International Test Score Comparisons: What's Wrong with the American Public Education System?

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ABSTRACT

US students' international test scores are panned by politicians and the media. It is often said that America spends more on education than any other country yet compares poorly on international tests (CBS News, 2013). Both statements are untrue (Owings & Kaplan, 2020). A closer look at how education functions in the United States as compared to OECD countries reveals a complex picture. The 10th Amendment to the US Constitution makes US education a federal interest and a state responsibility, carried out locally. The wide variance in state requirements for (a) preschool access, (b) compulsory attendance, (c) required lengths of the school day and year, (d) courses and credits required for high school graduation, (e) education funding, and (f) and child poverty rates help explain American students' outcomes on international tests.

Key Words International test scores, TIMSS, PISA, NAEP, student achievement, state education requirements, child poverty, equity

INTRODUCTION

Most older folks remember the "Miracle on Ice" – the 1980 Winter Olympics when the US hockey team defeated the Soviet Union (now Russia) 4 to 3 and went on to win the gold medal. American pride in their team's world-class achievement was evident across the country. In a similar way, US education has become an international sport as world-wide test scores reflect our relative standing transnationally. Sadly, American pride runs short for public schools when comparing students' mediocre academic performance with peers from other countries participating with the Organisation for Economic Cooperation and Development OECD) assessments.

U.S. Standing on International Student Assessments

OECD is an international organization with the goal of shaping policies that foster prosperity, equality, and opportunity well-being for all. Its Program for International Student Assessment (PISA) tests 15-year-old students' reading, mathematics, and science literacy every three years. On the 2017 reading assessment, US 15-year-old students scored 497, slightly above the OECD average of 493 (Snyder, de Brey, C., & Dillow, 2019). However, the US score was lower than the average score of 11 other countries, higher than the average score of 10, and not measurably different from 12 countries. On the PISA math test for 15-year-olds, US average student score was 470, below the OECD average of 490. On this measure, the US math scores were lower than the

* Newport News Public Schools (Retired)

average score in 12 countries, higher than 10, and not measurably different than 12 other countries. On the PISA science test for 15-year- olds, US scores were 496, slightly above the OECD average of 493, but lower than the scores in 12 countries and higher than the scores in 10 countries, as indicated in Table 1.

Table 1 Comparison of US PISA 15-year olds test results with other countries

	Reading Score	Math Scores	Science Scores
OECD Average	493	490	493
US Average	497	470	496
Notes	US scores were lower than 11 countries, higher than 12, and not measurably different than 10.	US scores were lower than 27 countries, higher than 4, and not measurably different than 3.	US scores were lower than 12 countries, higher than 10, and not measurably different than 12.

Source: Digest of Education Statistics, 2017, Table 602.70, p. 739.

The PISA results show the US did not rank not in the "Top 10" among of the countries while two of the three tests (reading and science) showed the US marginally above the OECD average.

Another international test, Trends in International Mathematics and Science Study (TIMSS), assesses students in grades 4 and 8 in mathematics and science every 4 years. On the 2015 fourth grade math assessment, US average score was 539, above the OECD average of 500. But US students scored lower than peers in 10 countries and higher than peers in 34 other nations. The eighth grade US average math score was 518, slightly above the OECD average of 500. US scores were lower than 8 other systems and higher than 24 other nations.

As Table 2 indicates, the TIMSS 8th grade science assessment the US score was 546, above the OECD average of 500. Here, US students' average score was lower than in 7 countries and higher than 38. Note that the OECD average score is computed to average 500.

Table 2 Comparison of US TIMSS 4th and 8th grade test results with other countries

	4th Grade Math	8th Grade Math	4th Grade Science	8th Grade Science
TIMSS Average	500	500	500	500
US Average	539	518	546	530
Notes	US scores lower than 10 and higher than 34.	US scores lower than 8 and higher than 24.	US scores lower than 7 and higher than 38.	US scores lower than 7 and higher than 26.

Source: https://nces.ed.gov/timss/timss2015/findings.asp, Table 23.

If American students' performance on international measures of academic achievement

were the Olympics, our students would not even be sitting near the winners' podium.

51 Education Varieties: How We Got Here

American students' modest showing on international assessments begs the question: "What is different about the US system of education compared with other countries?" The answer to that question goes back to 1791 when the national government ratified the Bill of Rights. Specifically, the 10th Amendment made education a state function and not a federal one. Subsequently, all states' constitutions have provisions for education that provide "adequate," thorough," "uniform," or other systems of free, public education.

