



Trend Analysis Techniques to Assist School Leaders in Making Critical Curriculum and Instruction Decisions

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As educational needs of students change in response to changing demographics, economic factors, workforce needs, and school accountability requirements, school leaders must continually monitor and adjust curricula and associated methods of instructional delivery to increase student learning. The analysis of student performance data is a critical component of curriculum decision-making processes, and the purpose of this study is to demonstrate an application of trend analysis techniques in making curriculum and instruction decisions using historical student performance data. The techniques are demonstrated in relation to a real school problem and are transferrable to similar problems facing other schools. This study underscores the importance school leaders should place on analyzing data when making decisions related to curriculum and instruction.

Keywords: trend analysis, school leadership, curriculum and instruction, assessment, data-driven decision-making

As educational needs of students change in response to shifts in demographics (e.g., the national economy, politics, state- and federal-level accountability requirements, workforce needs, etc.), school leaders must continually monitor curricula and associated methods of instructional delivery to make appropriate adjustments in meeting the needs of students. The *No Child Left Behind* legislation increased federal, state, and local scrutiny of schools in that by the 2014-15 school year, all students are expected to be academically “proficient.” As a result of the increased pressures on schools to improve student performance on state-mandated standardized assessments, vendors are continually producing new products including teaching tools, classroom supplies, curriculum supplements, and even entire curricula to appeal to faculties and administrations of school districts (Cuban, 2012; David & Cuban, 2010). Moreover, alternative class scheduling patterns have been implemented in schools to facilitate enhanced curriculum delivery. While these products or alternative scheduling patterns may meet the

needs of some schools, others excel without them. Nonetheless, when it appears that all of the neighboring school districts have purchased or adopted a given product, or made various scheduling changes or adjustments, the temptation of some school leaders is to question whether or not their schools should do the same, even though historically many curriculum innovations and reforms have not increased student learning as promised (Payne, 2010; Ravitch, 2010). Rather than trying to “keep up with the Jones’ next door” in determining whether such changes are appropriate, school administrators must meticulously analyze student academic performance data to determine ways to improve both curriculum benchmarks and classroom instruction to increase student learning (Darling-Hammond, 2013; Slavin, Cheung, Holmes, Madden, & Chamberlain, 2013).

Background

Data for this study were collected from publicly accessible state reports for a small, rural Texas school district. The school district’s total student enrollment

ranged from 370 to 431 with an average enrollment of 393.6 over the ten-year period from which data were collected. Although the data in Table 2 are restricted to state-assessed reading scores, they provide a sense of the high levels of success the school district had experienced with its student population over the decade covered by this study. The school district was considering a middle school scheduling change, with unknown, but potential ramifications for student achievement in its reading and English Language Arts (ELA) curriculum. Prompting the potential curriculum change was the fact that many school districts in the same geographical region were adopting a designated, comprehensive curriculum addressing all core subjects. Based on the nature of reading and ELA components of curricula being considered for adoption, a middle school curriculum and scheduling change specific to reading and ELA became the focal area in this study.

Reading instruction had historically been heavily emphasized school-wide. Beginning at the early childhood level, intensive phonics instruction had traditionally been emphasized, followed by the incorporation of a reader program to enhance students' reading comprehension skills. The school district's reading philosophy revealed that just as practice is needed by any athletic team to improve and become more competitive, "practice" is also needed in reading to improve students' reading skills and use of reading strategies as tools to obtain and critically analyze ideas and information, and to increase students' levels of language acquisition (Noddings, 2013).

Many schools combine the subjects of reading and ELA into a single class at the middle school level. However, given this school district's reading philosophy, reading instruction had been emphasized by designating reading as a class in and of itself in students' class schedules throughout their middle school years.

Problem

Middle schools often find themselves as literal battle grounds for competing interests. Pressure is exerted to avail course offerings in the disciplines of fine arts, career and technical education, and sports and exercise sciences. Moreover, with advanced high school graduation plans, middle schools have witnessed an impetus to move other courses such as health, algebra, and technology education onto their campuses to provide more advanced options to students as they move into high school (Harris, 2011; National Middle School Association, 2003; Wormeli, 2011).

While embracing the foundational nature of reading and its contribution to every academic discipline, with the external pressures to move other courses into the middle school, school leaders may be tempted to combine the reading and ELA disciplines into a single course at the middle school campus to provide students opportunities to take other courses. Similarly, comprehensive curricula designed for purchase by school

districts often combine the reading and ELA components such that middle schools may be encouraged to combine the two into a single class. Yet, recognizing the emphasis placed on reading by both state and federal accountability measures, the problem lies in risking a student performance decline on reading assessments as a result of combining reading with ELA instruction into a single class.

