The Relationship Between School District Instructional Related Expenditures to State Exam Scores in Small, Mid-Size, and Large School Districts in Texas

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There has been much debate by and among federal and state education agencies, state legislatures, courts, and educators regarding the identification of school district expenditures that best facilitate effective and efficient schools. The issue of equitable funding is far from being resolved (Education Week, 2017). Contradictory studies associated with school district funding, expenditures, and student achievement have been used to substantiate varied opinions on the subject (Archibald, 2006; Gigliotti & Sorensen, 2017; Pan, Rudo, Schneider, and Smith-Hansen, 2003). While much of the existing research is focused on overall school revenue and/or expenditures, research is needed that provides information specific to instructional expenditures and student performance.

The purpose of this study was to test the relationship between instructional related expenditures and student performance on a state mandated exam in small, mid-size, and large school districts in Texas. This correlational study utilized secondary data analysis of Texas school district accountability data to test the relationship between various district-level instructional expenditures and school district student performance. A stratified random sample of school districts were used in the study: Small = 1,000 – 2,000 students n = 120, Mid-Size = 5,000 – 10,000 students n = 59, and Large = 25,000 or more students n = 43.

Based upon the findings of the partial correlations, two variables, per-pupil instructional expenditures as a percentage of operational expenditures and per-pupil expenditures for curriculum development had a statistically significant relationship with district performance on the State of Texas Assessment of Academic Readiness (STAAR).

School finance has been an ongoing source of often contentious debate in the United States; specifically, as it relates to student/school performance and accountability (Archibald, 2006; Gigliotti & Sorensen, 2017; Pan et al., 2003). Arguably, one reason for the contentiousness is because research on the relationships between school district funding, expenditures, and student achievement has been inconclusive and often contradictory (Archibald, 2006; Gigliotti & Sorensen, 2017; Pan et al., 2003). The lack of consensus in findings has allowed entities to espouse favorable findings to support their preferred initiatives in regard to school finance (e.g., calls for more school funding, revised school funding models, more accountability, less funding for public education, and the need for a voucher system).

It has been suggested that one of the potential factors for inconclusive and contradictory findings was because much of the existing research focused on overall school revenue and/or expenditures. Archibald (2006) suggested that expenditures per pupil must be disaggregated into more meaningful categories to discern the relationship between resources and expenditures to student achievement. In other words, identifying the relationship between instructional related expenditures to student performance was a method of creating more specificity to targeted relationships, eliminating potentially confounding expenditures that may be unrelated or marginally related to student achievement.

Funding for public schools in the U.S. is often influenced, either directly or indirectly, by district size. For example, in Texas much of the funding for daily operations is from a Maintenance and Operation tax (M&O) established by school districts (Texas Education Agency, 2018b). Although there are formulas and guidelines for determining the limits to the tax rate a school district can impose, the amount is also influenced by the size and wealth within a school district. Although researchers have questioned the relevance of school districts to student achievement (Whitehurst, Chingos, & Gallaher, 2013), the relationship of district size to funding amounts could influence the relationship.

As expectations rise for students and teachers to perform at higher levels and for schools to guarantee the success of all students, the question of how best to achieve these goals through effective resource allocation becomes even more critical (Pan et al., 2003). As such, the purpose of this study was to test the relationship between various budgetary expenses and student passing rates on a mandated standardized test for small, mid-sized, and large, public school districts in Texas.

Review of the Literature

Educational Expenditures

Jones & Slate (2010) studied compliance of Texas school districts with the 65% instructional expenditures ratio as related to student academic success on the previous state exam and found that districts spending 60 to 65% of operational expenditures on instruction associated costs scored higher than districts which spent less than 60%. School district expenditures are impacted by the amount of revenue available to school districts in each state. Texas ranks 41st out of 50 states in the amount of money spent on education per-pupil. New York, the state with the highest expenditure per-pupil on education, spends more than twice the amount of Texas in a per-pupil comparison (U.S. Census Bureau, 2016). The sources of revenue for educational purposes in

Texas is approximately 52% locally generated by property taxes and other revenue, 38% is provided by the state, and 10% by the federal government. This is in contrast to revenue sources in other states where, on average, the state provides a larger percentage portion of the revenue compared to locally generated revenue (U.S. Census Bureau, 2016).

In the U.S. Supreme Court Case, *San Antonio School District v Rodriguez,* 1973, the court ruled that education is not among the rights afforded explicit protection under our Federal Constitution, but that no other state function is so uniformly recognized as an essential element of our society's well-being. This Supreme Court ruling places the burden of providing a free, public education system as a state responsibility (National Conference of State Legislatures, 2018).