The time between the Constitution's ratification in 1788 and the Bill of Rights ratification in 1791 was arduous. The Republicans, who favored states' rights, and the Federalists, who favored a strong national government, agreed to stop arguing momentarily and compromise with the Bill of Rights – specifically the 10th Amendment. The founding leaders agreed and disagreed on a variety of topics and consciously developed a system of checks and balances to constructively control and direct these disputes. That political arrangement continues to this day.

In the late 18th century when the Constitution was ratified, most people did not leave their village or state to earn their livings. Most jobs and commerce were local. The idea of state or local control of education worked well enough. It prepared most people to be productive citizens at that time and in the world in which they lived. Nonetheless, as seen from today's vantage point, the 10th Amendment has had serious unforeseen and unintended consequences for education, commerce, and jobs in a competitive, technology intensive, information-rich global economy.

Today, for example, we agree and disagree as a country about what portion of our national wealth we should spend on the public good (i.e., broadband Internet, roads and bridges, and education) or what should be reserved for private individual benefit. Over the years, the balance between spending for public or private wellbeing has shifted back and forth.

Today, just as at our founding, not all states have the same level of commitment to public schools. American educator and author, Ellwood Cubberley (1947), described the developing country's four basic school practices: good school conditions, mixed conditions, pauper and parochial schools, and the "no action" group. *Good school conditions* (such as Massachusetts, Connecticut, and New York) valued education and saw its worth for the entire population. *Mixed school conditions* (such as Illinois and Indiana) described places where diverse and conflicting

views on education existed. *Pauper and parochial conditions* (such as Pennsylvania, Maryland, and Virginia) existed where the wealthy sent their children to church-sponsored schools (parochial) and reserved a minimal level of education for the poor. The *"no action group* (such as Rhode Island, Tennessee, and Mississippi) believed that the government should play a minimal role in community affairs – including education. Today we can see how education evolved as a state function by examining the variance among the states' education standards.

Most OECD countries have a national Ministry of Education with a national curriculum and educational policies prescribing preschool, compulsory attendance, length of the school day and year, high school graduation requirements, and funding. In comparison, the 10th Amendment requires each of the United States' 50 states, the District of Columbia, and territories to have their own "Ministry of Education." We call these state departments of education or state education agencies, and each state's education agency holds differing expectations for schooling, dedicated resources, and student outcomes.

Despite the 10th Amendment, the federal government still has a great deal of influence in education policy and funding. The Elementary and Secondary Education Act (ESEA) and all its subsequent monikers and monies have required states accepting the funds to comply with federal guidelines. The latest version of ESEA, Every Student Succeeds Act (ESSA, 2015), gives states more freedom to implement policy. This new flexibility is a direct reaction to the prescriptive nature of prior education policies, including the No Child Left Behind Act (NCLB 2002) and the Common Core State Standards and related curriculum concerns about state versus federal control of education States continue to assert primary influence in what education standards they expect and support.

Getting into the Weeds

Since most OECD countries have their own single, standard national system of education requirements, it is prudent to examine the variance in the US states' expectations compared to OECD nations. In the United States, state legislatures determine policies and practices that often vary widely from state to state. Specifically, we will explore (1) preschool access; (2) compulsory attendance; (3) required length of the school year; (4) courses and credits required for high school graduation; (5) funding; and (6) child poverty rates. The first four factors deal with what states require for students. The fifth factor examines how much of the state's wealth, or fiscal effort it

invests in education. The sixth deals with comparative poverty rates. All six factors can be considered to have a snowballing effect on US international test score rankings.

Preschool Education

Research clearly shows that children who participate in high-quality preschool programs require fewer special education services, are less likely to be retained in grade, less likely to need child welfare services, and when they enter the workforce have higher incomes (Lynch, 2007; Yoshikawa et al., 2013). Studies have found that children who participate in high-quality preschool programs have better health, socio-emotional, and cognitive outcomes than those who do not participate (Yoshikawa, Weiland, Brooks-Gunn, Burchinal, Espinosa, Gormley, Ludwig, Magnuson, Phillips & Zaslow, 2013). Moreover, studies find that the return on investment (ROI) of high quality preschooling as high as 8.6 (White House Council of Economic Advisors, 2014); to 12.1 (Lynch, 2007). Conversely, lack of access to high-quality preschool contributes to the achievement gap when children start kindergarten (Mulligan, Hastedt, & McCarroll, 2012).

