

# “Cost” Functions Should NOT Be Used to Make Education Spending Decisions

A Review of the WestEd Legislative Cost Study



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## Executive Summary

In response to the Kansas Supreme Court's recent ruling in the *Gannon V* case, the Kansas Legislature recently contracted with a vendor to analyze the "cost" of educating public school students in grades K-12. Specifically, the vendor was asked to "estimate the minimum spending required to produce a given outcome within a given educational environment." The vendor, WestEd, used a "cost function" approach in order to estimate the costs of providing students in each public school in Kansas with an adequate education.

There are three primary reasons why supposed "cost" functions do not provide valid and reliable estimates of the minimum "cost" of achieving a given outcome:

- 1 Researchers do not have access to data on all external factors that impact the cost of educating students.
- 2 Researchers do not have access to all input prices; or, even accurate measures of the input prices they include in their modeling.
- 3 Researchers cannot fully control for the presence of inefficiency by public schools. Purging inefficiency from spending data is "the key step in converting a spending function to a 'cost' function."

While the WestEd research team endeavored to collect good data and control for only some possible inefficiency, these three concerns apply to the WestEd model.

There is a further concern with the WestEd model. Gronberg, Jansen, and Taylor (2011: page 25) wrote, "**For cost function analysis, best practice requires researchers to adopt appropriate modeling and estimation strategies and to check carefully for robustness and reliability of results**" (emphasis added). The third author listed who wrote those words was the lead author—Dr. Lori Taylor—of the WestEd report. A careful check for robustness and reliability of the WestEd cost function estimates was not performed. The following best practices should be performed to "check carefully for robustness and reliability of results":

### **Best Practice #1: Report 95 percent confidence intervals for estimates of "minimum" costs.**

Given the large degree of estimation involved with the WestEd cost model—and in any cost model done by anyone else—estimates are created with error. Given that the estimates are created with error, it is best practice to report 95 percent confidence intervals—upper and lower bounds of the outcome of interest such that one can be 95 percent confident that the true value lies in that range.

### **Best Practice #2: Check whether the parameter estimates of the WestEd cost model predict past changes in Kansas student outcomes—given Kansas' changes in spending per-student.**

If the parameter estimates from the WestEd cost function are correct, then they should do a reasonable job of pre-

dicting past historical patterns in Kansas state test scores, graduation rates, and spending per-student.

### **Best Practice #3: See if the WestEd cost function estimates predict historical changes in Kansas' National Assessment of Education Progress (NAEP) scores.**

The parameter estimates from the WestEd cost study can be easily used to see if they predict the historical relationship between Kansas public school NAEP test scores and per-student spending. There is evidence that NAEP scores are associated with future outcomes that are valuable to students, which are contemplated by the Kansas Rose Standards. In fact, the Kansas State Department of Education (KSDE) has said the NAEP "is considered the 'gold standard' of assessments."

### **Best Practice #4: Report the sensitivity of the minimum "cost" estimates to changes in specifications, variables included, and measurement of variables.**

There are myriad reasonable ways to model the costs of educating students. WestEd should report results from several alternative specifications—to see if their primary results are robust to different specifications.

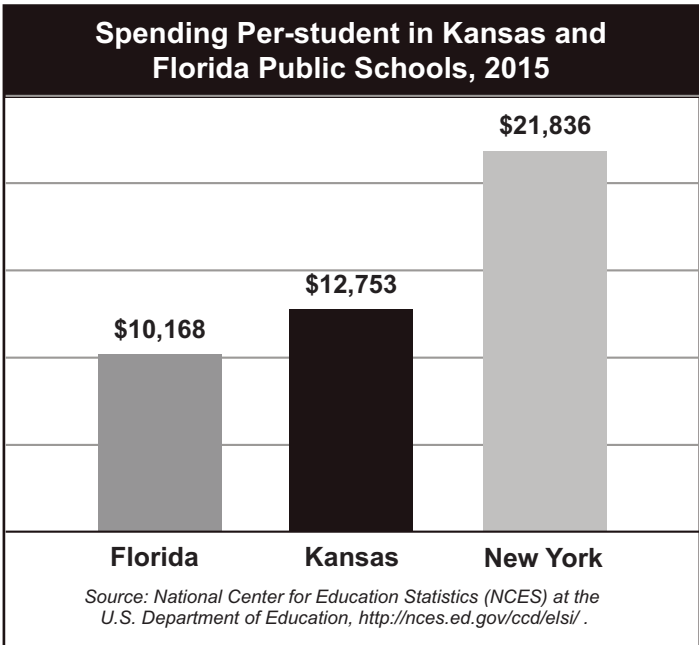
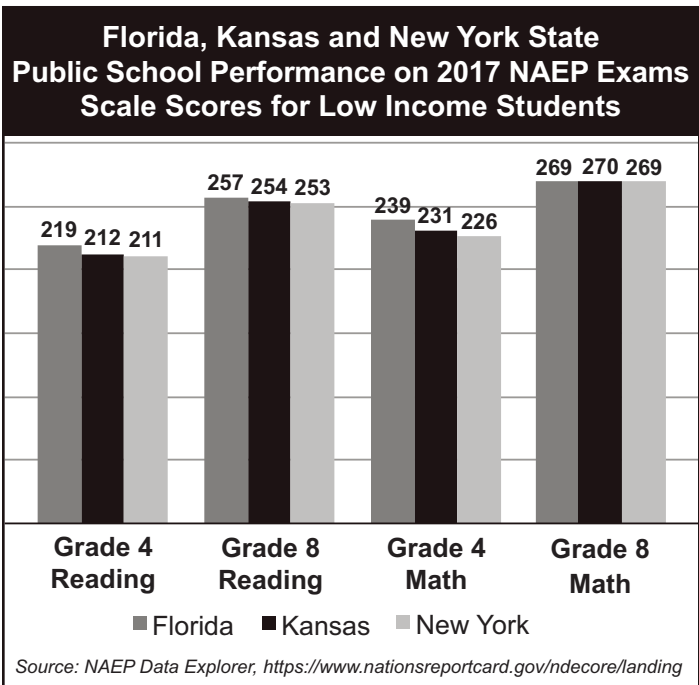
### **Best Practice #5: Estimate a production function to see if the estimates from the production function produce the same relationships between spending and outcomes as the WestEd cost function estimates.**

According to microeconomic theory, a cost function contains "essentially the same information" as a production function. That is, a cost function indicates the minimum level of cost needed to produce a given level of output, while a production function indicates the maximum output possible for a given level of expenditure.

These five best practices are widely implemented in academic research on the economics of education; and, are not controversial. That said, including these best practices in the WestEd cost function analysis runs the risk of showing that the WestEd cost model does not predict the recent history of the relationship between spending and achievement in Kansas public schools. Further, the current amounts spent on Kansas public schools may already be well within the 95 percent confidence interval of spending levels that would achieve standards deemed adequate.

Perhaps these risks are best shown with some contextual and historical evidence on the relationship between public school spending and student outcomes. For example, at best Kansas public schools do not outperform Florida public schools on the NAEP, but Kansas public schools spend 25 percent more per-student than Florida public schools, bearing in mind cost of living differences. New York public schools do not outperform either Kansas or Florida, and New York spends more than double what is spent per-student in Florida.

2017 is the most recent NAEP data available and 2015 is the most recent comparable data available on public school spending by state.



**Given that Florida public schools are achieving at levels at least as good as Kansas at a 25 percent lower cost, one must conclude that the minimum level of spending “required” to achieve at current levels in Kansas is significantly less than what is spent now. Given recent history in Kansas, as this report details below, it is not reasonable to conclude that giving the Kansas public school system—as currently constituted—a large boost in spending will significantly improve student outcomes.**

As shown in the body of this report, Kansas has increased real (inflation-adjusted) spending per-student rapidly this century—perhaps largely via mandates from the Kansas State Supreme Court. These increases in spending did not translate into significant gains in student outcomes on the

NAEP—a battery of tests for which there is evidence that they predict valuable future outcomes for students, and the KSDE has said “is considered the ‘gold standard’ of assessments.”

If the Kansas State Supreme Court insists on further spending increases—into the current education system in Kansas—recent history and comparisons among Kansas, Florida, and New York suggest this policy will be a costly failure. In contrast, the estimates from the WestEd cost model promise significant improvements in student outcomes would result from large increases in per-student spending.

So, on what should policymakers rely—(a) estimates from a cost model or (b) recent Kansas history and interstate comparisons of the relationship between spending and valuable student outcomes? If recent and large increases in spending have not increased measurable student outcomes by very much in Kansas, and if another state (Florida) has a higher cost of living, perhaps more student disadvantage, significantly lower spending, and better student outcomes, then that is strong evidence that the minimum cost to achieve the current level of achievement in Kansas is significantly lower than what it is spending now.

If history and interstate comparisons are not persuasive—that is, if you believe that “this time will be different,” implementing each of the five best practices recommended here into the WestEd cost function approach will either validate the cost model estimates (by showing a tight 95 percent confidence interval around minimum cost estimates, by accurately predicting past relationships between spending and student outcomes, etc.), or these five best practices will show that the cost model estimates are not valid or reliable predictors of any past relationships between spending and outcomes and will find that current spending levels are well within 95 percent confidence intervals of spending levels deemed adequate.

Given the vast sums of taxpayer funds at stake, the Kansas Governor, Legislature, and State Supreme Court should insist that these five best practices be implemented into the WestEd cost function approach—to discover the truth about the relationship between spending and valuable student outcomes.

## Introduction

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The Kansas Legislature recently contracted with a vendor to analyze the “cost” of educating public school students in grades K-12. Specifically, the vendor was asked to “estimate the minimum spending required to produce a given outcome within a given educational environment.”<sup>1</sup> The Legislature commissioned this study in response to the Kansas State Supreme Court’s October 2, 2017, ruling in the *Gannon V* case. Bear in mind, the *Gannon* litigation was originally filed in 2010, and the on-going litigation reaches back decades further. In *Gannon V* the Court ruled that the state of Kansas’ relatively new school funding formula, the Kansas School Equity and Enhancement Act (KSEEA), provided neither adequate nor equitable funding to Kansas public school students under Article 6 of the Constitution of the State of Kansas. Further, the Kansas Supreme Court ruled that the State of Kansas bears the burden of establishing that its funding formula is in compliance with Article 6. That is, the State of Kansas must somehow prove that the total amount of funding for public school children is adequate and distributed in an equitable manner. Unfortunately, the Constitution of the State of Kansas does not define the terms adequate or equitable. In fact, the Kansas Constitution does not even contain those terms.

The vendor mentioned above, WestEd—led by Dr. Lori Taylor—used a “cost function” approach in order to estimate the costs of providing students in each public school in Kansas with an adequate education.

With that background, this report offers:

- A discussion of the desirability of using cost functions to determine levels of funding “required” to meet certain K-12 educational outcomes
- Further concerns specific to the WestEd cost function study
- Historical and contextual data to help all branches of government in Kansas learn from the past experience of taxpayers providing significantly larger amounts of funding to the conventional Kansas public school system—and to the experiences of other states.