How expenditures on education are reported, and what effect expenditures have on student performance, have been the subject of conflicting studies (Archibald, 2006; Gigliotti & Sorenson, 2017). Studies involving expenditures and student performance have also identified differing effects of expenditures on various student groups. In a National Bureau of Economic Research working paper reviewing increased spending by states following education reform, it was noted that students from low-income families benefitted from the additional expenditures while performance of students from higher-income families resulted in limited consequences (Yettick, 2014). There is also the issue of funding per-student or varied funding allotments based on individual need. Lindahl & Cain (2012) describe this concept as horizontal equity, similarly situated students being funded similarly, and vertical equity, differentiated funding based on individual student need.

A common limitation of studies that examine the relationship between expenditures and student performance is the amount of general expenditures that have little or nothing to do with student performance. Expenditures relevant to instructional outcomes, along with increased instructional time, increases in teacher salaries, reduced class sizes, and other factors have been identified as having a direct relationship to student performance (Jackson et al., 2015). Policymakers are divided in their views on the proper course to follow in school finance. While some do not believe in a relationship of expenditures to student performance, others feel that more money needs to be spent to reduce disparities between rich and poor school districts to the point where spending levels in the two types of school districts are equivalent. This suggests that revenue should be increased for poor school districts to compensate for inequalities that students in poor districts experience (Wenglinsky, 1997).

The relationship of school district expenditures to student performance on standardized achievement tests has been studied in addition to studies focusing on the relationship of expenditures to student performance on state exams. Studies have found a correlation between per-pupil expenditures and scores on standardized achievement tests, including the American College Test (ACT) and the Scholastic Aptitude Test (SAT) Reasoning Test (Bolon, 2001).

Testing and Accountability

The Elementary and Secondary Education Act passed in 1965 was the first federal legislation to address widespread education requirements and was designed to support the Brown vs. Board of Education ruling in 1954. The bill advocated the use of testing to reduce the achievement gap between white and minority students (McKenzie & Kress, 2015). The legislation also included elements that addressed the need for schools located in disadvantaged areas to receive additional resources, emphasized the importance of measuring minority student progress, and included

information as to school district responsibility to policymakers and taxpayers (McKenzie & Kress, 2015).

No Child Left Behind was enacted by Congress to reauthorize the Elementary and Secondary Education Act. NCLB provided the guidelines which described financial support and school accountability expectations from the federal government to the states (Dee & Jacob, 2010). A provision of the legislation required each state to develop standards and placed emphasis on annual testing, academic progress, school accountability, and teacher qualifications (Dee & Jacob, 2010). Every Student Succeeds Act (ESSA) was passed by Congress in 2015 to replace NCLB with the intended purpose of giving more flexibility to the states as to how they would accomplish the objectives outlined in NCLB and to reauthorize the Elementary and Secondary Education Act (Mathis & Trujillo, 2016).

Both No Child Left Behind and Every Student Succeeds Act legislation incorporated requirements for states to utilize standardized testing in order to identify schools that were underperforming and guidelines for interventions for those schools. However, the use of standardized tests to measure student performance for the purpose of school accountability is inherently problematic (Wiliam, 2010). Wiliam reported that between-school differences account for less than ten percent of the variance in student scores, in part, because the progress of individuals is small compared to the spread of achievement within a specific grade level or cohort age group. This would indicate potential problems with current accountability systems because the school's impact on student achievement may not be representative to how performance is being treated in accountability system design. However, Dorn (2014) reported that advocates of test-based accountability in the United States and elsewhere argue that such accountability is required for human-capital development and to satisfy equity concerns.

Even though student test performance on standardized tests is used in all fifty states as part of school accountability systems, student achievement based upon standardized test scores, does not yield the same response from all states. Different responses by states include rewards, sanctions, and/or assistance. Many states in an effort to raise the performance for specified subgroups, including minority, low-income or economically disadvantaged, and limited English proficient students, require that data be disaggregated for reporting purposes (Kane & Staiger, 2002). Furthermore, they identified the problem associated with basing school accountability ratings on comparative student test results as between-school variance is only ten to fifteen percent of test score results. The difference in mean test performance between the best and worst-performing schools in not nearly as large as the differences between the best and worst-performing student in the typical school.