In the United States, access and enrollment to quality preschool programs (a response to compulsory attendance laws discussed later) vary greatly. Children from low-income families are less likely to be enrolled than from high-income families (US Department of Education, 2015). According to *The State of Preschool 2017* (Friedman-Krause, Barnett, Weisenfeld, Kasmin, DiCrecchio, & Horowitz, 2018), in the US:

- only 5% of 3-year-olds and 33% of 4-year-olds are enrolled in preschool programs;
- 22 states have no programs for 3-year-olds and seven states have not programs for 4-year-olds;
- the state range for 3-year-olds enrollments varies from 0% to 66%;
- the state range for 4-year-olds enrollments varies from 0% to 87.9%; and
- 25 states do not require preschool teachers to have earned a BA degree.

In comparison, the OECD average enrollment for 3-year-olds is 80%, for 4-year-olds is 91%, and for 5-year-olds is 95% (Friedman-Krause, et al., 2018). In other words, more children in OECD countries participate in preschool and enjoy the resulting benefits to them and their societies. Many US students needing preschool to be emotionally, socially, and cognitively ready for kindergarten do not have that head start that other countries' students have. The outcome puts too many US children in poverty at greater risk for school failure and its implications for adult

quality of life.

Compulsory Attendance

A statistically significant relationship exists between school attendance and student achievement (Balfanz & Byrne, 2012; Ginsburg, Jordan, & Chang, 2014; Bauer, 2018). In the US, each state, Washington DC, and the territories have compulsory attendance laws. Students' age ranges and the degree of compliance vary greatly among the states, however.

Table 3 shows the states' differing ages for compulsory attendance. In the US, ages of compulsory attendance range from 5 to 18 years (13 years of schooling) to 8 to 17 years (9 years of schooling). Seven states require 9 years of attendance, 12 states require 10 years, 10 states required 11 years, 11 states require 12 years, and 10 states require 13 years. Children in seven states will have four fewer years of schooling than students in other states.

Table 3 Compulsory Attendance Ages and Years in the US, by State

Ages	**States**
5-16 (11 years)	DE
5-17 (12 years)	SC
5-18 (13 years)	AR, CT, DC, HI, MD, NM, OK, RI, VA
6-16 (10 years)	AZ, FL, GA, IA, MA, NJ, NY, VT
6-17 (11 years)	AL, CO, IL, MS, WV
6-18 (12 years)	CA, KY, MI, NE, NH, OH, OR, SD, TN, UT, WI
6-19 (13 years)	TX
7-16 (9 years)	AK, ID, MT, NC, ND, WY
7-17 (10 years)	ME, MN, MO,
7-18 (11 years)	IN, KS, LA, NV
8-17 (9 years)	PA
8-18 (10 years)	WA

Source: Adapted from *Digest of Education Statistics, 2017*, Table 234.10, page 355.

In terms of OECD comparisons, 90% of students in OECD countries average 14 years of compulsory attendance as compared to an average of 12 years for US students. The range in OECD countries' compulsory attendance ranges from 10 to 16 years (OECD, 2018).

Required Length of the School Year

When we consider compulsory attendance, we must factor in the number of days each state requires students attend during the school year. The variance among the states is vast – ranging from 160 days in Colorado to 186 days in Kansas (Digest of Education Statistics, 2017, Table 234.20). As it stands, depending on where they live, some children will have 26 more days of

schooling each year than others. Some of those children with a shorter school year also are required to attend fewer years.

Courses and Credits Required for High School Graduation[1]

The fourth and last area examined under what is required of students is courses and credits required for high school graduation. High schools across the US use the Carnegie unit system to calculate credits for graduation. One Carnegie credit generally requires 120 hours of instruction in a subject. Most states require students to earn between 18 and 24 credits to receive a diploma. The range in requirements is large, however, unlike OECD countries whose national ministries of education promulgate one set of national standards for all its nation's students. Of the 47 states reporting, Carnegie credits required for graduation in 2017 averaged 20.9, a drop from 2016 of 21.125. The number of credits required for graduation varied from 13 in California, Wisconsin, and Wyoming to a high of 26 in Texas. Additionally, 27 states do not require an exit exam to receive the standard diploma. Going by the numbers, children in some states will take twice the number of high school courses than students in other states (Snyder, de Brey, & Dillow, 2019).