It is worth noting that prior research has found both (a) that increases in spending have improved student achievement and (b) that increases in resources have not improved student achievement. For example, a 2006 report by the Kansas State Legislative Post Audit Committee (LPA) reviewed the literature on the effects of increased spending on student outcomes and concluded:

“Educational research offers mixed opinions about whether increased spending for educational inputs is related to improved student performance. Well-known researchers who have reviewed that body of research

have come to opposite conclusions. Likewise, individual studies of specific educational inputs we reviewed sometimes concluded additional resources were associated with improved outcomes, and sometimes concluded they weren’t.” (page 107)<sup>2</sup>

That said, it is well known studies that find more spending improves student outcomes have not been consistent with actual history. For example, a recent study by Jackson, Johnson, and Persico (forthcoming) of the effect of per-student spending on valuable outcomes for students purported to find that increases in spending of 22.7 percent would close achievement gaps in educational attainment between subgroups of students.<sup>3</sup> The time period analyzed in that study began in 1970. But real (inflation-adjusted) spending per-student increased about 150 percent between 1970 and 2010—thus, if the results of that study were correct, we should be rid of achievement gaps in educational attainment by now.<sup>4</sup> Sadly, we are not. Put differently, the actual history of the relationship between spending and achievement did not comport with what the study predicted would occur.

And, despite the claims by advocates of public schools, the students have not become more-disadvantaged in recent decades and become “more costly to educate.” There are now four studies on this topic, and each finds that modern American students are not less advantaged relative to students in decades past.<sup>5</sup> Each of those four studies finds that public school students in recent years are actually slightly more advantaged relative to students of decades ago, on balance. That is, students in more recent years have characteristics that—by critics’ logic—would suggest higher student achievement relative to students of decades ago. As a

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<sup>2</sup> “Cost Study Analysis, Elementary and Secondary Education in Kansas” Estimating the Costs of K-12 Education Using Two Approaches,” [http://www.kslegresearch.org/KLRD-web/Publications/Education/Education\\_Cost\\_Study/Cost\\_Study\\_Report.pdf](http://www.kslegresearch.org/KLRD-web/Publications/Education/Education_Cost_Study/Cost_Study_Report.pdf)

<sup>3</sup> This study is forthcoming in the Quarterly Journal of Economics, but a working paper version can be found here: <http://www.nber.org/papers/w20847>.

<sup>4</sup> For a discussion of this issue, please see: Eric A. Hanushek’s “Money Matters After All?” <http://educationnext.org/money-matters-after-all/>.

<sup>5</sup> There are only four empirical studies that analyze the issue of whether students are becoming more advantaged or disadvantaged over time in terms of characteristics that have historically been favorable for academic achievement. Each of these four studies finds that students in more recent years have characteristics that are, on balance, more favorable for student achievement. In alphabetical order by first author’s last name, these studies are: Jay P. Greene and Greg Forster (2004), The Teachability Index: Can Disadvantaged Students Learn? (Center for Civic Innovation Education Working Paper No. 5), [http://www.manhattan-institute.org/pdf/evp\\_06.pdf](http://www.manhattan-institute.org/pdf/evp_06.pdf); Jay P. Greene and Brian Kisida (2012, September), The Educability Index, paper presented at the School Productivity Project Conference, George W. Bush Institute, Dallas, TX; David W. Grissmer, Sheila N. Kirby, Mark Berends, and Stephanie Williamson (1994), Student Achievement and the Changing American Family, [https://www.rand.org/content/dam/rand/pubs/monograph\\_reports/2006/MR488.pdf](https://www.rand.org/content/dam/rand/pubs/monograph_reports/2006/MR488.pdf); Caroline M. Hoxby (2003), School Choice and Competition: Evidence from the United States, Swedish Economic Policy Review, 10, pp. 9-65, <http://www.government.se/49b73e/contentassets/25c599d2a5a241b98255e7650f3da9ec/caroline-m.-hoxby-school-choice-and-school-competition>.

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<sup>1</sup> “Estimating the Costs Associated with Reaching Student Achievement Expectations for Kansas Public Education Students: A Cost Function Approach,” WestEd, pages 5-6.

separate piece of evidence on this issue, according to a left of center think tank, child poverty is now the lowest it has been on record—the child poverty rate was 15.6 percent in 2016, as compared to 28.4 percent in 1967.<sup>6</sup> Thus, based on the logic of advocates for greater spending on public schools, students of today are less costly to educate, on balance, relative to students of decades past. Yet, America has consistently increased real spending per-student in public schools over many decades.

As LPA has correctly noted, “It’s important for the reader to understand that any study involving the estimation of costs for something as complex as K-12 education involves a significant number of decisions and assumptions. Different decisions or assumptions can result in very different cost estimates.” LPA goes further to wisely observe, “... it’s important to remember that these cost studies are intended to help the Legislature decide appropriate funding levels for K-12 public education. They aren’t intended to dictate any specific funding level, and shouldn’t be viewed that way.”<sup>7</sup>

Finally, LPA makes a crucial point with respect to cost model approaches “... within these cost studies we weren’t directed to, nor did we try to, examine the most cost-effective way for Kansas school districts to be organized and operated. Those can be major studies in their own right.”<sup>8</sup> That said, a cost model approach is literally estimating “minimum” costs if and only if researchers can measure any and all forms of public school inefficiency—a hefty data requirement.

The rest of this report is organized as follows. Section II contains a description of the cost function methodology; problems applying it for policymaking purposes in K-12 education; and specific concerns with the WestEd March 15, 2018 report—including five best practices upon which all branches of Kansas state government should insist. Section III offers some context with respect to public school spending and student outcomes, including historical patterns and a comparison between the public education systems in the states of Florida, Kansas, and New York. Concluding remarks are offered in Section IV. Problems of creating operational definitions of an adequate education are present irrespective of the approach taken. These problems are discussed at length in an appendix at the end of this report.

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<sup>6</sup> Isaac Shapiro and Danilo Trisi, “Child Poverty Falls to Record Low, Comprehensive Measure Shows Stronger Government Policies Account for Long-Term Improvement” <https://www.cbpp.org/research/poverty-and-inequality/child-poverty-falls-to-record-low-comprehensive-measure-shows>

<sup>7</sup> “Cost Study Analysis, Elementary and Secondary Education in Kansas” Estimating the Costs of K-12 Education Using Two Approaches,” [http://www.kslegresearch.org/KLRD-web/Publications/Education/Education\\_Cost\\_Study/Cost\\_Study\\_Report.pdf](http://www.kslegresearch.org/KLRD-web/Publications/Education/Education_Cost_Study/Cost_Study_Report.pdf).

<sup>8</sup> Ibid.

## The Cost Function Methodology

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In standard microeconomic theory, a cost function, for any good or service, measures the minimum cost of producing a given level of output given some set of prices for production inputs. Cost functions contain parameters that determine the specific relationships between outputs, prices of all inputs, and the minimum total cost to produce the outputs.

Economic theory does not specify the sizes of these various parameters—one for each output and input price, but given appropriate data on many producers of a good or service, researchers can seek to estimate these parameters of a cost function. Appropriate data include the prices of all inputs needed to produce the outputs; the quantities of all the various outputs actually produced; and the total amounts expended to produce the outputs by the various producers. Estimates of the parameters from the cost function can then be used to construct an estimate of the minimum cost of producing some desired level of output or outputs. All of the prior statements in this paragraph are hypothetical in the sense that they make the large presumption, among other things, that all of the appropriate data are available to researchers.

### ■ *The Cost Function Methodology Applied to K-12 Education*

With respect to cost functions, there may be external factors that impact production and hence the minimum cost required for a given level of production. In K-12 education, those external factors are the characteristics of students and the characteristics of communities (neighborhood crime, poverty rates, etc.), where schools are located and students reside.

Thus, to estimate minimum costs using a cost function specified for K-12 education, the researchers must have data on:

- All input prices
- All outcomes that have value to students or to others
- All characteristics of students that impact the production of the outcomes or the cost of achieving the outcomes.

### ■ *In K-12 Public Education it is Extremely Unlikely for Cost Functions to Produce Accurate Estimates of Minimum Costs*

In contracting with WestEd, the Kansas Legislature asked that WestEd, “estimate the minimum spending required to produce a given outcome within a given educational environment.”<sup>9</sup> These instructions to WestEd are in keeping with the Kansas State Supreme Court in their initial *Gannon* ruling in March 2014,

“In short, the panel should apply the *Rose*-based test articulated in this opinion for adequacy in school finance to the evidence it deems relevant to its analysis, recognizing the test does not require the legislature to provide the optimal system. ... (issue is whether SDFQPA satisfied the

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<sup>9</sup> WestEd, pages 5-6.

constitution by providing suitable financing, not whether level of finance is optimal or the best policy).<sup>10</sup>

Thus, the Court is really looking for some minimum level of spending to be deemed adequate or suitable. The *Merriam-Webster Dictionary* defines the word “minimum” as:

the least quantity assignable, admissible, or possible<sup>11</sup>

Costrell, Hanushek, and Loeb (2008) offer a polite but scathing critique of usage of the cost function methodology as a tool to estimate the minimum spending required to achieve K-12 educational outcomes.<sup>12</sup> In the abstract to their article, they wrote:

Econometric cost functions have begun to appear in education adequacy cases with greater frequency. Cost functions are superficially attractive because they give the impression of objectivity, holding out the promise of scientifically estimating the cost of achieving specified levels of performance from actual data on spending. By contrast, the opinions of educators form the basis of the most common approach to estimating the cost of adequacy, the professional judgment method. The problem is that education cost functions do not in fact tell us the cost of achieving any specified level of performance. Instead, they provide estimates of average spending for districts of given characteristics and current performance. It is a huge and unwarranted stretch to go from this interpretation of regression results to the claim that they provide estimates of the minimum cost of achieving current performance levels, and it is even more problematic to extrapolate the cost of achieving at higher levels.

— *Costrell, Hanushek, and Loeb (2008)*

Costrell et al. are rightly critical of the “professional judgement” method that is often used to ascertain the cost of achieving some increase in student outcomes. The authors of the WestEd report are also rightly critical of professional judgement.<sup>13</sup>

But, Costrell et al. are highly skeptical of the cost function approach as well. Costrell et al. makes three broad critiques of the cost function approach:

1. Researchers do not have access to data on all external factors that impact the cost of educating students.

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<sup>10</sup> The Court’s March 2014 Gannon opinion can be found here: <http://www.kscourts.org/Cases-and-Opinions/opinions/SupCt/2014/20140307/109335.pdf>.

<sup>11</sup> <https://www.merriam-webster.com/dictionary/minimum>

<sup>12</sup> Robert Costrell, Eric A. Hanushek, and Susanna Loeb (2008) “What Do Cost Functions Tell Us About the Cost of an Adequate Education? Peabody Journal of Education.

<sup>13</sup> “Professional judgement” relies on educators and education experts to use their good judgement to specify what resources public schools ought to have and then cost out what those resources will cost. A Massachusetts trial judge sympathetic to giving public schools a large increase in funding called the professional judgement approach “something of a wish list” (Costrell, 2007). The WestEd report, page 12, is also critical of the professional judgement approach.

That is why the data show very wide variations in expenditures across districts that have very similar levels of student outcomes. By not controlling for all of these external factors, cost functions will yield biased estimates of their parameters.

2. Researchers do not have access to all input prices; or even accurate measures of the input prices they include in their modelling.