When volatility in test scores is combined with a relatively narrow distribution of school performance, it implies that he ninety-five percent confidence interval for the average fourth-grade reading or math score in a school with as many as sixty-nine students at that grade level would extend from approximately the twenty-fifth to the seventy-fifth percentile among schools of that size (Kane & Staiger, 2002). Although one could argue that states are placing too much credibility on student performance scores in identifying an accountability rating or score based on test results, it is currently the system being used. Other variables that complicate the relationship of test results to accountability ratings. Student socioeconomic status (SES) has a profound impact on high-stakes test results. It has been found that students with lower SES, sometimes called economically disadvantaged, do not perform as well on high-stakes tests as their more affluent peers (Amrein & Berliner, 2002; Ediger, 2000; Holman, 1995; Madaus & Clarke, 2001; Reeves & Grubb, 1997).

There are defendable reasons why standardized test scores should be used for comparison and accountability purposes even though it is widely accepted that these same tests measure a restricted range of knowledge do so in a limited range of performance formats, primarily multiple-choice responses (Ravitch, 2010). However, Ravitch found that because such exams allow for widespread comparability of scores and reduced inter-rater variability as compared to more authentic forms of evaluation, they have become the most-used measure for research studies and accountability comparisons.

School District Size

Previous studies were conducted to examine the relationship between school district size and student performance on state exams. In an earlier study, Lenear (2013) conducted a non-experimental, quantitative, causal-comparative research design for her doctoral dissertation. Lenear found that larger school districts (10,000 or more students), outscored moderate-size (1,600-9,999 students), and small school districts (100-1,599 students) on Texas state exams for school years 2007-2012. School district size is only one factor that influences student performance on standardized tests as evidenced in a study that reviewed student performance on state exams in Florida and North Carolina. In that study, other factors, such as teacher impact and size of school were seen as having influence (Chingos, Whitehurst, & Gallaher, 2013). This research also emphasized the importance of policy decisions made at the state and federal levels which affect funding and effort of school districts on reform strategies. Further, Hayes III (2018) indicated study findings that supported large school districts being more efficient and achieved better student performance on standardized tests.

Policy considerations focused on funding for public education is influenced by the size of school districts and the number of students served in each district. The trend in the United States has been to reduce the number of school districts at the same time that student enrollment continually increases (U.S. Census Bureau, 2016). District number reduction with an increasing student enrollment is creating larger school districts and, therefore, larger school campuses. Some studies have concluded that larger schools are more efficient to operate based on per-pupil operation costs, however, a growing body of evidence challenges the way efficiency is determined in absence of important student outcomes (Stevenson, 2006). Graduation rates, drop-out rates, and participation in extra and co-curricular activities are seen as important outcomes that are seldom measured when determining efficiency.

Not all school districts are becoming bigger by virtue of student enrollment growth. Consolidation of school districts are contributing to the reduction of school district numbers and the size of school districts once consolidation of multiple school districts creates a single, larger school district. There are conflicting study findings regarding increased efficiency of consolidated school district. Advocates of school district consolidation believe that consolidating small, rural districts, is a means of creating efficiency and improving quality (Herzog & Pittman, 1995). Other studies have been conducted in which per pupil expenditures, after districts were consolidated, did not result in a significant reduction of per-pupil expenditures and did not result in improved student performance (Cooley & Floyd, 2013).

The debate on school size has been individualized to primary grades as well as public education in general. Gershenson & Langbein (2015) suggest that primary grade level students who are socioeconomically disadvantaged, as well as students who have learning disabilities, are

adversely influenced when grade sizes are larger. Other studies indicate that larger schools may offer more specialized instruction because of economies of scale.

Purpose of the Study and Research Questions

There were two primary purposes for conducting this study: (a) to determine whether student performance achievement on a specific standardized test might differ as a function of school district instructional expenditure amounts and ratios and (b) to determine whether the effect of school district instructional expenditure amounts and ratios on standardized test results differed among school districts of varying size. Based on the importance of school district leaders making budgeting decisions in an environment in which resources are limited, the relationship of expenditures associated with instruction and the effect on student performance is extremely important. The study was guided by the following research questions:
1. What is the relationship between size of school district, per-pupil instructional expenditures and student performance on the 2017 state exam for public school districts in Texas?
2. What is the relationship between size of school district, per-pupil instructional expenditures as a percentage of operational expenditures, and student performance on the 2017 state exam for public school districts in Texas?
3. What is the relationship between size of school district, per-pupil expenditures for curriculum development, and student performance on the 2017 state exam for public school districts in Texas?
4. What is the relationship between size of school district, per-pupil expenditures for curriculum development as a percentage of operational expenditures, and student performance on the 2017 state exam for public school districts in Texas?
5. What is the relationship between school district size and district performance on the 2017 state exam for public school districts in Texas?