Purpose

The purpose of this study is to demonstrate trend analysis techniques that may be useful to school leaders in making decisions affecting curriculum and instruction. Specific to the circumstances identified in the school selected for this study, trend analysis techniques will be used to determine the relationship between the scheduling scheme practiced in the middle school and student reading achievement assessed via the state-mandated standardized reading assessment. The information yielded by this type of analysis should prove to be valuable to school leaders in making these critical decisions.

Research Hypothesis

Through trend analyses of ten- and five-year reading performance data obtained from the school district's Academic Excellence Indicator System (AEIS) (TEA, 2013) reports, mean student passing percentage scores were computed by grade level and by campus. The calculated data were analyzed to answer the following question: "Does a middle school departmentalized scheduling scheme requiring that reading and ELA instruction be delivered to students in two separate classes demonstrate any relationship to student performance on the state-mandated standardized reading assessment?" Considering the case study parameters, (i.e., a single school district and the ex post facto nature of the data collected), the answer to the question was sought through hypothesis testing by comparing student reading achievement, aggregated by campus, among the three campuses within the same school district. While obvious extraneous variables were at play, the single distinguishing variable that was isolated among the three campuses was the scheduling scheme utilized in the delivery of each campus's reading and ELA curriculum. This question was therefore addressed through the testing of two null hypotheses, from both ten- and five-year data compilations, that read:

Ho: A middle school departmentalized scheduling scheme requiring that reading and ELA instruction be delivered to students in separate classes will demonstrate no significant relationship to student performance on the state-mandated standardized reading assessment, aggregated by campus, as compared with equivalent aggregated student reading performance resulting from an elementary school delivery of reading and ELA instruction through

scheduling schemes varying from self-contained to semi-departmentalized.

Ho: A high school departmentalized scheduling scheme requiring that reading and ELA instruction be combined for delivery to students in a single class will demonstrate no significant relationship to student performance on the state-mandated standardized reading assessment, aggregated by campus, as compared with equivalent aggregated student reading performance resulting from a middle school departmentalized scheduling scheme requiring that reading and ELA instruction be delivered to students in separate classes.

Review of Literature

Reading and Literacy

Because of the foundational nature of reading, student success in all academic subjects, including mathematics, is predicated on their ability to read, comprehend, and interpret information. Consequently, additional instructional time devoted to reading and writing enriches the school curriculum and enhances students’ levels of language acquisition and their abilities to learn more effectively in all subject areas (McConachie et al., 2006).

A designated reading class in addition to an ELA class provides teachers more instructional time to focus on total language development. For instance, students are taught various reading strategies (e.g., mapping stories, Baumann & Bergerson, 1993; outlining and summarizing texts, Marzano, Pickering, & Pollack, 2001) to enhance their reading comprehension. Equally important, a separate reading class allocates more time for instruction in vocabulary development, which improves students’ reading comprehension (Kelley, Lesaux, Kieffer, & Faller, 2010; Lesaux, Kieffer, Faller, & Kelley, 2010; Marzano, 2007), but which is taught infrequently in many classrooms (Hiebert, 2005). Furthermore, a separate reading class provides opportunities for reading teachers to collaborate with content area teachers to teach content specific reading strategies for their respective content areas including ELA (Lesaux et al., 2010; Morrow, Pressley, Smith, & Smith, 1997; Siegel & Fonzi, 1995) in

addition to spending more time teaching students how to read analytically and how to make inferences to establish purposes for their reading (Gomez & Gomez, 2007).

Over the past twenty-five years, researchers have documented the reciprocal nature of reading and writing (Newell, 1998; Shanahan & Shanahan, 2008; Wittrock, 1984). For example, teachers often use texts not only to teach students reading strategies, but also as springboards of discussion and topics for compositions. Conversely, when students write analytically about complex content they are reading, their understanding of the given concepts and their relationship among ideas is enhanced (Kelley et al., 2010; Newell, 1998). Similarly, reading and writing are intertwined in that teachers often use texts as models of the type of writing students are to complete, and these models serve as instructional scaffolds to guide students through planning and composing processes (Vygotsky, 1986).

Accountability

Literacy and mathematics instruction were regarded as top priority at the initiation of the No Child Left Behind (NCLB) Act as indicated on Adequate Yearly Progress (AYP) targets established for schools in the United States. These targets have been measured by their respective state-mandated standardized reading assessments in grades three through eight and ten. The AYP targets as reported in Table 1 were established at the outset of the NCLB legislation for all U.S. public schools.

AYP Reading/ELA targets were consistently set above math targets from the 2002-03 to the 2012-2013 school year. In Texas, from 2002-03 to 2010-11, the literacy target was measured by the reading Texas Assessment of Knowledge and Skills (TAKS) from the 3rd grade through the 9th grade, and the reading/ELA TAKS after the 9th grade. Beginning with the 2011-12 school year, the state’s assessment changed from TAKS to the State of Texas Assessment of Academic Readiness (STAAR). However, since the STAAR is so new, data collected in this study were limited to that obtained from state assessments prior to the STAAR. Reading and math were also emphasized on the Texas accountability system, the Academic Excellence Indicator System (AEIS), and these subjects were tested annually in grades three through eleven.

