

TO: Senate Select Committee on Education Finance, Kansas Legislature

FROM: Dr. Lori T. Taylor & Jason Willis

DATE: ~~Wednesday, March 28, 2018~~ **Monday, April 2, 2018**

SUBJECT: **AMENDED** Follow-up Requests from Committee Members, Responses from Consultants

On Monday, March 19, 2018 testimony was provided before the Senate Select Committee on Education Finance of the Kansas Legislature to present the *Estimating the Costs Associated with Reaching Student Achievement Expectations for Kansas Public Education Students: A Cost Function Approach* report. There were several follow-up requests from committee members. Each of those requests are captured below.

1. What effect would there be if the analysis observed a quadratic (non-linear) relationship of spending to outcomes compared to the current model which is a linear relationship?
2. What is the size threshold (of a school district) at which costs begin to increase?
3. What factors are included in the economies of scale index?
4. What is the difference between the maintenance and compensatory support scenarios?
5. The maintenance scenario contains a performance threshold of 0.50 NCE score and a 95% graduation rate. Is the 95% a statewide rate or the rate reached by each district?
6. Can the research team provide other cost estimates at various ELA/math passing rates?
7. Does the research team have examples of states that have created a 'minimum funding guarantee' for public education? What has been the impact of that legislative language?
8. Can the research team reproduce the map on page 80 of your report to identify the school district values in the northeastern corner of the state?
9. Can the research team produce the cost estimates for seven years?
10. What impact, if any, would removal of the KPERS spending have on the findings?
11. Can the research team expand upon the strategies that may be employed by the Legislative Post Audit (LPA) that further expands upon finding #9 in the report?

1. What effect would there be if the analysis observed a quadratic (non-linear) relationship of spending to outcomes compared to the current model which is a linear relationship?

The research team re-ran the analysis assessing the impact of a quadratic or non-linear relationship of spending to outcomes and found that the squared terms were statistically insignificant, indicating that the relationship was not quadratic. Below are the coefficient estimates and associated significance tests generated from the re-run of the analysis.

LABELS	Baseline	Quadratic Outputs Model
Normal Curve Equivalent	5.295***	4.796***
	(0.607)	(0.926)
NCE, squared		0.570
		(0.712)
Graduation Rate	1.244***	0.284
	(0.262)	(1.057)
Graduation Rate, squared		0.590
		(0.627)
Graduation Rate * High School	0.696***	0.699***
	(0.0995)	(0.101)
District Enrollment	-1.444***	-1.444***
	(0.0568)	(0.0569)
District Enrollment squared	0.0991***	0.0991***
	(0.00378)	(0.00378)
Salary index (log)	1.373***	1.332***
	(0.279)	(0.280)
Rural indicator	0.0505***	0.0505***
	(0.0112)	(0.0112)
% Economically Disadvantaged	0.886***	0.900***
	(0.078)	(0.0792)
% English Language Learner	0.226***	0.236***
	(0.0667)	(0.0666)
% Special Education	2.157***	2.179***
	(0.226)	(0.229)
Population Density	0.166***	0.171***
	(0.018)	(0.0183)
Elementary grades served	-0.129***	-0.130***
	(0.016)	(0.0159)
High school grades served	-0.508***	-0.511***
	(0.0909)	(0.0920)
Salary Index (log), squared	-0.648	-0.550
	(0.578)	(0.581)
% English Language Learner, sq	-0.623***	-0.640***

LABELS	Baseline	Quadratic Outputs Model
	(0.109)	(0.109)
% Special Education, sq	-6.135***	-6.211***
	(0.674)	(0.684)
Population density, squared	-0.00202	-0.00208
	(0.00134)	(0.00133)
Population density* Salary Index	-0.510***	-0.519***
	(0.0414)	(0.0419)
AYP Schoolyear = 2016	-0.0364***	-0.0366***
	(0.00591)	(0.00591)
First stage Residuals, NCE	-5.102***	-5.180***
	(0.609)	(0.608)
First stage residuals, Graduation	-1.454***	-1.517***
	(0.271)	(0.280)
Constant	9.644***	10.12***
	(0.357)	(0.550)
Error Variance		
Herfindahl Index, log	0.797***	0.798***
	(0.249)	(0.248)
Border metro	2.320***	2.268***
	(0.372)	(0.364)
% Owner occupied	7.293***	7.154***
	(1.321)	(1.286)
% Over 60	-2.316	-1.976
	(1.496)	(1.475)
% College	-12.06***	-11.90***
	(1.542)	(1.415)
Usigma	-7.214***	-7.294***
	(0.958)	(0.941)
Vsigma	-4.095***	-4.086***
	(0.0418)	(0.0415)
Observations	2,310	2,310

2. What is the size threshold (of a school district) at which costs begin to increase?

The size threshold (of a school district) at which costs begin to increase is 1,464 students.