Methods

For this study, secondary data analysis of Texas school district accountability data was used to test the relationship between various district-level expenditures and school district performance indicators. Sample size was determined *a priori* using a survey sampling frame method that would provide adequate power for correlational analysis with a significance level of .05 and a +/- margin of error for descriptive data *analysis*, thus allowing us to generalize back to the population of Texas school districts meeting the stratification criteria of school size. Data from the 2016-2017 Federal Report Card for Texas Public Schools (Texas Education Agency, 2018a) was obtained for a stratified random sample of Texas public school districts *(N=*1,247*)*. Stratification was based upon school district size: *Small* = 1,000 – 2,000 students, *Mid-Size* = 5,000 – 10,000 students, and *Large* = 25,000 or more students. The sample included 120 small school districts, 59 mid-size school districts, and 43 large school districts. The data was acquired from the Texas Education Agency website (Federal Report Card Data and Public Education Information Management System (PEIMS). Table 1 shows the comparison of variable means and standard deviations for each school size on the variables of interest.

Table 1

Comparison of Variable Means and Standard Deviation for Small, Mid-Size, and Large School Districts

Variable	School Size		
	Small	Mid-Size	Large
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
PPIE	4931.94 (754.87)	4727.05 (406.51)	**5131.21 (310.09)**
PPIE-POE	52.71 (4.03)	54.80 (3.18)	**57.38 (3.18)**
PPECD	81.98 (67.37)	117.56 (72.61)	**151.95 (72.76)**
PPECD-POE	.86 (.67)	1.36 (.84)	**1.70 (.81)**
STAAR	73.08 (7.85)	74.36 (10.11)	**75.16 (7.67)**

Note. For PPIE and PPECD, *M* and *SD* are dollar amounts; for PPIE-POE and PPECD-POE, *M* and *SD* are percentages; for STAAR, *M* and *SD* are percentage passing. Largest expenditures are in bold font.

For the correlational analysis, the predictor variables consisted of four different measures of district expenditures and the outcome variable was a district-level score for student performance on all levels of the state's mandated standardized assessment, the State of Texas Assessment of Academic Readiness (STAAR) for the 2017 academic year. The four measures of district expenditures included are:

- Per-pupil instructional expenditures (PPIE) for each sample size.
- Per-pupil instructional expenditures as a percentage of operational expenditures (PPIE-POE) for each sample size.
- Per-pupil expenditures for curriculum development (PPECD) for each sample size.
- Per-pupil expenditures for curriculum development as a percentage of operational expenditures (PPECD-POE) for each sample size.
  The outcome variable was district level performance for the *all levels* category of the state's mandated standardized assessment, the State of Texas Assessment of Academic Readiness (STAAR) for the 2017 academic year.

Analysis and Findings

Prior to analysis, data was evaluated to assure all assumptions for inferential analysis were met. There were no issues with missing data because the data came from pubic information that public school districts are required to report to the State of Texas. For the correlational analysis, a one-tailed partial correlation controlling for school size was conducted using SPSS. All descriptive statistics were also calculated in SPSS.

Four of the research questions guiding this study were in regard to the relationship between various aspects of school district spending and student performance on the standardized state test, when controlling for school size. Based upon the findings of the partial correlations, only two variables, *per-pupil instructional expenditures as a percentage of operational expenditures* ($r(219)= .46$, $p<.001$) and *per-pupil expenditures for curriculum development* ($r(219)= -.13$, $p=.03$), had a statistically significant relationship with district performance on the STAAR. For *per-pupil instructional expenditures as a percentage of operational expenditures,* the relationship

was a direct relationship that predicted approximately 21% of the variation in the district measure of student performance on the STAAR. This suggests that on average, as the proportion of the operational budget dedicated to instructional expenditure increased, students performed better on the STAAR exam.

The *per-pupil expenditures for curriculum development* was a negligible, inverse relationship, which in many studies would be considered spurious at best. None the less, the results of the analysis suggested that, on average, increased spending on curriculum development did not always result in better STAAR performance. The *per-pupil expenditures for curriculum development* only predicted approximately 1.69% of the variation in STAAR performance, so it had negligible predictive validity for understanding STAAR performance for this sample. Table 2 provides the partial correlation matrix for all the variables.

Table 2

Partial Correlation Matrix for Spending Variables and Student Performance on STAAR Exam

Measure	1	2	3	4	5	*M*	*SD*
1. PPIE	--					4916.09	622.22
2. PPIE-POE	.44	--				54.17	4.07
3. PPECD	.18	-.17	--			104.99	75.17
4. PPECD-POE	.02	-.17	.98	--		1.15	.82
5. STAAR	.01	**.46**	**-.13**	-.09	--	73.82	8.48

Note. Coefficients with a statistically significant relationship between the predictor variables and outcome variable are in BOLD.