What is the minimum price required to hire cafeteria workers of a given effectiveness in Humboldt? In Olathe? In Rawlins? In Wichita? About half of all public school employees are not teachers. They are custodians, teacher aides, curriculum specialists, assistant principals, cafeteria workers, administrative assistants, counselors, social workers, etc. What is the minimum cost of hiring each one of these groups of employees in each district? The authors of cost function studies do not know these minimum prices; therefore these minimum prices for each of these employee groups are not included in a cost function as they should be.

There is a second issue that applies to even the one salary researchers do observe—teacher salaries. This second issue is best explained by an example. If Mrs. Smith, a typical 2nd grade teacher, had her annual salary reduced by \$300, would she quit teaching at her current school? If not, then her actual salary is above the minimum price required to get her to remain at the school. Of course, this does not mean the district should cut Mrs. Smith’s salary but, again, this is an example of the inherent shortcomings of this sort of cost function. Cost function researchers observe only actual salaries paid to public school employees—not the salaries that would prevail in highly competitive labor markets. The use of actual salary data for teachers shows what districts currently spend—not what the minimum costs are for hiring teachers of a given quality.

3. Researchers cannot fully control for the presence of inefficiency by public school districts. Purging inefficiency from spending data is “the key step in converting a spending function to a ‘cost’ function” (Costrell et al., 2008).

The WestEd study endeavors to allow for inefficiency. But here are three sources of inefficiency not considered in their model: (a) Public schools paying too much for some employees. The WestEd study indirectly acknowledges this first issue. Its authors write on page 35: “teacher characteristics shown to have a positive effect on student learning include: content knowledge, pedagogical knowledge, verbal ability, at least a few years of teaching experience, and degrees in science or mathematics (when teaching those subjects) (Rice, 2003).” Notice that advanced degrees and years of experience after the first couple of years are not associated with more effective teaching—that is a widespread empirical finding as suggested by the WestEd report. The WestEd authors also write: “Earnings also rise as workers get older, but the increase is more rapid for men than for women (perhaps because age is not as good an indicator of work experience for



women as it is for men). Workers with advanced degrees earn systematically more than workers with a bachelor's degree."

Thus, the WestEd authors concur that experience, after the first couple of years, and advanced degrees are not indicative of teaching effectiveness, yet they report that Kansas public school teachers are systematically paid more for having these two characteristics. Thus, the WestEd study is not controlling for this inefficiency—that all school districts in Kansas are paying higher prices for teacher characteristics that do not benefit students—and are thus systematically overestimating minimum costs.

The second inefficiency not considered in the WestEd report entails (b) any state regulations—that impact all school districts in Kansas—that raise costs but do not impact student outcomes positively. The final inefficiency is (c) that other states have outcomes similar to Kansas, but do so at dramatically lower costs. As discussed at length in the next section, Florida public schools had slightly better overall outcomes than Kansas on a national test that has been shown to be associated with future valuable outcomes for students, and that the KSDE has said "is considered the 'gold standard' of assessments". Further, Florida's cost of living has been estimated to be about 10 percent higher than the cost of living in Kansas, and Florida public schools spend over 25 percent less per-student as compared to Kansas public schools. Getting (charitably) the same results at a significantly lower cost in Florida suggests that Kansas public schools overall have an inefficiency present—an inefficiency that cannot be detected by the WestEd cost function approach.

One inefficiency in Kansas may be in the configuration of school districts—Florida public schools serve over five times as many students as do Kansas public schools. Yet, Kansas has over four times as many school districts as Florida—each with its own central and back office operations.

Yes, the Costrell et al. critique was published in 2008. And, yes, the lead author of the WestEd report and others have made some improvements in the cost function approach that have been worthy of publication in academic economics journals. That said, these improvements have not overcome the central points made by Costrell, et al., and they are not able to truly discern the minimum cost necessary to produce some increase in student outcomes. That is, cost functions are not a reliable or accurate tool to forecast the extent to which valuable future outcomes would increase if conventional public schools received a big increase in taxpayer funding per-student. I expand upon these points in the next subsection and the section that follows it.

Given numbers 2 and 3 of the Costrell, et al. critique of cost functions—not knowing all minimum prices of all inputs and in all districts and not controlling for all sources of inefficiency, **the "cost" function approach is in actuality a "spending" function approach—and merely tells us what districts actually spend and actually achieve, and not what is the true minimum cost of achieving some level of output.**

### ■ **Specific Concerns with the March 15, 2018 WestEd Cost Function**

I want to be clear on my next point—I am not suggesting that I or any other researcher could have necessarily conducted a cost function approach any better than WestEd with the limited data and short time frame they were provided. Maybe someone could, but maybe not. That is not my point. My point is that given the lack of available and accurate data and given the tenuous relationship between spending and outcomes in the conventional public school system over the past five to eight decades, education spending decisions should not be made on the basis of estimates from any cost function approach. While I agree with Taylor (2004); Costrell, et al. (2008); Gronberg, Jansen, and Taylor (2011); and the WestEd (2018) report itself that other approaches to estimating minimum costs required to produce some set education outcomes are conceptually significantly worse than a cost function approach, I cannot conclude that any cost function approach provides estimates that are accurate enough to use to determine education policy.<sup>14</sup> **Again, the lack of necessary data on minimum input prices and necessary data on all major sources of inefficiency doom the prospect that any cost function approach will produce estimates of the minimum cost required to produce a given set of outcomes. Instead, a cost function approach merely yields what is currently spent to achieve current outcomes—which is not useful at all to ascertain what is the minimum cost to achieve these outcomes.**

While the Costrell et al. general concerns with the cost function approach apply to the WestEd study as well, below are some specific concerns with the WestEd study itself. To illustrate these specific concerns, I offer five best practices that have emerged from and are routinely undertaken in the academic literature on the economics of education. None of these best practices was employed by the WestEd report, and each of these five best practices are doable with existing data — if time were permitted by the several branches of Kansas state government. Finally, none of these best practices are controversial in the economics or education policy literature.

At a minimum, the norms and best practices of academic research should be upheld as a matter of course. However, given that the WestEd report is for real-world policymaking, the standards should be higher than the norms in academic research. The Kansas Legislature, Governor, and State Supreme Court should insist on the application of these five best practices to the WestEd cost model.

#### ■ **Best Practice #1. Report 95 percent confidence intervals for estimates of "minimum" costs.**

The WestEd cost model had to *estimate* how much was actually spent at each school. It also had to *estimate* how much teachers cost in various areas. Any statistical model

<sup>14</sup> Each of these studies are cited in the WestEd report, except Costrell et al. (2008) which was cited previously on Page X of this paper.

involves creating *estimates* of model parameters. Given the large degree of estimation involved with the WestEd cost model—and in any cost model done by anyone else—estimates are created with error. Given that the estimates are created with error, it is best (and standard) practice to report 95 percent confidence intervals—upper and lower bounds of the outcome of interest such that one can be 95 percent confident that the true figure lies within that range. In prior cost model studies, the 95 percent confidence interval led to an extremely wide range of minimum “cost” estimates.<sup>15</sup>

The WestEd report does not report these confidence intervals. And, these bounds would shed light on how accurate the estimates are and whether what is currently being spent per-student is well above the lower bound estimate.

That said, the existence of a lower bound estimate begs the question—if we are trying to ascertain minimum costs of educating students, why are we not using the lower bound estimate as our estimate of minimum costs? By construction, one cannot reject the hypothesis that the lower bound estimate is statistically different from the cost estimates of required spending reported for each Kansas school that are listed in the WestEd report. Of course, I am accepting a standard definition of the word “minimum,” listed on page 16 of this paper.

**Best Practice #2. Check whether the parameter estimates of the WestEd cost model predict past changes in Kansas student outcomes—given Kansas’ changes in spending per-student.**

If the parameter estimates from the WestEd cost function are correct, then they should do a reasonable job of predicting past historical patterns in Kansas state test scores, graduation rates, and spending per-student.<sup>16</sup>

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<sup>15</sup> I put the word cost in quotation marks, because I concur with Costrell et al. that these are merely spending functions. But, even if they are truly “cost” functions, 95 percent confidence intervals and the other best practices should be undertaken to ensure validity of the results.

<sup>16</sup> It is likely the case that Kansas state tests have changed significantly over time and have not historically been “vertically aligned”—such that a given level of knowledge and skills in a given grade and subject would yield identical scores across years. If this is not the case—then great, go ahead and see if the estimated parameters of the cost model do a reasonable job of predicting past patterns of Kansas public school spending and state test scores. Once the historical data are provided to researchers, this is a straight-forward and not a time intensive exercise. But, if these tests are not vertically aligned across years, student scores can be benchmarked against corresponding NAEP test scores. NAEP—the National Assessment for Educational Progress—has been administered to a sample of Kansas public school students for well over a decade. As an example, suppose statewide average 4th Grade scores on the NAEP Mathematics exam increased by one percent from one administration of the test to the next one two years later. Then, researchers can correlate the corresponding 4th Grade math scores on Kansas state tests for those two years—the latter year’s average scores would be one percent higher than the prior average. And, all other student scores would be benchmarked appropriately from the means. That is, if a given student scores ten percent above the mean score in the latter year, the student would be assigned a one percent higher score than a student who scored ten percent above the mean in the prior year—because the state average was one percent higher in the latter year. I am being terse given the venue, but economists and psychometricians will understand.

Gronberg, Jansen, and Taylor (2011: page 25) wrote, **“For cost function analysis, best practice requires researchers to adopt appropriate modeling and estimation strategies and to check carefully for robustness and reliability of results”**<sup>17</sup> (emphasis added). The third author listed who wrote those words was the lead author of the WestEd report. A careful check for robustness and reliability of the WestEd cost function estimates was not performed—likely through no fault of WestEd, but the fault lies with the short Kansas State Supreme Court timeline and specified in *Gannon V* and the legislative response to the same.

**Best Practice #3. See if the WestEd cost function estimates predict historical changes in Kansas public school NAEP scores.**

There is no evidence that the Kansas battery of tests is correlated much less causally related to future outcomes for students, including those contemplated by the *Rose Standards*. Further, there is evidence from myriad states that their own state exams are not necessarily correlated with valuable future outcomes such as high school graduation, college attendance, success in college, college graduation, or future labor market earnings. Nevertheless, there is a standardized test—given to a sample of public school students in all states—that does have evidence that it is measuring knowledge and skills that lead to beneficial future outcomes.<sup>18</sup> That test is called the National Assessment of Education Progress (NAEP). The moniker for the NAEP is “the nation’s report card”.<sup>19</sup> The NAEP is governed by an independent governing board through the U.S. Department of Education. The Kansas State Department of Education has said the NAEP “is considered the ‘gold standard’ of assessments.”<sup>20</sup>

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<sup>17</sup> <https://www.tandfonline.com/doi/abs/10.1080/0161956X.2011.539953>

<sup>18</sup> See, for example, <http://hanushek.stanford.edu/sites/default/files/publications/Hanushek%2BWoessmann%202010%20IntEncEduc%202.pdf>.