3. What factors are included in the economies of scale index?

School district enrollment is the only factor used to derive the economies of scale index. The U-shaped curve observed in Kansas is consistent with a large body of research demonstrating the

same effect in other states as well as national data sets. The costs that may be more highly associated with higher levels of spending may be urbanicity or the demographic of the students. However, even when held constant it is likely that the loading – or the increased cost – would be born on wages within those school districts. That is, if the cost was not to show up in the economies of scale it was highly likely to have presented itself in other variables introduced in the model.

4. What is the difference between the maintenance and compensatory scenarios?

There are several distinguishing characteristics between the maintenance and compensatory scenarios that are important to understand. As the label implies, the maintenance scenario is the necessary funding level in order to maintain, on average, a specified level of performance. In this case a 95% graduation rate and an annual growth of a 0.50 NCE score. Also, important to note is that the maintenance scenario would accomplish an outcome of raising the overall, statewide achievement average but would not close gaps between school districts that are performing below the current state average. ***That is, the maintenance scenario can be considered an ongoing and perpetual investment in the public education system to improve overall statewide achievement.*** Further details on the maintenance scenario and presumptions of improvement are outlined in question #5 below.

In contrast, the compensatory support scenarios identify the necessary investment to support individual school districts to close the gap between their current performance and the identified performance threshold over a period of five years. And further, that once the investment was made in a school district that they would be able to close the gap and then having achieved that threshold be able to return to a spending level in line with the maintenance scenario. ***That is, the compensatory scenarios can be considered a remedial, one-time investment in the public education system (spread out over a five-year period) to support school districts and their respective students to 'catch-up' and achieve the identified performance thresholds.***

There are several precedents for the combination of both ongoing and one-time funding streams in both federal and state education policy to support student achievement growth. And, in those examples policymakers made explicit the intent of each of the types of funding – ongoing and one-time – and how each should contribute to helping raise the level of student achievement in schools and school districts. In particular, school districts would need to guard against hiring staff (which is primarily an ongoing expense) using one-time funds. Examples of the use of one-time funds may be directed towards activities that help to provide a boost to the educational system that can be further maintained over a longer period of time. Such investments may include building stronger teacher supply pipelines from post-secondary institutions to school districts; designing training for teaching staff that build their capacity for instructional delivery; developing partnerships with other local mental health and wellness partners to provide services to students. All of these examples would aim to significantly increase the capacity of schools and school

districts to achieve higher levels of performance then allow for a level of maintenance to sustain that achievement over a longer period of time.

- The maintenance scenario contains a performance threshold of 0.50 NCE score and a 95% graduation rate. Is the 95% a statewide rate or the rate reached by each district?

The long-run maintenance scenario includes an assumption of a performance threshold for ELA and math of a 0.50 NCE score and a 95% graduation rate at the end of the 2021-22 school year. The 95% graduation rate presumes that each district achieves that level of performance. The 0.50 NCE score presumes that every student performs as expected given his or her prior scores, or equivalently that every student experiences the normal amount of progress from one year to the next, given where they started. If all of the students had experienced average progress from 2015-16 to 2016-17 under the long-run maintenance scenario, rather than their actual progress, then the percentage of students scoring at level 2 or better in ELA and math would have been roughly 2 percentage points higher statewide, the percentage of students scoring at level 3 or better in math would have been roughly 3 percentage points lower, and the percentage of students scoring at level 3 or better in ELA would have been essentially unchanged. The percentage scoring at level 3 or better in Math would have been lower because many students with above average growth had just barely crossed the threshold into level 3 and would not have done so had they posted only average progress.

	Actual Progress (Actual NCE)	Average Progress (0.50 NCE)
Percent scoring at level 3 or better, statewide		
ELA	39.46%	39.04%
Math	32.81%	29.97%
Percent scoring at level 2 or better, statewide		
ELA	73.97%	76.56%
Math	73.97%	75.88%

Note that the conditional NCE scores measure the change in student performance from one year to the next, so conditional NCE scores are not defined for grades 3 and 10 (because there are no corresponding prior year's scores). The actual percentages reported above therefore cover grades 4-8 and will not match those reported elsewhere because only a subset of grades are included in the calculations above.