Furthermore, substantial differences exist in state-to-state requirements for the courses needed for high school graduation. In English/Language Arts, the required credits range from 3 to 4.5; for math and science, from 2 to 4; and from social studies (history, civics, economics, etc.) from .5 to 4. This variance could be even greater considering that the course titles may not reflect their degree of academic rigor. Moreover, one national study of high school graduates found that 20 states fail to offer a diploma that requires students to complete a college and career-ready program – 4 years of college-preparatory English, and at least 3 years of math through Algebra II (Achieve, 2015). Additionally, an Education Trust study found only 47% of US high school graduates do not complete a college ready or career-ready course sequence (Bromberg & Theokas, 2016).

Curriculum Rigor

The National Assessment of Educational Progress (NAEP), otherwise known as the Nation's Report Card, provides a common metric for measuring students across the United States. NAEP

[1] NOTE: The latest Digest of Education Statistics 2017, published in 2019, does not contain the number of course credit requirements by state. The latest data are in the 2018 publication, and those data are used in this section (Snyder, T.D., de Brey, C., & Dillow, S.A., 2018, Table 234.30, p. 375)

scores measure students' achievement in Reading or Mathematics as *Proficient* (solid academic performance for each grade/subject), *Basic* (partial mastery of prerequisite knowledge and skills that are fundamental for proficient rating at each grade/subject), and *Below Basic* (less than partial mastery of required knowledge and skills essential for proficient rating at each grade/subject). By placing state academic standards onto NAEP scales, a metric common to all states, it is possible to compare states' standards for students.

Table 4 How Well States' Proficiency Standards Align with National Assessment of Educational Progress (NAEP) Standards

NAEP Rating	Grade 4 Reading	Grade 4 Mathematics	Grade 8 Reading	Grade 8 Mathematics
Proficient	2	5	1	3
Basic	23	42	40	38
Below Basic	26	4	10	8

Source: de Mello, V. B., Rahman, T, & Park, B. J. (2015).

In 2015, a comparison between state "proficiency" standards and the NAEP "proficiency" standards found very poor alignment. What most states call "proficient" achievement actually falls at the NAEP "Basic" level (de Mello, 2015). Table 4 shows how many states' standards for "proficient" student performance actually align with NAEP's "Proficient" performance. Only two states' "proficiency" standards match NAEP's "proficiency" standard. Twenty-three states' "proficiency" standards actually match NAEP's "Basic" performance and 26 states' "proficiency" standard align with NAEP's "Below Basic." A mismatch exists between what states believe to be proficient curriculum standards and what NAEP assessed them to be.

Education Funding

The fifth factor, comparative funding for education, also reveals stark state differences. On average, education funding in the United States is derived from three sources – federal (8.5%), state (46.6%), and local (45.0%). A large variance occurs in these figures among and within the states. Federal funding ranges from 4.2% in New Jersey and Connecticut to 14.9% in South Dakota. In state funding the range is from 90.1% in Vermont to 24.9% in Illinois. Local revenue ranges from 58.8% in Illinois to 3.9% in Vermont (Snyder, T.D., de Brey, C., and Dillow, S.A. 2019, Table 235.20, p. 360). Since local revenues must make up for what state and federal governments do not cover, the poorest localities are left without resources to provide and equitable, comparable, and high-quality education for their students, a serious equity issue that exists to a lesser extent in OECD countries.

Money matters in student achievement. Research shows that money spent and where and how it is targeted has a positive impact on student achievement (Greenwald, Hedges, & Laine, 1996; Hanushek, 2016; Jackson, Johnson, & Persico, 2016). We also know that instructional practices such as rigorous, relevant, and coherent curriculum; effective instructional delivery of instruction; and classroom management (Barton, Coley, & Weglinsky, 1998; Blair, 2000; Chetty, Friedman, & Rockoff, 2011) are associated with increased student achievement.