<sup>19</sup> <https://nces.ed.gov/nationsreportcard/about/>

<sup>20</sup> The Kansas State Department of Education’s full description of NAEP is as follows: “The state of Kansas participates in the National Assessment of Educational Progress, otherwise known as the Nation’s Report Card. The National Assessment of Educational Progress (NAEP) is considered the “gold standard” of assessments. It is the largest nationally representative assessment of what America’s students know and can do and it serves a different role than state assessments. The NAEP assessments allow each state to be compared to national results and to evaluate progress over time. It informs the public about the academic achievement of elementary and secondary students in Kansas and in the United States. The National Assessment of Educational Progress (NAEP) is authorized and funded in the federal Elementary and Secondary Education Act (ESEA). Each state and local educational agency (LEA) that receives Title 1 funding is required to participate in the reading and mathematics assessments if selected. Kansas, as a state, receives Title 1 funding and all LEA’s in Kansas (Unified School Districts) also receive some Title 1 funds. The National Center for Education Statistics (NCES) is responsible for the development, administration, scoring and reporting the results of these assessments. The NAEP provides policy makers and leaders at the federal and state level a measure to guide important decisions on educational resources and funding. NAEP is not a high stakes assessment. It does not reveal a particular student’s or schools score. It is an assessment completely independent of politics and education reform efforts and is the only yardstick currently available that reveals student achievement nationally, by state, and by large urban district. Used as a resource, NAEP is a window into the state of our educational system and what students are

The parameter estimates from the WestEd cost study can be easily adapted to analyze to what extent they predict the historical relationship between Kansas public school NAEP test scores and per-student spending. These historical patterns are described in the next section. Quick preview: Kansas per-student spending in public schools increased rather dramatically this century, but its public school NAEP scores did not—contrary to what the WestEd estimates predict should have actually occurred.

**Best Practice #4. Report the sensitivity of the minimum “cost” estimates to changes in specifications, variables included, and measurement of variables.**

There are myriad reasonable ways to model the costs of educating students. The WestEd researchers should try several alternative specifications and report the results. This is standard practice in all academic empirical work, including the economics of education.

As stated previously, the LPA has correctly noted, “It’s important for the reader to understand that any study involving the estimation of costs for something as complex as K-12 education involves a significant number of decisions and assumptions. Different decisions or assumptions can result in **very different** cost estimates.” (emphasis added)

**Best Practice #5. Estimate a production function to see if the estimates from the production function produce the same relationships between spending and outcomes as the WestEd cost function estimates.**

According to microeconomic theory, a cost function contains “essentially the same information” as a production function.<sup>21</sup> That is, a cost function indicates the minimum level of cost needed to produce a given level of output, while a production function indicates the maximum output possible for a given level of expenditure. Thus, in principle, researchers seeking an estimate of the minimum cost of producing a given output may use either a cost function or a production function to seek to make such an estimate.

Costrell et al. (2008) made the obvious point that researchers should estimate both cost and production functions with the data they have, as was done in Imazeki (2008). Imazeki found tremendous differences in “costs” across the two approaches, which casts doubt on the entire exercise—one of her models found that it would “cost” \$1.7 billion to give all California public schools adequate funding, but her other model found it would cost \$1.7 trillion—yes trillion with a “t.”

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learning.” The National Assessment of Educational Progress (NAEP) is the only nationally representative and continuing assessment of what America’s students know and can do in various subject areas. Assessments are conducted periodically in mathematics, reading, science, writing, the arts, civics, economics, geography, and U.S. history.” <http://www.ksde.org/Agency/Division-of-Learning-Services/Career-Standards-and-Assessment-Services/CSAS-Home/Assessments/National-Assessment-of-Educational-Progress-NAEP>

<sup>21</sup> Hal Varian, *Microeconomic Analysis* (1992) pg. 81, [https://www.amazon.com/Microeconomic-Analysis-Third-Varian-1992-03-17/dp/B01JXTU60C/ref=sr\\_1\\_1?ie=UTF8&qid=1525719746&sr=8-1&keywords=varian+1992](https://www.amazon.com/Microeconomic-Analysis-Third-Varian-1992-03-17/dp/B01JXTU60C/ref=sr_1_1?ie=UTF8&qid=1525719746&sr=8-1&keywords=varian+1992)

Clearly there is a data problem when two models that are supposedly consistent with each other in principle—cost and production functions—do not produce similar estimates of costs.

In principle, cost functions and production functions should be consistent with each other. If they are not in practice, then that tells the researchers that their models are problematic and are not necessarily measuring costs.

**Related Issue**

A related issue has been included in the appendix to this report—this issue is that there is no evidence that Kansas state tests are measuring the *Rose Standards* or even measuring factors that lead to future valuable outcomes for students. In fact, as described in the appendix, there is a large body of evidence that similar tests from other states are not correlated, much less causally related, with valuable future life outcomes contemplated by the *Rose Standards*. Thus, NAEP scores are actually a better metric to measure valuable future outcomes for students.

**Implementing These Five Best Practices**

Given the significant taxpayer funds at stake, both the WestEd researchers and independent economists from Kansas’ universities and colleges should separately perform careful checks for robustness and reliability for at least the five best practices listed above. All data used should be publicly available so that interested Kansas experts may perform their own analyses as well. And, these research teams should have a full twelve months to secure needed data and conduct these analyses.

As shown in the next section, there is a real risk that the WestEd cost function estimates will not prove to be accurate predictors of the historical performance of Kansas public schools, as recent and large increases in spending per-student in Kansas public schools have not had any discernable effect on a national test that has been shown to be a predictor of valuable future student outcomes. The next section provides additional context as well.

## Historical and National Context Regarding Public School Spending

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The Kansas Supreme Court in *Gannon V*, and in prior rulings, has been, all but, requiring the legislative and executive branches to spend significantly more taxpayer money on Kansas public schools. The Court's operating assumption throughout has been that these increases in taxpayer funds will cause better outcomes for students. In this section, I provide some historical and national context for the claim that more taxpayer funds will improve student outcomes in the conventional Kansas public school system.

As stated previously, there is no evidence that the Kansas battery of tests is correlated, or even causally related, to valuable future outcomes for students, including those contemplated by the *Rose Standards*. Further, there is evidence from myriad states that their own state exams are not necessarily correlated with valuable future outcomes such as high school graduation, college attendance, success in college, college graduation, or future labor market earnings. Please see the appendix for a fuller discussion of this issue. Nevertheless, there is a standardized test—given to a sample of public school students in all states—that does have evidence that it is measuring knowledge and skills that lead to beneficial future outcomes. That test is called the National Assessment of Education Progress (NAEP). In this section, NAEP scores are used to provide historical and contextual perspective on relative student outcomes across states and the (in)effectiveness of higher levels of spending in promoting valuable student outcomes.

Average student performance on the NAEP can be compared across states for given years.<sup>22</sup> Given changes in the NAEP assessments over time, it is best to compare changes in individual state performance to national trends. Thus, NAEP scores can be used to ascertain the performance of public school systems across states and changes in their relative performance over time. As mentioned previously, KSDE has said that NAEP “is considered the ‘gold standard’ of assessment,” and empirical work has shown that higher NAEP scores are associated with higher income in the future. That is, there is strong evidence that performance on the NAEP is measuring knowledge and skills that provide value to students in the future.

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<sup>22</sup> The NAEP also has Long-Term Trend results that allow for apples-to-apples comparison of student learning over time. The NAEP Long-Term Trend Assessment is largely unchanged over time in terms of its expectations for student learning. Since the Long-Term Trend Assessment does not contain state-level results, the Main NAEP results are used here. As discussed in the body of this report, given that the Main NAEP does change slightly over time, it is best to compare changes in state-specific results to changes in national results in order to ascertain which states are making learning gains. For a description of the differences between Main NAEP and the NAEP Long-Term Assessment, please see: [https://nces.ed.gov/nationsreportcard/about/ltt\\_main\\_diff.aspx](https://nces.ed.gov/nationsreportcard/about/ltt_main_diff.aspx).

Below is a comparison of NAEP test results for public school students in the U.S. as a whole and for public school students in the states of Florida, Kansas, and New York. And, these NAEP test scores are compared to levels and changes in real (inflation-adjusted) public school spending per-student.<sup>23</sup> The NAEP is given to students in grades 4 and 8, and the results listed below are for public school students only. Florida and New York were chosen as comparison states because they have very different spending levels and historical patterns when compared to Kansas and when compared to each other.

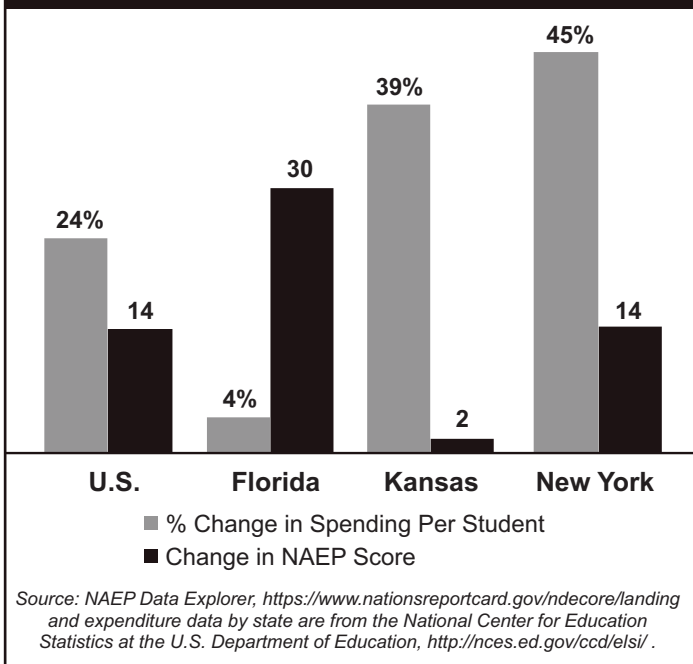
For Grade 4 and Grade 8 Reading scores, one is able to compare the performance of public schools nationally and in Florida, Kansas, and New York from 1998 to 2015. These years and all years referenced below are academic years; therefore 1998 represents the 1997-98 academic year and 2015 represents the 2014-15 academic year. The NAEP results for 2017 are available and usage of them would strengthen each of the conclusions discussed below—Florida's NAEP scores generally increased by more than Kansas between 2015 and 2017, for example. However, I limit the results to 2015 because comparable data on total public school spending per-student are available only up to 2015 from the National Center for Education Statistics at the U.S. Department of Education.<sup>24</sup> Finally, NAEP scores are calculated with decimals, but reported as whole numbers in some venues. I used the decimals to make the calculation of test score changes below, and report the changes as whole numbers. For example, a venue that shows a given change in NAEP scores from 222 to 227 may round to a change of “6” if the NAEP scores were actually 221.7 and 227.4, a difference of 5.7 that would round to “6” when reported here.