6. Can the research team provide other cost estimates at various ELA/math passing rates?

The research team re-ran the analysis looking at three other scenarios in which the ELA/math passing rates for Level 2 was 85% (Scenario C) the ELA/math passing rates for Level 3 was 55% (Scenario D), and Level 2 was 80% (Scenario E). The results of that analysis can be captured in the table below (in 2017 dollars). Note that the relationship is not linear between the percent proficient students in ELA and math and the amount of dollars invested.

	Cost Estimate (\$)	Percent Increase Over Current	Per Pupil Cost Estimate (\$)
Current K-12 Spending	\$4.652 billion	n/a	\$9,313
Long-run maintenance	\$5.103 billion	9.7%	\$10,419
Compensatory support: Scenario A (Level 2 @ 90%)	\$6.438 billion	38.4%	\$13,144
Compensatory support: Scenario B (Level 3 @ 60%)	\$6.719 billion	44.4%	\$13,717
Compensatory support: Scenario C (Level 2 @ 85%)	\$6.111 billion	31.4%	\$12,477
Compensatory support: Scenario D (Level 3 @ 55%)	\$6.664 billion	43.3%	\$13,605
Compensatory support: Scenario E (Level 2 @ 80%)	\$5.768 billion	24.0%	\$11,766

7. Does the research team have examples of states that have created a 'minimum funding guarantee' for public education? What has been the impact of that legislative language?

There are several states that have statutory language in their education funding formulas which guarantees a minimum funding level for the state K-12 education system. One of the most prominent of these systems is in California. In 1998, the California taxpayers approved Proposition 98 which created several scenarios (“tests”) under which K-12 education is guaranteed a certain amount of public funding.

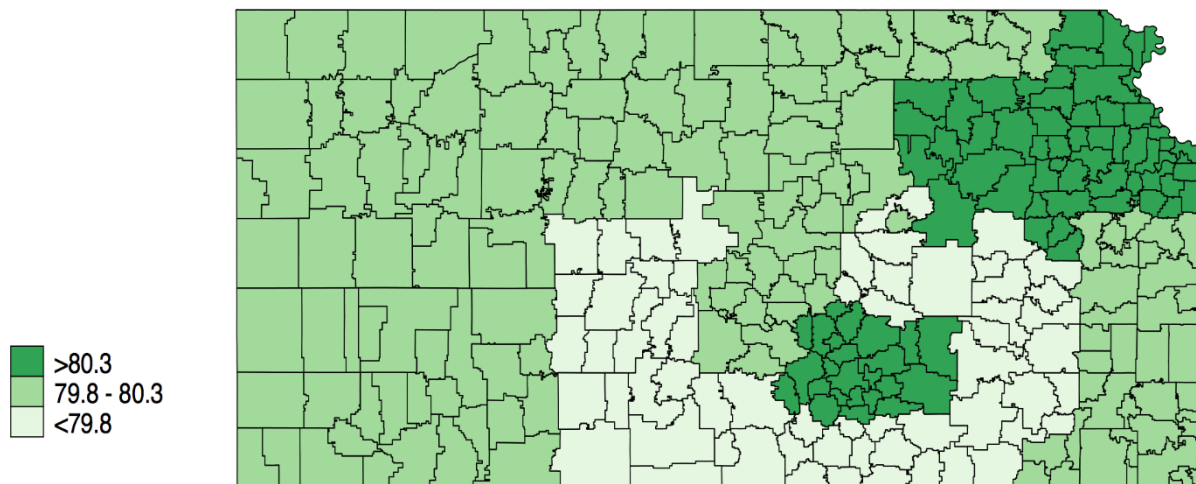
The selection of the test during a fiscal year is determined largely on the size of the state budget (driven by the state economy) as well as other factors, e.g., growth in student attendance, that determines the overall investment for the upcoming school year. This legal provision has provided California with a healthy balance between ensuring that policymakers recognize and commit to minimum investments in the K-12 education system while also ensuring that the growth of the

state budget is shared with public education. A one-page description of the formula best captures the method of the formula: <https://edsources.org/wp-content/publications/PolicyBriefR3.pdf>

Notably, the formula has not been without its benefits and challenges. In particular, policymakers in California has instituted a myriad of formula adjustments to the basic premise associated with the proposition which arguably has led to some of the findings in a recent review by the state's Legislative Analyst's Office (LAO). There are numerous lessons learned from California's experience, among which is the acknowledgement that ensuring the statute is flexible enough that it allows policymakers to work within the parameters of the minimum funding guarantee for public education. A link to the LAO's recent review can be found here: <http://www.lao.ca.gov/reports/2017/3526/review-prop-98-011817.pdf>

8. Can the research team reproduce the map on page 80 of your report to identify the school district values in the northeastern corner of the state?

