodate this near universal demand. This accommodation included admission of a substantial share of students with weaker literacy and numeracy skills.

Admissions requirements were liberalized, Harrington and colleagues write, despite the fact that

most colleges are not organized to bolster those skills. Substantial shares of matriculating students with lower literacy and numeracy skills raise the risk of both quitting school before graduation and of mal-employment after the degree award.

Who are the mal-employed?

Employed persons with a bachelor’s degree or higher who are employed in an occupation that does not typically require the knowledge skills and abilities of a college graduate. The college labor market is largely composed of professional, technical, managerial and high-level sales occupations. The incidence of mal-employment is highest among recent college graduates who frequently struggle to find their place in the labor market.

Harrington and his colleagues estimate that

about one in four prime age workers are mal-employed. The likelihood of mal-employment varies considerably by major field of study. About one in three humanities/liberal arts/social sciences majors are mal-employed, about one in six engineering, math and computer science majors as well as majors in health specialties are mal-employed.

I asked John Van Reenen, the M.I.T. economist who co-authored the “Lost Einsteins” paper, about these trends and he replied by email that these developments are

particularly a problem for disadvantaged groups — kids from low-income families and minorities. The U.S. has stunningly high levels of inequality and this means many talented kids are not getting the opportunities they should have. This is bad on grounds of equity and growth.

There are many kids from disadvantaged backgrounds, he continued, “who could benefit but do not get the opportunity because of the quality of K-12, the neighborhoods they grow up in, their lack of access to mentors and networks, bad information, etc.,” citing the work of Card-Giuliano and others.

David Deming, a professor of education and economics at Harvard, dissented from those faulting the quality of public schooling.

“There is a narrative out there that our K-12 schools are failing, and I think it’s wrong,” Deming wrote by email.

NAEP scores in grade 12 have been flat for 20 years, but we are educating more low-income and immigrant students in grade 12 than ever before, which makes me think that flat overall scores are understating our progress due to composition effects. The high school graduation rate over this period rose by 7 percentage points, from 84 percent in 2000 to 91 percent today. So there are many more young people staying in school long enough to be tested.

Deming argues that the focus of public concern should be on inequities in postsecondary education:

Most importantly, resource inequality is an order of magnitude larger in higher education compared to K-12. Rich school districts spend maybe 20 percent more than poor school districts. Elite private colleges are spending upwards of \$100k per student per year, compared to about \$10k in community colleges. In higher education, we devote the most resources to the students who need the least help.

At the same time, Deming acknowledges the relentless escalation in the demand for skills of all kinds:

Work is becoming more knowledge-intensive, and more and more jobs require BOTH a strong foundation of numeracy and literacy AND “higher-order” skills like problem-solving, teamwork, critical thinking etc. Many of these jobs also require digital fluency and more advanced technical skills. Overall, the baseline skill set required for most middle or high-paying jobs is increasing, and will continue to do so.

Deming suggested that responsibility for many of the problems in education today could be laid at the feet of the for-profit college industry:

If you could measure skills by college type, I suspect you’d find that the college grads with low skills in non-college jobs are mostly graduating from for-profit schools and less-selective open access nonprofits and publics. I also suspect that the “mal-employed” college grads are mostly from this group.

Furthermore, he continued,

almost all of the expansion in college degrees over the last 20 years has happened in for-profit and less-selective schools. So I think it is all part of the same problem. There are lots of colleges out there, but the best ones are not expanding. In fact, they are getting harder to access. Just look at any data on median GPA and SAT/ACT scores among entering classes at flagship universities. They have all become way more selective. There are more and more talented young people out there, but only so many slots at selective schools.

The fact is that the whole topic of standardized testing has become extraordinarily controversial.

In October 2020, Ibram X. Kendi, founder and director of Boston University’s Center for Anti-Racist Research and author of “How to Be an Antiracist,” told the Boston School Committee:

Standardized tests have become the most effective racist weapon ever devised to objectively degrade Black and Brown minds and legally exclude their bodies from prestigious schools.

But what if, as Lubinski says, there is a “sleeping giant of talent” out there? How do we find him? How do we awaken her? How do we reach out to make a better world?

Testing has become a flashpoint in the larger debate over policies based on merit: Do they prevent discrimination or are they barriers to admission and advancement? One of the original purposes of testing was to identify those who were illegitimately pushed to the side. Whatever their overall impact, these tests can and do often serve as a gateway rather than a barrier to admission — that was part of what they were intended to do in the first place.

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