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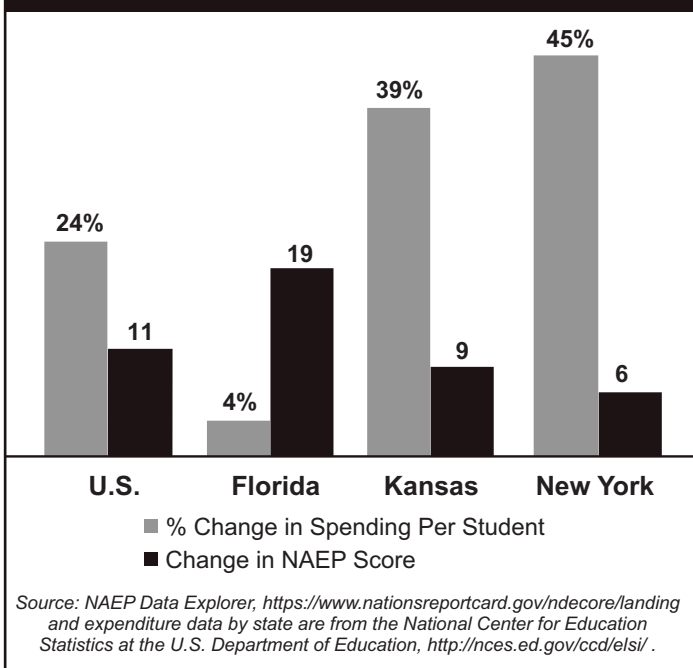
<sup>23</sup> The inflation adjustment is made by using the January CPI-U for each academic year considered, retrieved from [www.bls.gov](http://www.bls.gov). The CPI-U is the headline inflation rate compiled and reported by the U.S. Bureau of Labor Statistics, and slightly overstates actual inflation on a year-to-year basis. These slight overstatements of inflation compound over time to yield large overestimates for lengthy periods of time. For a lay description of this issue, please see: <https://www.forbes.com/sites/scottwinship/2015/06/15/debunking-disagreement-over-cost-of-living-adjustment/#4c352b682eb4>. Given this overstatement of inflation, real increases in spending per-student are actually larger than what is depicted in this report.

<sup>24</sup> I use data on total spending per-student from the National Center for Education Statistics (NCES) at the US Department of Education, because these data are reported annually to the federal government by each state department of education in a manner that allows apples-to-apples comparisons across states. Data reported on state department of education websites often omit large categories of public school spending, including food service, capital and debt service, and/or pension liability payments. These omissions vary by state, often in non-transparent ways. Using NCES data to compare total spending per-student allows researchers to be confident that all public school spending is included and therefore that comparisons across states are valid. While these omissions in spending on state department of education websites may not be an issue in Kansas, they are an issue in almost every other state.

**Figure 1: Change in Real Spending Per-student and NAEP Grade 4 Reading Scores, 1998 to 2015 Low Income Students**



**Figure 2: Change in Real Spending Per-student and NAEP Grade 4 Reading Scores, 1998 to 2015 Not Low Income Students**



**■ Grade 4 Reading Performance**

Figures 1 and 2 show the percent change in “real” inflation-adjusted total spending per-student and the change in NAEP test scores (absolute change in scores; not a percent change) for public school students nationally, and public school students in Florida, Kansas, and New York. Figure 1 contains NAEP results for Grade 4 “low income students”—defined as students eligible for a free or reduced price lunch, while

Figure 2 contains NAEP results for Grade 4 “not low income students”—defined as students not eligible for subsidized meals at school.

As shown in Figures 1 and 2, public school students nationally and in both Kansas and New York experienced very large increases in real resources devoted to their schooling. Specifically, public school students nationally in 2015 had 24 percent more spent on their schooling relative to public school students in 1998. That is, per-student spending, adjusted for inflation, increased by 24 percent between 1998 and 2015. This significant national increase in spending per-student masks differences in rates of change across states. In Kansas, the increase in spending was significantly larger—Kansas public school students had 39 percent more spent on their schooling in 2015, relative to Kansas students of 1998. Real spending per-student increased by even more in New York over this time period, with a 45 percent increase. In contrast, the real increase in spending on Florida public school students was modest—only four percent between 1998 and 2015.

The Main NAEP changes over time to reflect changes in what is taught (please refer to Footnote 22 for a discussion of the distinctions between Main NAEP and Long-Term Trend NAEP). Therefore, it is difficult to ascertain whether national changes in scores are true increases in learning. That said, it is valid to compare changes in scores across states and changes in individual state scores to changes in national scores, as states who have gains that exceed national average gains are outperforming national trends. States that have test score gains or losses below national gains are clearly underperforming as compared to national trends. Given that the tests change over time, any national gain in scores or decrease in scores may be due to real changes in average student learning or due to changes in the test; we cannot distinguish between the two. (To measure whether the national average is improving, staying the same, or declining over time, one must analyze changes in NAEP Long-Term Trend results.)<sup>25</sup>

Even though Florida had only a modest increase in real spending per-student, its public school students experienced a very large gain in 4th Grade Reading scores. These gains were much larger than national increases. Specifically, low income students in Florida saw a gain of 30 points in 4th Grade Reading scores, as compared to the national gain of 14 points (Figure 1). Florida students who were not low income gained 19 points, as compared to a national gain of 11 points (Figure 2).

<sup>25</sup> It is well known that NAEP Long-Term Trend scores have been relatively flat over a many-decade period, despite dramatic increases in real (inflation-adjusted) spending per-student in American public schools. These trends are publicly available from the NAEP Data Explorer and the National Center for Education Statistics at the U.S. Department of Education, respectively. Please see: [https://nces.ed.gov/programs/digest/d17/tables/dt17\\_236.55.asp?current=yes](https://nces.ed.gov/programs/digest/d17/tables/dt17_236.55.asp?current=yes) and <https://www.nationsreportcard.gov/ndecore/xplore/ltr> to access these trends in per-student spending and test scores for American public schools.

Despite extremely large real increases in real spending per-student, Kansas and New York state students experienced gains below the national average. Despite a 39 percent increase in real spending per-student, Kansas public schools experienced a 2-point gain among low income students (Figure 1) and a 9-point gain among students who were not from low income backgrounds (Figure 2) in 4th Grade Reading scores on the NAEP.

Even with a 45 percent real increase in per-student spending—an extremely large increase over this 17-year period, the gains in New York state were at the national average for low income students (Figure 1) and well below the national average for other students (Figure 2).

**Thus, Florida—with by far the lowest real increase in spending (only four percent over this 17-year period)—had significantly larger learning gains in Grade 4 Reading performance than public schools nationally and public schools in Kansas and New York State.**

■ **Grade 8 Reading Performance**

Figure 3 contains NAEP results for Grade 8 “low income students”—defined as students eligible for a free or reduced price lunch, while Figure 4 contains NAEP results for Grade 8 “not low income students”—defined as students not eligible for subsidized meals at school.

Figure 3 shows a similar pattern as the previous subsection—despite only very modest real increases in spending per-student (four percent) over a 17-year period, 8th graders in Florida public schools experienced out-sized gains in Reading when compared to the national public school average and to gains in Kansas and New York public schools. In fact,

Florida’s gains were twice the national average, while New York’s and Kansas’ gains were half or less than half the national average.

As shown in Figure 4, gains in Reading for Florida students who were not from low income backgrounds were only slightly above the national average, while the gains in Kansas and New York were well below national gains.

**Thus, Florida—with by far the lowest real increase in spending (only four percent over this 17-year period)—had significantly larger learning gains, especially among low income students, in Grade 8 Reading performance than public schools nationally and public schools in Kansas and New York state.**

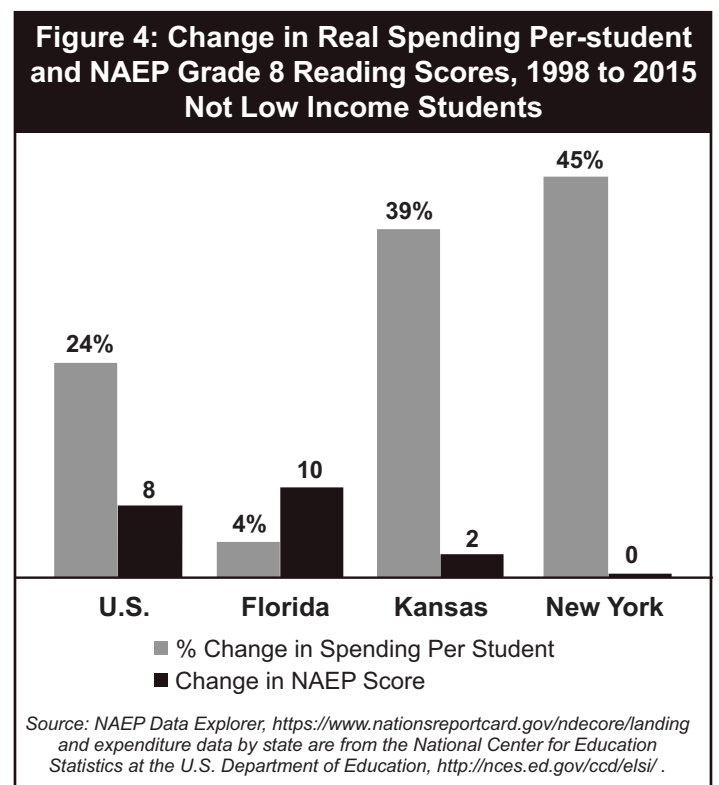
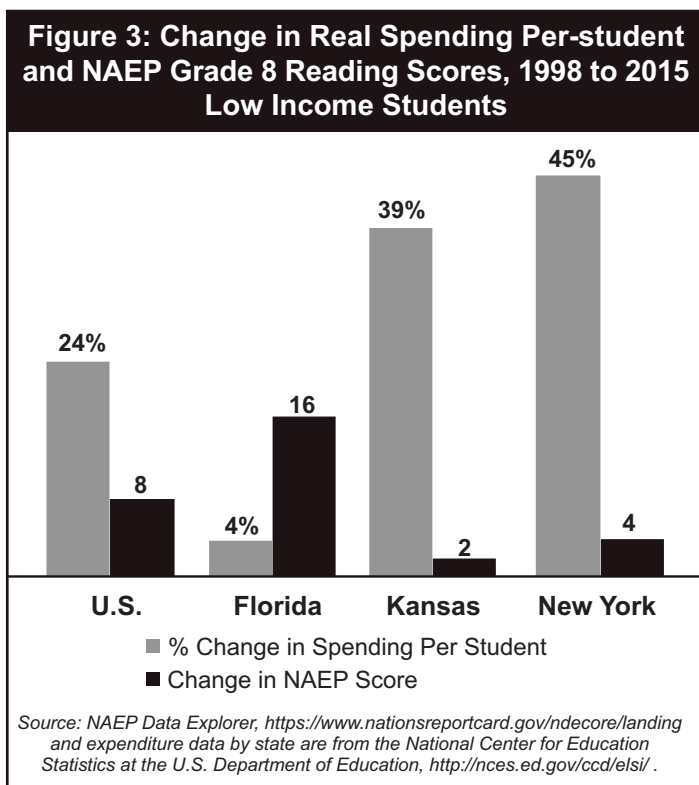
■ **Grade 4 Mathematics Performance**

For Math scores, comparisons can only be made back to 2003. That is, 2003 is as far back as one can go given data availability for all states under consideration here.

Figure 5 contains NAEP results for Grade 4 “low income students”—defined as students eligible for a free or reduced price lunch, while Figure 6 contains NAEP results for Grade 4 “not low income students”—defined as students not eligible for subsidized meals at school.

As shown in Figures 5 and 6, between 2003 and 2015, real spending per-student actually fell by four-tenths of one percent in Florida. Nationally, real spending per-student in public schools increased by seven percent during this time period, while increases in Kansas (19 percent) and New York (27 percent) were significantly higher.