Because the inverse relationship between *per-pupil expenditures for curriculum development* and STAAR performance were contrary to belief and practice, we conducted further analysis on the relationship between *per-pupil expenditures for curriculum development* and STAAR performance for each category of school size. Based upon this analysis, it appeared the small schools in the sample heavily influenced the inverse direction of the relationship, as a disproportionate number of small schools with above average spending had lower STAAR scores. Figures 1-3 show the scatterplots for each of the relationships.
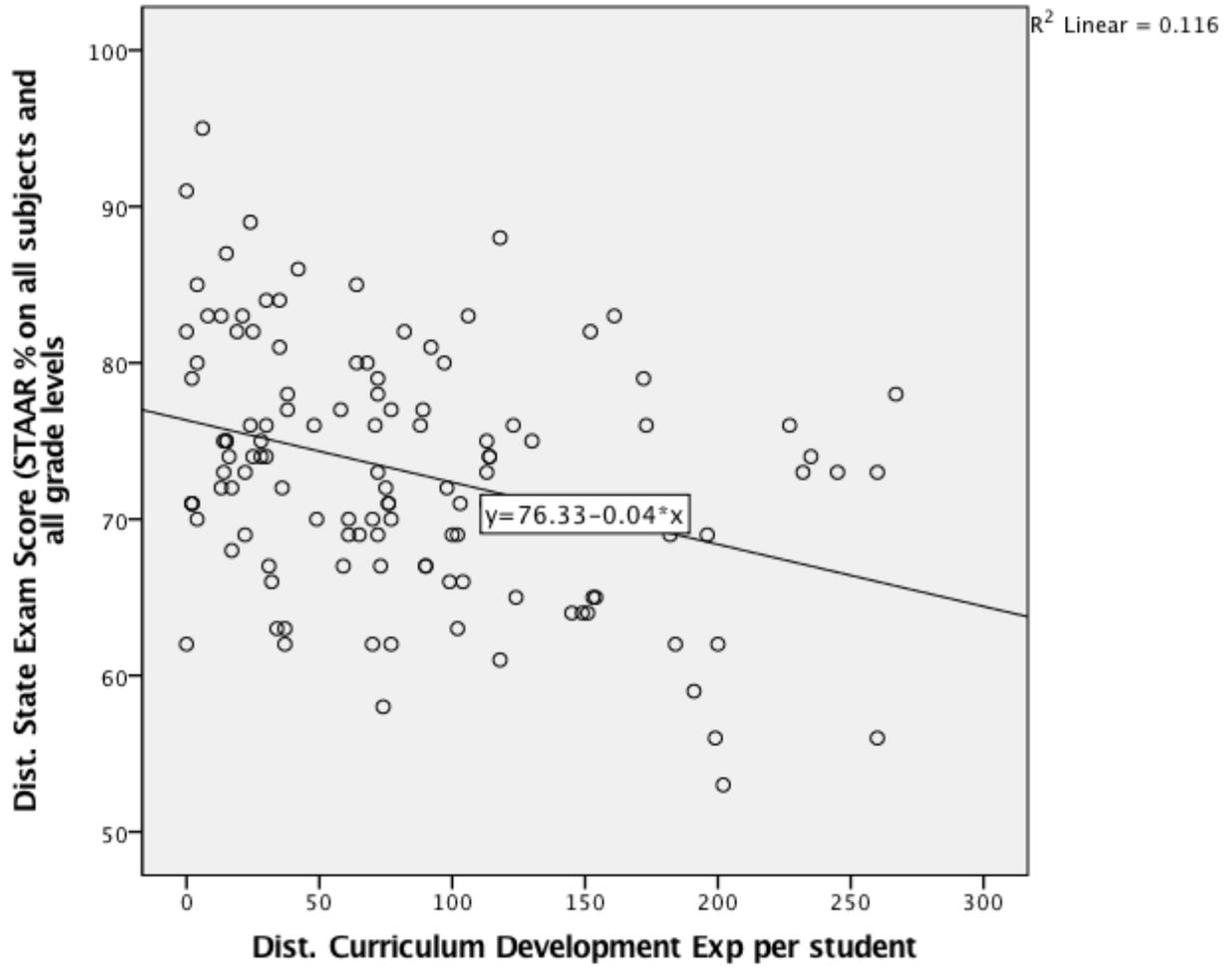
Figure 1. Regression line shows the inverse relationship between the district level curriculum development expenditure per student and STAAR performance for small schools.