While the average US per-pupil expenditure in 2015 was $11,445, the range was from a high of $20,744 in New York to a low of $6,751 in Utah (Snyder, de Brey, & Dillow, 2019, Table 236.20, p. 373). Of course, a state's cost of living provides an essential context. School funding across states is not equitable. Some states fail to account for poverty factors when determining education costs. As a result, one national study found that 12 states had progressive funding formulae that provide greater funding to schools with high concentrations of poverty, 15 had no substantial variation in funding, and 21 states were regressive, providing less funding to schools with higher concentrations of low-income students high-poverty schools than to low-poverty schools (Baker, Farrie, Johnson, Luhm, & Sciarra, & Farrie, 2017). Intra-district funding disparity can be even greater; one study showed that for every per-pupil dollar spent at one district's "popular" high school, only 39.7 cents was spent per pupil at the "least" popular high school (Owings & Kaplan, 2010).

Most OECD countries have a national ministry of education that provides the majority of funds to schools. An OECD Report (2017, p. 18) states that "While the majority of school funding originates at the central government level, other actors also increasingly contribute to raising funds for school services. Trends towards multi-level and multi-actor governance of school funding need to be accompanied by adequate institutional and regulatory frameworks to optimize the role of each actor in ensuring an effective and equitable allocation of funds."

A comparison of US and OECD countries' fiscal effort to fund education proves instructive. One way to examine how much each country spends on education is to measure it against the country's wealth as measured by Gross Domestic Product (GDP). Table 5 shows the US and OECD expenditures on primary and secondary education as a percentage of GDP. Ten OECD countries spend a greater percentage of their GDP at the primary level, and 21 countries spend a greater percentage at the secondary level (OECD, 2018, Table C2.1, p. 266). The wide variance in US

high school requirements may provide an explanation for the lower-than-average GPD spending.

Table 5 Total Public Expenditures on Education as a Percentage of GDP

	Primary	Secondary
United States	1.6%	1.8%
OECD Average	1.5%	2.0%

Source: Education at a Glance 2018: OECE Indicators, Table C2.1, p. 266.

Child Poverty Rates

Poverty is the risk factor that exacerbates all other educational risk factors. The United States is one of the world's wealthiest nations with the 11th highest child poverty rate in the OECD Family Database (2018). This makes the US child poverty rate higher than 32 other countries and 10 countries higher than the OECD average. With the high US child poverty rankings, the snowballing impact of absent progressive state funding formulae, the low rates of preschool enrollments, the variance in compulsory attendance ages, taken as a US 50-state (plus District of Columbia) average compared to OECD countries (with a more centralized system), it is no wonder that our international test scores do not reach the top tier.

Escaping the "Average": Looking at One State

State rankings offer one bright spot that answers the question of whether US students can perform apace with students in top tier nations. The OECD rankings are based on the nation's average scores. Looking at one state's – Massachusetts – test scores suggests how variations in the states' policies and resources impact our students' overall scores.

On the PISA science scores, Massachusetts students tied for sixth place internationally, placing in the top tier. Looking at statistical significance, Massachusetts students' scores were lower than Singapore, not measurably different than 10 countries, and measurably higher than all the remaining systems. In reading scores, Massachusetts students came in second to Singapore, but not measurably different than eight countries, and measurably higher than all other countries. In math scores, Massachusetts students were lower than 12 other countries and not measurably different from 20 other countries. Interestingly, Massachusetts students' scores in science were 33 points higher than the US average, 30 points higher in math, and 30 points higher in reading (Institute of Education Sciences, 2015). Massachusetts students' academic performance hints at the educational opportunities for US students elsewhere were their states' expectations for

education and dedicated resources higher.

CONCLUSION

We are living in a much larger and more complex world than our nations' founders could have ever conceived. The 10th Amendment compromise placed education as a state responsibility, setting up significant unanticipated consequences 200 years later for American students living in a very different world. If American public schools are "failing," it is a failure of individual states to provide the correct resources in the right places, early and quality access to preschooling, sufficient time and expectations for teaching and learning, rigorous curricula, and adequate and equitable funding throughout the grades that ensures every student has equal access to a high quality education. We can see the cumulative impact of not doing so.

If we Americans do not fully develop our human capital for a global economy, what happens to our standard of living and our economic and national security? Perhaps it is time to focus on the question argued since our country's founding– how much of our national wealth should be spent on the public good versus the private good? If we as a country are to strengthen education policies to adequately prepare all students for the competitive world they will enter, we must start by advocating for funding and policy changes state-by-state. Here's a new soundbite that state policy makers might consider: "Education – think and invest a generation or two ahead." Other nations are already enacting this agenda.

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