For low income students, the patterns were similar for Grade 4 Mathematics performance when compared to NAEP



Reading patterns. Specifically, despite a tiny decrease in real spending per-student over this 12-year period, Florida’s low income students gained 5 more points, relative to national gains for low income students (Figure 5). Also from Figure 5, low income students in New York experienced half the gains of low income students nationally, while low income students in Kansas made no absolute test score gains over this time period.

With respect to performance in Grade 4 Mathematics among students who were not from low income backgrounds, Florida’s gains were the same as the national average, while the gains in Kansas and New York were less than half the national average (Figure 6).

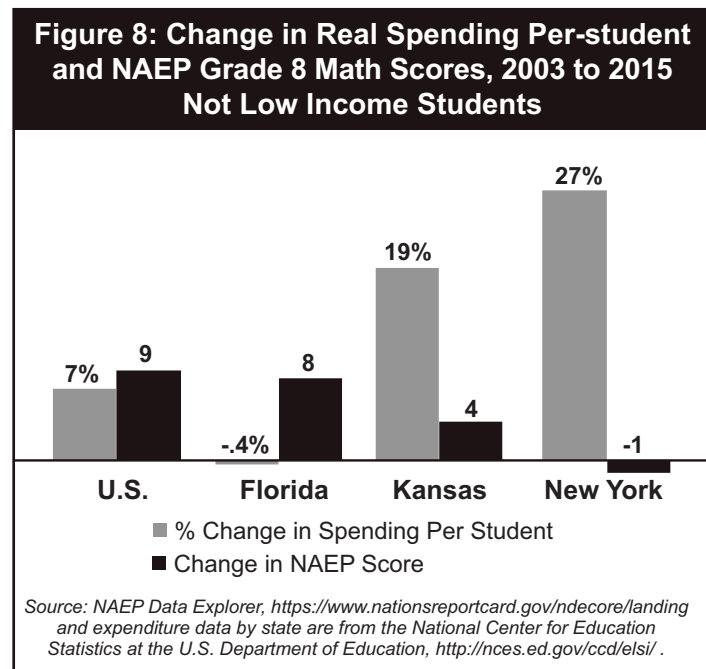
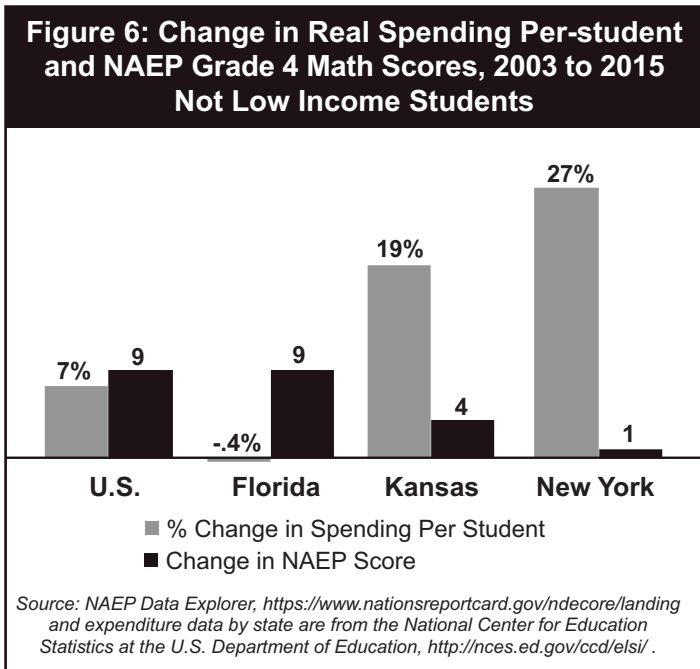
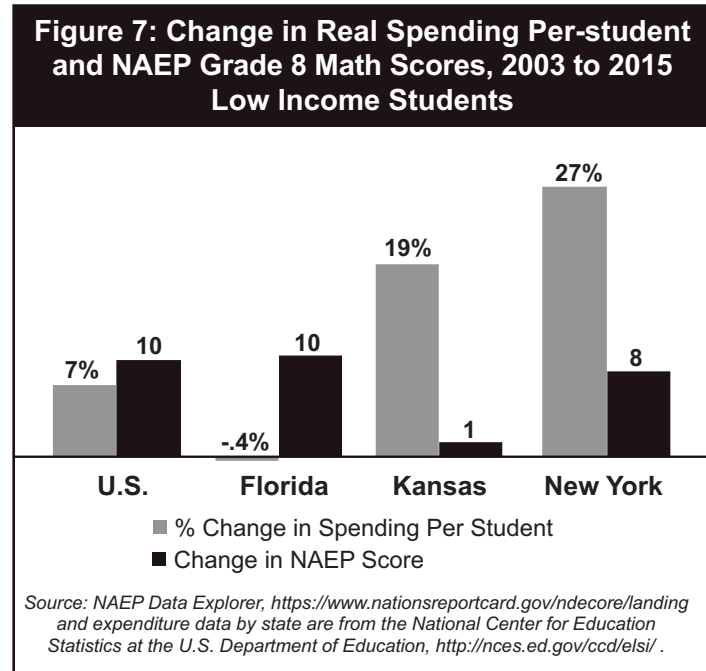
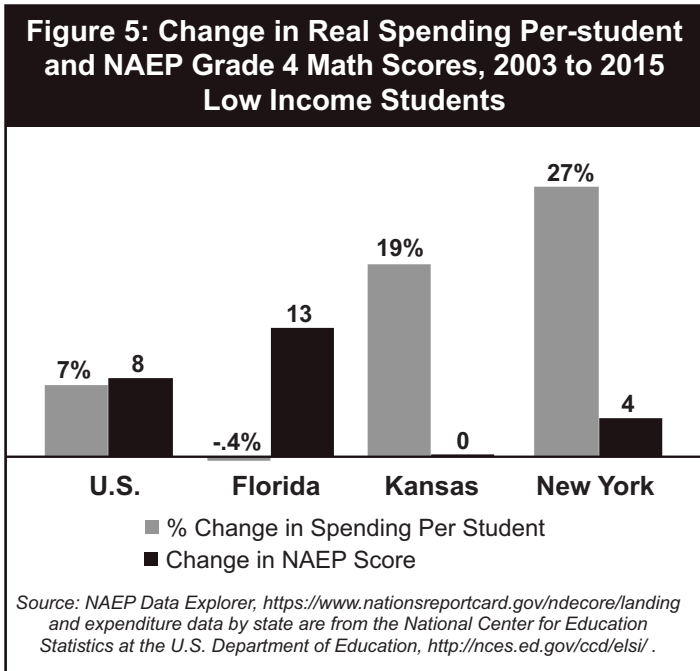
**Thus, Florida—with a slight decrease in real per-student spending (-0.4 percent over this 12-year period)—had**

**significantly larger learning gains, especially among low income students, in Grade 4 Mathematics performance than public schools in Kansas and New York state.**

**■ Grade 8 Mathematics Performance**

Figure 7 contains NAEP results for Grade 8 “low income students”—defined as students eligible for a free or reduced price lunch, while Figure 8 contains NAEP results for Grade 8 “not low income students”—defined as students not eligible for subsidized meals at school.

As shown in Figures 7 and 8, between 2003 and 2015, changes in NAEP Grade 8 Mathematics scores among Florida’s students were not significantly different than changes in the national average. However, both Kansas and New York’s public school 8th graders experienced



significantly lower learning gains relative to the national average over this 12-year period.

**Thus, Florida—with a slight decrease in real per-student spending (-0.4 percent over this 12-year period)—had learning gains similar to the national average in Grade 8 Mathematics performance, while gains in the public schools in Kansas and New York state lagged behind, despite the latter having increases in spending of 19 percent and 27 percent, respectively.**

All of the data in this section are well-known and widely-used by researchers and education policy experts and are publicly available from the U.S. Department of Education. **These data indicate there has been no historical relationship between increases in real spending per-student and increases in student performance on a valid battery of tests.**

***Other Ways to Consider Relationships Between Spending and Student Outcomes***

Perhaps differences in *levels* of spending have a positive relationship with student learning gains.

In reality, it is not the case that Florida public schools have been spending more per-student than public schools in Kansas and New York, and that higher *levels* of spending are responsible for the outsized gains in Florida. One might expect public school spending to be significantly higher in Florida relative to Kansas, as the cost of living in Florida was about 10 percent higher than the cost of living in Kansas in 2015, and the majority of public school spending is devoted to employee compensation. But the state of New York had an estimated cost of living that was 35 percent above Florida’s, so one would expect New York to spend about 35 percent more than Florida, all else equal.<sup>26</sup>

In 1998, at the beginning of the time period analyzed here, Florida public schools actually spent slightly more per-student than Kansas—in academic year 1998, Florida public schools spent \$6,752 per-student, while Kansas public schools spent \$6,343 per-student in nominal (actual) dollars, using NCEES figures for total spending per-student. However, this pattern changed radically with the dawn of the new century, and by 2002 Kansas public schools were spending almost \$400 per-student more than Florida. And, by the 2015 academic year, Kansas public schools were spending 25.4 percent more per-student than Florida public schools—\$12,753 per-student in Kansas relative to \$10,168 per-student in Florida. Thus, students who graduated high school in 2015 in Kansas has significantly more spent on their schooling than their counterparts in Florida in every year of their public school career—and Florida public schools appear to have outperformed Kansas public schools, especially for low income students.

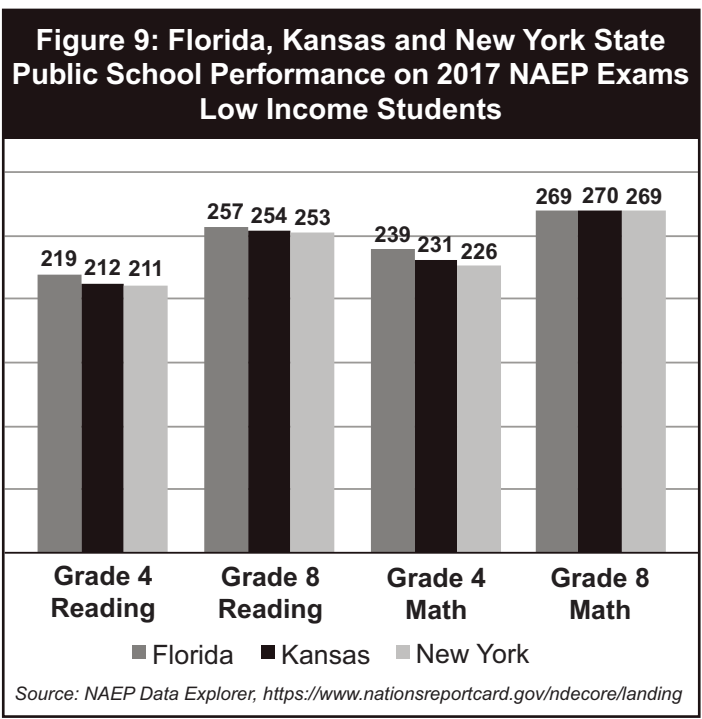
<sup>26</sup> This cost of living estimates were generated by the Missouri Economic Research and Information Center (MERIC), and are reported here: <http://dakotafreepress.com/2016/02/23/south-dakota-2015-cost-of-living-102-5-of-natl-average-2nd-highest-in-region/>.