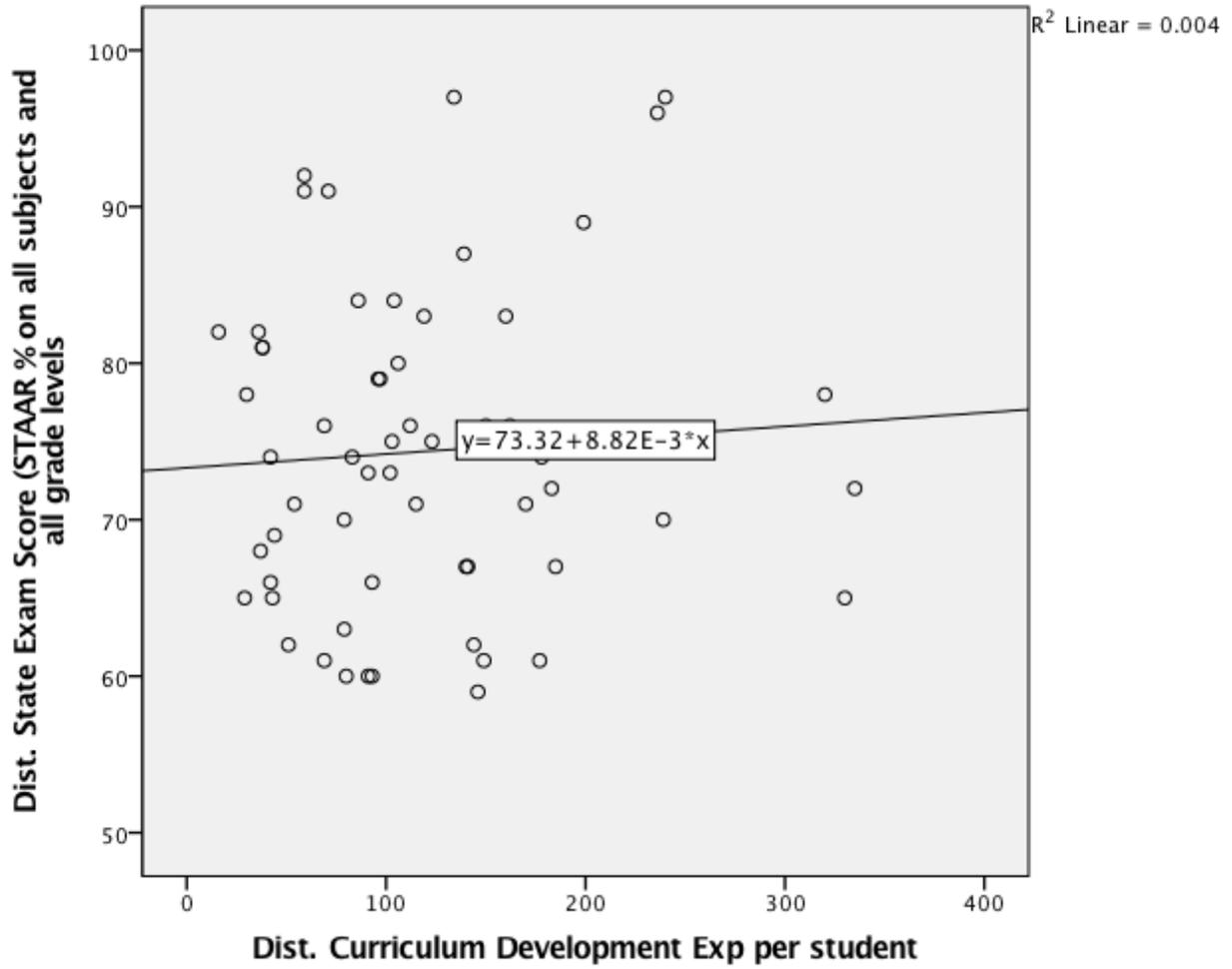
Figure 2. Regression line shows the positive relationship between the district level curriculum development expenditure per student and STAAR performance for mid-size schools.
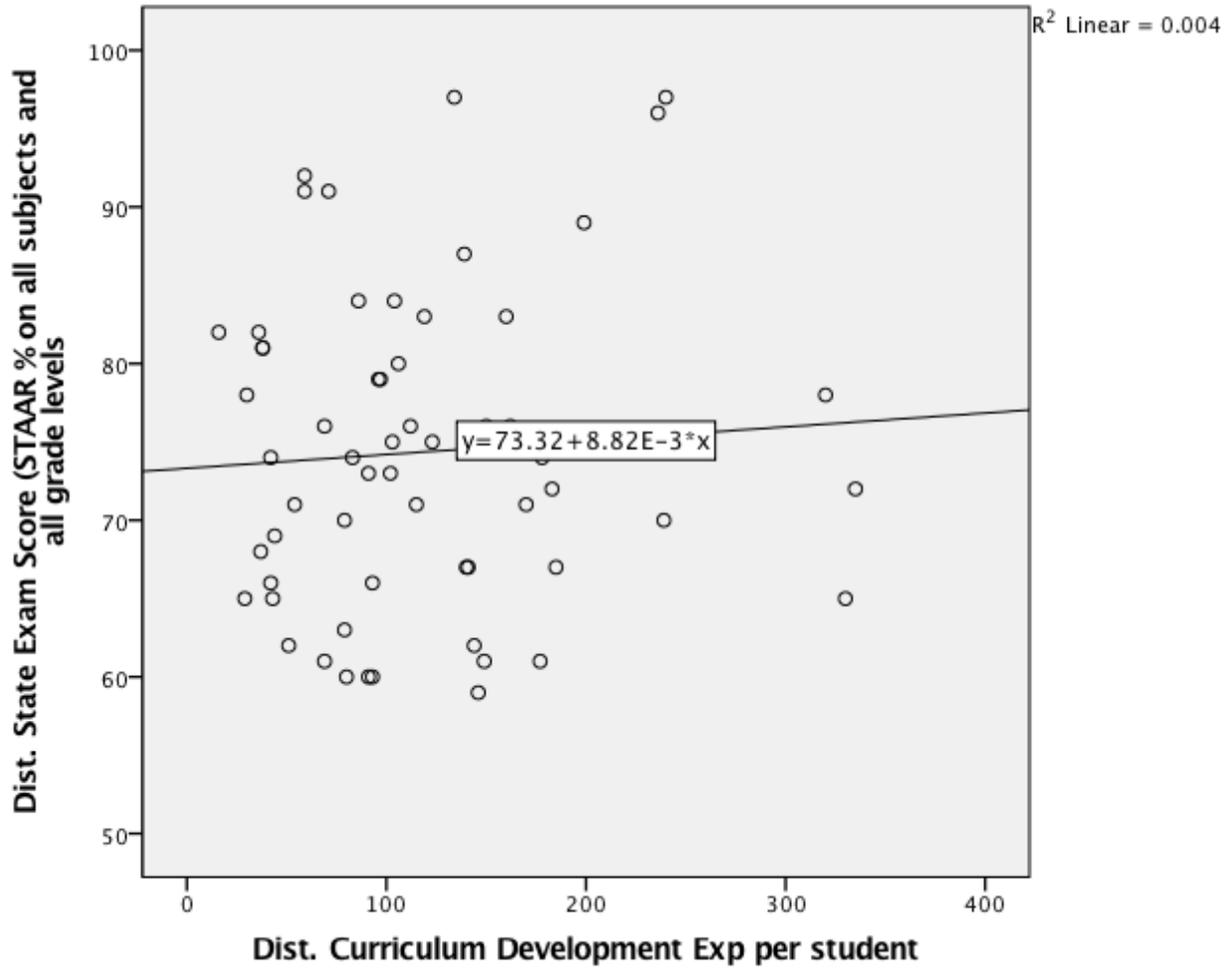
Figure 3. Regression line shows the positive relationship between the district level curriculum development expenditure per student and STAAR performance for large schools.