Below is a reproduction of the map of Kansas identifying the comparable wage index (CWI) by school district. The identified school districts in the northeastern corner have values greater than 80.3.





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9. Can the research team produce the cost estimates for seven years?

The tables below provides a 7-year schedule which adds several additional years to the 3-year schedule presented during the hearing.

	2016-17	Change: 16-17 to 17-18	2017-18	Change: 17-18 to 18-19	2018-19	Change: 18-19 to 19-20	2019-20	Change: 19-20 to 20-21	2020-21	Change: 20-21 to 21-22	2021-22	Change: 20- 21 to 21-22	2022-23
Maintenance	\$4.737 B	+\$46 M	\$4.782 B	+\$119 M	\$4.901 B	+\$122 M	\$5.023 B	+\$125 M	\$5.147 B	+\$128 M	\$5.275 B	+\$131 M	\$5.406 B
<i>Inflation</i>		+\$46 M		+\$46 M		+\$47 M		+\$49 M		+\$50 M		+\$51 M	
<i>Graduation Cost</i>		\$0		+\$72 M		+\$75 M		+\$76 M		+\$78 M		+\$80 M	
Scenario A	\$5.978 B	+\$58 M	\$6.036 B	+\$150 M	\$6.185 B	+\$154 M	\$6.339 B	+\$157 M	\$6.496 B	+\$161 M	\$6.657 B	+\$165 M	\$6.821 B
<i>Inflation</i>		+\$58 M		+\$58 M		+\$60 M		+\$61 M		+\$63 M		+\$64 M	
<i>Graduation Cost</i>		\$0		+\$91 M		+\$94 M		+\$96 M		+\$98 M		+\$101 M	
Scenario B	\$6.239 B	+\$60 M	\$6.299 B	+\$156 M	\$6.455 B	+\$160 M	\$6.615 B	+\$164 M	\$6.779 B	+\$168 M	\$6.948 B	+\$172 M	\$7.120 B
<i>Inflation</i>		+\$60 M		+\$61 M		+\$62 M		+\$64 M		+\$65 M		+\$67 M	
<i>Graduation Cost</i>		\$0		+\$95 M		+\$98 M		+\$100 M		+\$103 M		+\$105 M	
Graduation Rate	90%		90%		91%		92%		93%		94%		95%
ELA at Level 2 %	72.6%		74.6%		76.6%		78.6%		80.6%		82.6%		84.6%
Math at Level 2 %	72.4%		74.4%		76.4%		78.4%		80.4%		82.4%		84.4%

Notes: B=billion; M=million; some calculations do not add due to rounding

These additional funding figures presume two variables: (1) adjustments for annual inflation presuming the 5-year historical Midwest U.S. average consumer price index (CPI) of 0.965% and (2) a graduation rate of 90% in 2016-17 and 2017-18 growing one percentage point to 95% in the 2022-23 school year. The additional funding identified in the 2017-18 school year is exclusively associated with the annual inflation factor because the graduation rate is held steady. The additional funding identified in 2018-19 is associated with a combination of both the inflation factor as well as necessary resources to achieve a one percentage point increase in the graduation rate.



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The table below presents the application of the same scenarios except it applies a graduation rate of 91% in the 2016-17 school year for the maintenance scenario. Note that the growth in the percentage of students at Level 2 for ELA and math scores represents the statewide average and is an approximate figure.

	2016-17	Change: 16-17 to 17-18	2017-18	Change: 17-18 to 18-19	2018-19	Change: 18-19 to 19-20	2019-20	Change: 19-20 to 20-21	2020-21	Change: 20-21 to 21-22	2021-22	Change: 20- 21 to 21-22	2022-23
Maintenance	\$4.808 B	+\$46 M	\$4.854 B	+\$47 M	\$4.901 B	+\$47 M	\$4.948 B	+\$48 M	\$4.997 B	+\$48 M	\$5.045 B	+\$49 M	\$5.093 B
<i>Inflation</i>		+\$46 M		+\$47 M		+\$47 M		+\$48 M		+\$48 M		+\$49 M	
<i>Graduation Cost</i>		--		--		--		--		--		--	
Graduation Rate	91%		91%		91%		91%		91%		91%		91%
ELA at Level 2 %	72.6%		74.6%		76.6%		78.6%		80.6%		82.6%		84.6%
Math at Level 2 %	72.4%		74.4%		76.4%		78.4%		80.4%		82.4%		84.4%

Notes: B=billion; M=million; some calculations do not add due to rounding

The table below presents a gradual increase of the graduation rate to 91% in the 2022-23 school year for the maintenance scenario.