New York presents an interesting contrast with both Florida and Kansas. In 1998, the earliest year for which complete data are available for each of these three states, New York state public schools spent 55 percent more per-student than public schools in Florida and 65 percent more per-student than Kansas—significantly more spending than can be explained by cost of living differentials alone. Not only did New York state begin the time period under study with significantly higher spending, it, as stated previously, also experienced a higher growth rate in spending. Between 1998 and 2015, real (inflation-adjusted) spending per-student increased by four percent in Florida, 39 percent in Kansas, and 45 percent in New York state. So, not only did New York start the time period under study with significantly higher spending, it also experienced a higher growth rate in spending. By 2015, public schools in the state of New York were spending \$21,836 per-student, while Kansas was spending \$12,753 per-student, and Florida \$10,168 per-student.

Given these very large differences in per-student spending, guess which of these three states had the highest NAEP scores in 2017?

As shown in Figures 9 and 10, for the most part, Florida public schools outperform their counterparts in both Kansas and New York.

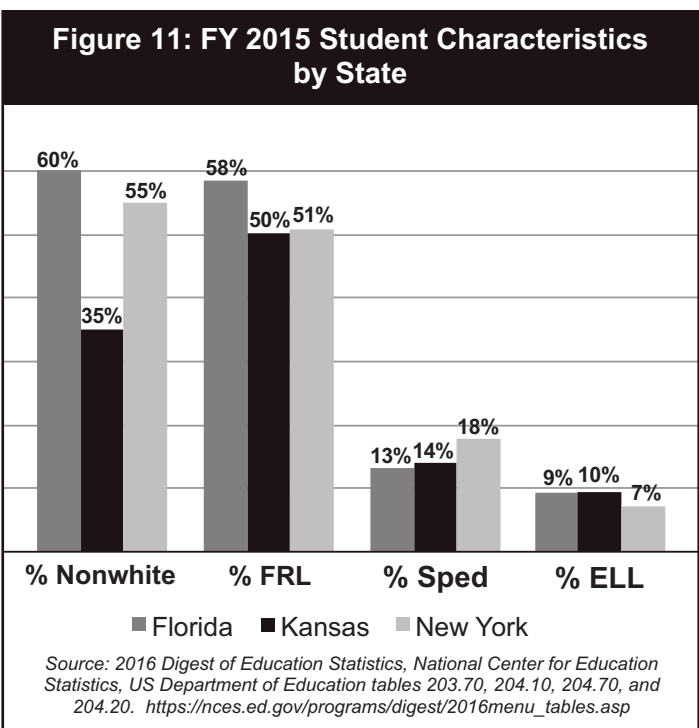
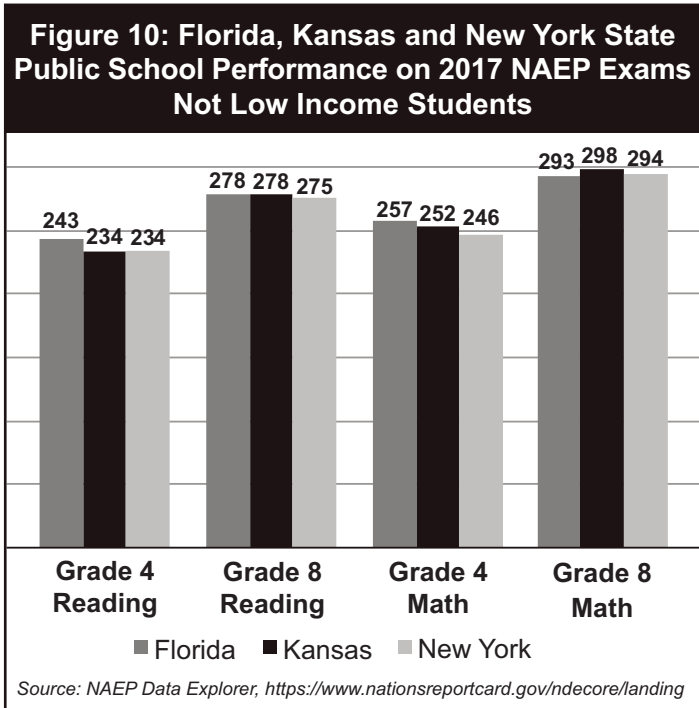
Differences in student characteristics also do not seem to explain spending differences between public schools in Kansas and Florida and New York and Florida. As shown in Figure 11, Kansas public schools have slightly higher proportions of students who use special education (SPED) or English Language Learner (ELL) services relative to Florida. In both cases, the differences are less than one percentage point. However, Florida has 8.3 percentage points more low income students (as measured by eligibility for a free or reduced





price lunch, FRL) and 25 percentage points more nonwhite students—60 percent of Florida students are nonwhite as compared to 35 percent of Kansas students. With respect to the states of New York and Florida, New York has five percentage points more special needs students, but Florida has more nonwhite students, more English Language Learner students, and more low income students relative to New York. Given the historical evidence on the public school systems in the states of Florida, Kansas, and New York, one cannot conclude that there is a positive relationship between more money spent on the public education system and higher student performance. Per its mandate that the taxpayers of

Kansas spend significantly more money on Kansas public schools, why does the Kansas Supreme Court believe “this time will be different”? That belief is contrary to longstanding historical patterns and to differences in spending and performance between Florida, Kansas, and New York. Clearly Florida’s public education system is doing something that Kansas should emulate—and that something is not related to spending more money on the current Kansas public education system.



## Concluding Remarks

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Please recall the definition of the word “minimum” from *The Merriam-Webster Dictionary*:

the least quantity assignable, admissible, or possible<sup>27</sup>

Given the historical evidence from Kansas and Florida public schools on a battery of tests that have “considered as the ‘gold standard’ of assessment” according to the KSDE and been validated as promoting higher income and economic growth (NAEP), “the least quantity assignable, admissible, or possible” to achieve tremendous learning gains as measured by NAEP is more than 25 percent *below* what Kansas currently spends per-student. [Yes, Kansas has a higher proportion of students in smaller schools relative to Florida, but Florida has a cost of living that is 10 percent higher than Kansas. Kansas has a slightly higher proportion of students who use special education and English language learner services, but Florida has significantly more disadvantaged students and tremendously more minority students who experienced historical disadvantages.] Moreover, public schools in the state of New York provide evidence that even spending dramatically more per-student on public schools than Kansas does not ensure improved student outcomes.

If the Kansas Supreme Court’s only interest is in improving valuable outcomes for Kansas students and if the Court (rightly or wrongly) feels a constitutional duty to act, then it should require public school leaders and policymakers to mimic Florida’s education policies—significant taxpayer-funded education choice opportunities among private, public charter, and virtual schools, A-F grading of schools, implementing only scientifically-based reading programs, etc.<sup>28</sup> If the Court’s interest is something else, then it should make public what that other interest is.

I agree with myriad other researchers, including the lead author of the WestEd report, that other approaches to estimate the minimum costs required to achieve a desired level of outcome given school circumstances are frankly terrible. While cost functions in theory may be better than professional judgement and other approaches, that does not necessarily

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<sup>27</sup> <https://www.merriam-webster.com/dictionary/minimum>

<sup>28</sup> I do not support the courts mandating higher spending in public schools—given the tremendous real increases in per-student spending that have occurred since 1970. As an example, public school students in Kansas and from sea to shining sea have dramatically more access to staff relative to students of decades past with stagnant outcomes to show for it, <https://www.ed-choice.org/research/back-staffing-surge/>. I also do not support courts mandating changes in education policy with the goal of boosting overall levels of student achievement, as courts are not necessarily education experts. Spending on public schools in Kansas far exceeds any reasonable definition of adequate. But, if the Court has some mysterious definition of adequate and if the Court is true to its word that it wants proof as to what minimum level of spending will improve student outcomes, the historical and contextual evidence is clear that it should mandate that the Kansas K-12 education system adopt something akin to Florida’s complete battery of education policies. Spending more money per-student has been a costly failure in Kansas (and nationally) to date. Florida’s battery of education policies has led to tremendous gains in student outcomes—at a 25 percent lower cost than Kansas.

imply they produce accurate estimates of these minimum costs in practice. As shown in this report, inherent data limitations indicate that even a well-designed and well-executed cost function approach will yield very large overestimates of the minimum costs of providing an adequate education for all Kansas students. Here is one example of the limitations of cost functions—small rural schools by necessity have very small class sizes. For some courses, it may make sense for rural schools to band together to have students instructed with the very best teachers Kansas has to offer through virtual means. It may be cheaper to have eight Algebra students from four different rural schools be served by a single and excellent math teacher than for each of the four schools to have their own in-person Algebra teacher. It also may have a positive impact on actual student outcomes and educational opportunities afforded to rural students, especially for Advanced Placement courses, other advanced courses, and specialty courses. Perhaps each school’s media specialist or a teacher aide (who is significantly lower cost than a teacher) could monitor and aid students during their live virtual instruction. Such a cost saving measure may or may not improve student achievement in Algebra—but a cost model cannot help one ascertain as to whether this virtual instruction would or would not improve student learning. And, this example was only but one. As stated by LPA, “... within these cost studies we weren’t directed to, nor did we try to, examine the most cost-effective way for Kansas school districts to be organized and operated. Those can be major studies in their own right.” Cost function approaches, by construction, ignore investigations of cost-effective approaches, which suggests that cost function approaches are not investigating what minimum costs are truly possible.

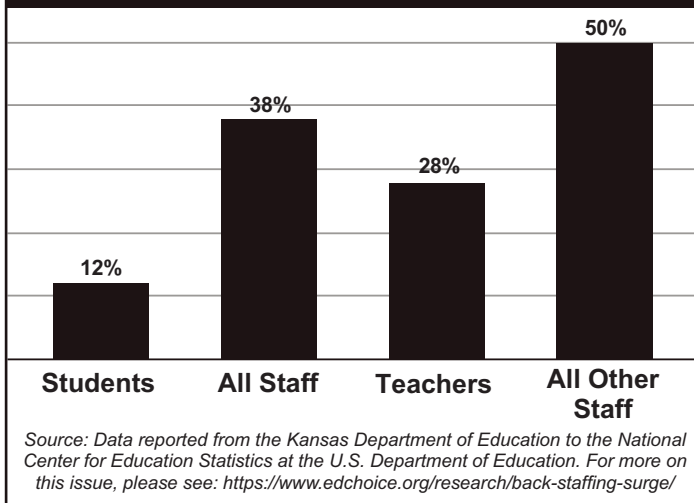
How could large increases in school funding not translate into improved student outcomes? There are likely several possibilities, but let me explain two. First, there are four broad factors that potentially determine the achievement of valuable student outcomes in the conventional public school system:

1. Students, Families, and their Neighborhoods
2. Public School Leadership
3. Education Policies
4. Education Finance.

As I am conceiving these categories, number 1 is determined outside of the control of schools and policymakers. The Kansas Supreme Court has chosen to focus solely on number 4, which has not had a good track record at boosting valuable student outcomes in Kansas, or nationally for that matter. Perhaps focusing on number 4, Education Finance, diverts attention from making improvements with respect to numbers 2 and 3—Public School Leadership and Education Policies. With respect to the latter, it is clear that Florida—lower spending per-student, higher achievement, and higher gains in achievement—has policies that Kansas should consider.