Based upon the scatterplots, the inverse relationship is best explained by the influence of the small school data, as they had more districts with above average spending and lower STAAR performance indices.

The fifth research question asked if there was a relationship between school size and performance on the STAAR. Based upon the findings from the Spearman *rho,* there was not a meaningful relationship between school size and district performance on the STAAR, (r (222) = .09, *p*= .09).

Conclusions, Implications, and Recommendations

Conclusions

As stated in the introduction, research on the relationship between public school funding, spending, and student achievement has varied in findings (Archibald, 2006; Gigliotti & Sorensen, 2017; Pan, et al., 2003) with a call for more research that investigates these relationships with disaggregated financial data. The current study sought to add to the literature by disaggregating spending data on a district level to determine if there was a relationship between various categories of expenditure and district performance on the STAAR. Based upon the findings from this study, the only category of district spending that had a meaningful relationship with the STAAR performance indicator, while controlling for differences in school size, was the percentage of total operating budget dedicated to instructional expenses. Although there was a statistically significant relationship between per pupil spending on curriculum development, the size of the relationship did not support that it was a meaningful relationship for understanding factors that best predicted STAAR performance.

Perhaps one reason the percentage of total operating budget dedicated to instructional expenses may have had a meaningful relationship with STAAR performance is that aligned instructional activities to objectives measured on the state exam may have had a positive effect on student learning that would be reflected by student pass rates. A review of sixty primary research studies of aggregated data found that a broad range of resources were positively related to student outcomes (Greenwald, Hedges, & Laine, 1996). The greatest difficulty for school leaders is identifying which resources and activities have the greatest impact on student achievement and this concept is explored in implications of the study.

Another reason that the per-pupil instructional expenditures as a percentage of operational expenditures might make a difference in student performance is the implied importance of instruction as more resources are committed to this function. Individuals within an organization tend to value and provide greater effort on activities that are considered important by the leadership team. This is much the same concept and results of the Hawthorne Studies conducted in a business sector in the 1920's and 1930's (Brannigan & Zwerman, 2001).

Although the large school districts had the most spending in each of the categories, as well as the higher STAAR performance. It should be noted that the average passing rates were not extremely different, but the differences could be considered important in terms of accountability standards. From a perspective of efficiency in spending, large schools proportioned 2.58% more per pupil instructional expense from their budget than mid-sized schools and 4.67% more than small schools, that yielded a 1-2% increase in percentage of students passing the STAAR.

Implications for School Districts

Contradicting studies has been conducted to identify the relationship of expenditures to student performance, school district funding, and student achievement to support differing opinions about the variables that impact each issue (Archibald, 2006; Gigliotti & Sorensen, 2017; Pan, et al., 2003). While this study will not resolve the issues of this debate, it has identified a variable that has a meaningful relationship to expenditures and student performance on the 2017 State of Texas Assessment for Academic Readiness (STAAR) exam. Per-pupil instructional expenditures as a percentage of operational expenditures had a meaningful relationship to district performance on

the STAAR exam. Currently 98% of Texas public school districts are at, or above, the maximum M & O tax rate (Texas Education Agency, 2018b) identified in law and decisions made at the district level in identifying budget priorities are important in order to make the most effective use of available funding. A review of per-pupil district instructional expenditures as a percentage of total operating expenditures is suggested for school districts working to improve student performance on standardized exams.

Per-pupil instructional expenditures were not found to be statistically significant, however, it is difficult to ignore study findings that the school district group which spent the most money on instruction, per-pupil, had the highest passing rate on the STAAR all tests taken – all grade levels. The school district grouping which spent the next highest amount per-pupil had the second highest pass rate, and the school district group that spent the least amount on instruction per-pupil had the lowest pass rate of the three groups. It is recommended that a review of individual school district expenditures committed to instruction should be reviewed by every school district as well as per-pupil expenditures as a percentage of total per-pupil operational costs. In addition, individual school case studies in small, medium, or large schools would be helpful in identifying more clearly the relationship between per-pupil instructional expenditures and standardized test results.

Recommendations for Future Research

There were several limitations to the current study. First, the level of observation for the archival data limited the types and depth of analyses that could be conducted. Future investigations into the relationship between spending and student performance should consider collecting primary data that includes the measurement of other variables known to influence student outcomes. This would not only address issues in measurement, but also provide a fuller model for understanding the relationships between spending and student performance. Likewise, more complex designs and analysis should be considered to address the nested nature of many of the factors known to influence student performance.

Another limitation was in regard to the data being from a single state. Due to the potential differences in educational funding, future studies should not only consider including data from other states, but also testing for differences in state funding processes as part of the research design. This would potentially allow for a better understanding of various funding models and their influence on the relationships between district-level spending and student outcomes.

A third limitation would be the manner in which the size of schools in the current study were operationalized. During the design phase, the sizes were determined based upon research knowledge of school sizes and sought to create a system that would yield the most balance and coverage of school districts in the state of Texas, while maintaining a close approximation to size designations used by the state of Texas. It is recommended that a replication of the current study be conducted utilizing the current Texas University Interscholastic League (UIL) school district size designations and see if the more complex breakdown of school sizes had an effect on the results.

In addition to addressing the limitations in the current design, future research should focus on understanding specific aspects of spending within the broader categories of instructional and curricular expenditures that were most strongly related to student performance. Various quantitative models could be developed to assist school districts to be more efficient in spending. Likewise, it would also be beneficial to disaggregate the secondary data by specific student groups to investigate the relationships between spending and student performance. Finally, qualitative

investigations could be conducted to understand how perceptions of the relationship between spending and student performance actually influenced specific expenditures by district administrators, as well as public perception.

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