	2016-17	Change: 16-17 to 17-18	2017-18	Change: 17-18 to 18-19	2018-19	Change: 18-19 to 19-20	2019-20	Change: 19-20 to 20-21	2020-21	Change: 20-21 to 21-22	2021-22	Change: 20- 21 to 21-22	2022-23
Maintenance	\$4.737 B	+\$46 M	\$4.783 B	+\$60 M	\$4.843 B	+\$61 M	\$4.904 B	+\$62 M	\$4.966 B	+\$62 M	\$5.028 B	+\$63 M	\$5.090 B
<i>Inflation</i>		+\$46 M		+\$46 M		+\$47 M		+\$47 M		+\$48 M		+\$49 M	
<i>Graduation Cost</i>		--		+\$14 M		+\$14 M		+\$14 M		+\$14 M		+\$14 M	
Graduation Rate	90%		90%		90.2%		90.4%		90.6%		90.8%		91%
ELA at Level 2 %	72.6%		74.6%		76.6%		78.6%		80.6%		82.6%		84.6%
Math at Level 2 %	72.4%		74.4%		76.4%		78.4%		80.4%		82.4%		84.4%

Notes: B=billion; M=million; some calculations do not add due to rounding

10. What impact, if any, would removal of the KPERS (fund 51) spending have on the findings in the report?

The research team reviewed its coding of the school district's operational spending for the 2016-17 school year against the guidance from KSDE to Chief Administrative Officers on how to classify the remedial KPERS spending payments. Based upon a memo produced in October 2016, these funds were reflected as a revenue received for each school district then transferred (within the district) to Fund 51 (KPERS Retirement Contribution). This activity – both the revenue recognition as well as the fund transfer – were not included in the analysis of a school district's operational spending. The extended reference cited above was an October 17, 2016 memo from Dale Dennis at KSDE to all Chief Administrative Officers.

11. Can the research team expand upon the strategies that may be employed by the Legislative Post Audit (LPA) that further expands upon finding #9 in the report?

The research team, following a review of many of the LPA reports for school districts outlined three possible avenues in which that information could further developed and used. These possible avenues include:

The analytical and comparative techniques used by the Legislative Post Audit have applicability in other environments and forums

LPA often uses in their individual investigations of school districts analytical techniques that leverage trend information over time and/or comparisons of the school district to other populations, i.e., similar or all other Kansas school districts. These types of techniques may be of real value to other school districts interested in maintaining or increasing their effectiveness. This platform may also create an opportunity to generate consensus among practitioners for common metrics that can be used to investigate spending and resource patterns.

The insights reached – although mostly oriented towards compliance with the law – surface matters of process, culture and performance important for any organization to consider

While the LPA investigations largely focus on checking the school districts compliance against language that exists in statute it is often the case that LPA further identifies other characteristics of school district culture – such as their processes, performance, behavior and activities – that are reflected in, at a minimum, compliance with the law but also their ability to operate a highly effective school system. The research team would suggest that

broadening the scope to have the LPA investigate some of these other elements of the school systems as compared to benchmarks besides the law, e.g., best practice within industry or other well-established metrics, etc., would create an aspiration and learning opportunity for the school district that continues to add value for the state's engagement with school districts.

The school district's response represents one way in which to engage in an exchange

Currently, the school district has an opportunity to respond to the LPA findings in the report by attaching an appendix that may include their narrative response and often an action plan that is responsive to the LPA findings. This written document is simply one way in which a school district may respond to the findings. While these activities are helpful and also create samples of how well local education agencies are doing relative to the law, there are other opportunities to engage school districts in the pursuit of higher levels of performance.

And, there are other approaches that – with encouragement from the state – the school district can identify other ways in which to respond to the findings. For example, one method that has been shown to produce results is creating professional learning communities (PLC) with a group of professionals with a common interest or aim. Originally this concept rose to prominence with Richard DuFour's work on PLC focusing primarily on instructional practices in the classroom. However, over time there has also been the applicability of such structures for other education professionals, including various Central Office administrator-similar roles.