A second possibility is the well-known tradeoff that exists between quantity and quality in many walks of life. Since

**Figure 12: Kansas Public School Staffing Surge  
FY 1992 to 2015**



1992, and likely before as well, Kansas public schools have been hiring staff at a rate far in excess of what was needed to accommodate student enrollment growth.

This increase in the quantity of personnel will have lowered the average quality of personnel—under the assumption that Kansas public schools have endeavored to hire the best people they can find when adding staff. If Kansas public schools seek to hire the most effective person for each job opening, as they hire more and more staff, they are forced to reach down the quality distribution—thereby lowering average staff effectiveness. Thus, if Kansas public schools endeavor to hire the best personnel they can and if personnel differ in terms of their effectiveness, then a tradeoff between quality and quantity is present.

Statewide increases in school funding may translate into hiring more staff, lowering the average quality of staff, and therefore not allowing even accurate cost model estimates to extrapolate the effects of funding increases accurately in the manner that WestEd and all cost function research suggests. More funding and the concomitant increase in staffing would lower the average effectiveness of personnel and perhaps lowering student outcomes.

Again, these are two possible reasons why historical increases in funding for public schools have not translated into measurable gains in valuable outcomes for students, and why future increases in funding may also have this sad result.

I wish to leave the branches of the Kansas state government with the following parable from Nobel Laureate Milton Friedman:

- “There are four ways in which you can spend money.
- (1) You can spend your own money on yourself. When you do that, why then you really watch out what you’re doing, and you try to get the most for your money.
  - (2) Then you can spend your own money on somebody else. For example, I buy a birthday present for someone.

Well, then I’m not so careful about the content of the present, but I’m very careful about the cost. (3) Then, I can spend somebody else’s money on myself. And if I spend somebody else’s money on myself, then I’m sure going to have a good lunch! (4) Finally, I can spend somebody else’s money on somebody else. And if I spend somebody else’s money on somebody else, I’m not concerned about how much it is, and I’m not concerned about what I get.”<sup>29</sup> (emphasis added)

The branches of the Kansas state government are contemplating whether to spend more of somebody else’s money on somebody else, which is one reason to carefully consider the issues with cost functions raised and best practices offered in this report. Perhaps a better reason to carefully consider these is the importance of education itself—a core function of state government—and the tremendous sum of taxpayer dollars being discussed.

The Kansas State Supreme Court and at least some Kansas elected officials desire to spend significantly more of the money of Kansas taxpayers on conventional Kansas public schools. If history is any guide, this approach will be a costly failure.

*That said, the Kansas State Supreme Court can prove history wrong!* Suppose that the Kansas State Supreme Court has a strong faith that the estimates produced by the WestEd cost function approach are accurate and yield accurate information on the minimum level of spending required to give students in each Kansas school the opportunity to meet the *Rose* Standards. If the WestEd model is accurate, then implementing the five best practices described in this report will validate it. If the model is not accurate, then these best practices will reveal that as well. These best practices should be implemented because it is the right thing to do; they are standard practice in academic research; and the stakes are so high for Kansas students and taxpayers.

Finally, the WestEd cost model report contemplates giving more money to all students—even students who are currently meeting standards. If Kansas state courts and policy-makers wish to ensure students have an educational opportunity that “is reasonably calculated to have all Kansas public education students meet or exceed the standards set out in *Rose* and presently codified in K.S.A. 2016 Supp. 72-1127,” and they believe more money is the only or best answer, then logic indicates that all students do not need more funding—only students who are currently below standard. Thus, even if implementing the five best practices listed in this report indicate that the WestEd cost model estimates are accurate, then the true increase in spending required to provide these adequate educational opportunities will be far less than the total listed in the WestEd report, as funds “required” to provide these opportunities will be targeted only to students who are not meeting standards.

<sup>29</sup> <http://lpmaryland.org/liberty-quotation-milton-friedman-four-ways-spend-money/>

## Appendix

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### ■ *How to Define and Operationalize Measures of an Adequate Education?*

The state of Kansas contracted with WestEd to “estimate the minimum spending required to produce a given outcome within a given educational environment.” Which begs the question—what outcome?

Spurred by the Kansas Supreme Court, the Kansas Legislature passed the “Rose Standards” into law in 2014 in HB 2506.<sup>30</sup> These Kansas “Rose Standards” appear to be adapted from a 1989 State Supreme Court case from Kentucky. The Kansas Rose Standards are a list of goals for public school students. In Kansas state law, these goals are:

- Sufficient oral and written communication skills to enable students to function in a complex and rapidly changing civilization;
- Sufficient knowledge of economic, social, and political systems to enable the student to make informed choices;
- Sufficient understanding of governmental processes to enable the student to understand the issues that affect his or her community, state, and nation;
- Sufficient self-knowledge and knowledge of his or her mental and physical wellness;
- Sufficient grounding in the arts to enable each student to appreciate his or her cultural and historical heritage;
- Sufficient training or preparation for advanced training in either academic or vocational fields so as to enable each child to choose and pursue life work intelligently; and
- Sufficient levels of academic or vocational skills to enable public school students to compete favorably with their counterparts in surrounding states, in academics or in the job market.<sup>31</sup>

As stated above, the Kansas Supreme Court wants the executive and legislative branches of the state of Kansas to prove that its system of financing K-12 public schools is adequate and equitable. Specifically, from the *Gannon V* opinion, it appears that the Kansas Supreme Courts wants federal, state, and local taxpayers to provide enough funding for all public schools in Kansas such that this amount “is reasonably calculated to have all Kansas public education students meet or exceed the standards set out in *Rose* and presently codified in K.S.A. 2016 Supp. 72-1127.”

Clearly, these *Rose* Standards are terse and lack specificity. In addition, reasonable people can disagree about what skills students need today. Do students need to learn cursive? PowerPoint or Prezi—or some other oral presentation tool even more advanced? Given the ever increasing amounts of information on the internet, should students spend so much

time learning basic facts? Maybe basic facts, but what about higher order facts? There does not seem to be one obviously correct answer to such questions. Given the inherent lack of specificity in the Kansas *Rose* Standards and given that the words “adequate” and “equitable” are not defined or even present in the Constitution of the State of Kansas, the state has an incredible burden of proof indeed.

Thus, the list of seven goals, hereafter called the *Rose* Standards—is ambiguous for the purposes of creating actual operational measures of adequacy. For example, how does a state Supreme Court Justice, a researcher, an educator, or a parent ascertain whether a given student has “sufficient oral and written communication skills” to enable that student “to function in a complex and rapidly changing civilization”? Kansas does have standardized assessments in writing and oral skills (KELPA<sub>2</sub> Assessments).<sup>32</sup> Perhaps passing these standardized assessments would suggest a student has the oral and written communication skills to “function in a complex and rapidly changing civilization.”

Or, perhaps not ....

Jay Greene of the University of Arkansas has compiled a list of ten rigorous empirical studies—from nine different research teams who used data from many states—that find that gains on state-based standardized tests are not necessarily associated with gains in valuable future outcomes like graduating high school, college attendance, success in college, and future labor market earnings.<sup>33</sup> The list of studies, with hyperlinks to the underlying studies, is below:

1. *Angrist, et al, 2014* – Huge state test score gains, no increase in high school graduation rate or postsecondary attendance. Shift from 2 to 4 year universities
2. *Dobbie and Fryer, 2014* – Same as #1
3. *Tuttle, et al, 2015* – Large state test score gains, no or small effect on high school graduation rate, depending on analysis used
4. *Beauregard, 2015* – improving state test scores, no increase in college enrollment
5. *Unterman, et al, 2016* – same as #1
6. *Dobbie and Fryer, 2016* – Increased state test scores and college enrollment, but no effect on earnings
7. *Booker, et al, 2014* – No state test score gains but large increase in high school graduation rate, college attendance, and earnings
8. *Wolf, et al, 2013* – Little or no state test score gain but large increase in high school graduation rate
9. *Cowen, et al, 2013* – Little or no state test score gain but large increase in high school graduation rate

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<sup>32</sup> <http://www.ksassessments.org/sites/default/files/documents/2017-2018KansasAssessmentsOverview.pdf>

<sup>33</sup> <https://jaypgreene.com/2016/11/05/evidence-for-the-disconnect-between-changing-test-scores-and-changing-later-life-outcomes/>

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<sup>30</sup> [http://kslegislature.org/li\\_2014/b2013\\_14/measures/hb2506/](http://kslegislature.org/li_2014/b2013_14/measures/hb2506/)

<sup>31</sup> [http://www.mainstreamcoalition.org/what\\_are\\_the\\_rose\\_standards](http://www.mainstreamcoalition.org/what_are_the_rose_standards)

10. *Chingos and Peterson, 2013* – modest state test score gain, larger college enrollment improvement

Further, a new stream of research, by various research teams, is finding that some schools and approaches that lead to improvements in student test scores appear to be harming valuable non-cognitive skills such as grit, conscientiousness, and self-control. Most of this research is unpublished and preliminary, but an early published study was conducted by Angela Duckworth at the University of Pennsylvania, Martin West of Harvard University, and colleagues.<sup>34</sup> As an example of the tradeoff this research finding highlights, approaches that improve test scores on academic subjects per the several of the *Rose Standards* listed above may harm outcomes per the fourth *Rose Standard* (mental wellness).

The punch line of the ten empirical studies listed above and the new research by Duckworth, West, and colleagues is that gains in *state* standardized tests may not necessarily be associated with gains in later life outcomes that many claim (and the *Rose Standards* claim) are the ultimate goals. In fact, more often than not, these *state* test scores may be providing little useful information about future outcomes for which are ultimate goals contemplated by the *Rose Standards*. To be clear, I am not anti-testing, but there is a significant bundle of evidence that states are not producing tests that are positively related to valuable future life outcomes.

If the Kansas Supreme Court or any policymaker or researcher wishes to deem standardized tests in Kansas as valid operational measures of the *Rose Standards* that actually provide value to students' future outcomes, then the burden of proof is on them to show such evidence. I am not aware of any evidence that higher scores on Kansas standardized tests—all else held equal—caused improvements in students' later life outcomes as contemplated by the *Rose Standards*. Given this absence of evidence, student scores on these exams should not be used to make policy or State Supreme Court determinations with respect to the adequacy of school funding. And, as the large body of research findings makes clear, a partial analysis of some of the *Rose Standards* will not do, as schools may promote some outcomes (that may be measured by tests) while simultaneously harming others.

The cost function methodology, discussed in this report, relies on specific operational measures of student outcomes and presumes that these specific operational measures provide value to students later in life—and presumes that they encompass all of the *Rose Standards*. To my knowledge, there is no evidence that Kansas' battery of standardized tests is an accurate measure of the ambiguous *Rose Standards* or is an accurate measure of skills needed to foster good outcomes for students later in life. There is a large body of evidence that state tests in a large number of states are not necessarily correlated with valuable future outcomes for students. With zero actual evidence, why should policymakers think the Kansas tests are different?

Thus, cost function approaches or any approaches that use the results of Kansas state tests to ascertain whether public school funding is adequate have not been shown to be analyzing a valid metric of student outcomes. As stated in the body of this report, there is evidence that NAEP assessments are good predictors of valuable future outcomes like income and economic growth. Unfortunately, large increases in per-student spending in public schools have not historically led to increases in NAEP performance.

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<sup>34</sup> <http://journals.sagepub.com/doi/abs/10.3102/0162373715597298>



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