Table 1
AYP targets for U.S. schools pursuant to the NCLB Act

	02-03 03-04	04-05 05-06	06-07 07-08	08-09	09-10	10-11	11-12	12-13	14-15
Rdg/ELA	46.8%	53.5%	60.1%	66.8%	73.4%	80.1%	86.7%	93.4%	100%
Math	33.4%	41.7%	50.0%	58.3%	66.6%	74.9%	83.2%	91.5%	100%

Methods

Research Design

The descriptive research design was employed in this study. “Descriptive research is a type of quantitative research that involves making careful descriptions of educational phenomena” (Gall, Gall, & Borg, 2003, p. 290) at its most basic level, and it “seeks to find answers to questions through the analysis of variable relationships” (Best & Kahn, 2006, p. 133). Consequently, the descriptive research design was the most appropriate selection since this study endeavored to determine the relationship between the scheduling scheme practiced in the middle school (the independent variable) and student reading achievement (the dependent variable) assessed via the state-mandated standardized reading assessment.

Because the collected data consisted of historical student performance on state-mandated standardized reading assessments as reported on state accountability reports over ten- and five-year periods of time, the trend study methodology – a derivation of the descriptive research design – was designated as the most appropriate method for this study. “Trend studies describe change by selecting a different sample at each data collection point from a population that does not remain constant” (Gall et al., 2003, p. 292). The population was defined as students in grades three through nine, or ten, in the school district over ten- and five-year periods of time. As identified by Gall et al’s (2003) description of a trend study population,

this study’s population changed from year to year as a result of the normal progression of students from grade to grade and campus to campus. The samples were defined as the students enrolled in each grade level. Thus, with data collection occurring once each year at the designated grade levels, the samples changed each year as well. Then, the comparison groups used in the statistical analyses were defined as the students enrolled in each campus at each data collection point, which also was an annually changing dynamic. Nonetheless, the examination of reading performance scores over time aids in revealing trends and determining the effectiveness of certain system-level practices in relation to student performance, and this method parallels the trend study methodology described by Gall et al. (2003).

Data Collection

Ten years of state-mandated standardized reading assessment data, measured by the Texas Assessment of Academic Skills (TAAS) from 2000 through 2002 and Texas Assessment of Knowledge and Skills (TAKS) from 2003 through 2009, were extrapolated from the school district’s AEIS reports published on the Texas Education Agency’s (TEA) website. The AEIS reports student performance as the percentage of students meeting the state standard, hereinafter referred to throughout this study as the passing rate. These reading performance data were collected and organized on a spreadsheet in columns by grade level and in rows by calendar year as displayed in Table 2.

Table 2
Percentage of students meeting reading TAAS/TAKS standard from 2000 through 2009

		Elementary			Middle School			High School	
Year		3	4	5	6	7	8	9	10
TA AS	2000	93	100	90	100	100	100		96
	2001	91	97	96	88	100	100		100
	2002	94	92	100	100	93	100		100
TA KS	2003	100	97	88	100	100	100	100	
	2004	96	100	100	96	100	100	100	
	2005	100	82	95	94	86	100	95	
	2006	90	81	95	100	100	96	95	
	2007	100	76	78	86	100	91	93	
	2008	80	96	84	89	81	96	83	
	2009	88	70	96	84	80	85	92	

The Texas statewide assessment shifted from the TAAS to the TAKS from 2002 to 2003. Another notable change is that, in high school, reading as a separate subject was tested with the TAAS in the tenth grade, but with the TAKS, it was moved to the ninth grade. At the inception of the TAKS, reading was assessed beyond the ninth grade although it was done so in conjunction with ELA with the reading/ELA TAKS. Since this study focused primarily on reading, reading/ELA data were not used in the calculation of any results. Accordingly, for purposes of measuring reading achievement of students in high school, only tenth grade TAAS scores and only ninth grade TAKS scores were used.

Data Analysis

Two separate data analyses were conducted. The first analysis encompassed all ten years of data collected, whereas the second analysis pulled only the most recent five years of data reported in Table 2. The two separate analyses were conducted because the statewide assessment change from TAAS to TAKS reflected the move to a more rigorous assessment. From a sample size perspective in the application of a statistical power analysis, the ten-year aggregated data resulted in a population of $N = 2073$ students enrolled in the grade levels tested and the five-year aggregated data resulted in a population of $N = 1012$ students enrolled in the grade levels tested. Obviously, the ten-year analysis resulted in greater sample size power, but the five-year analysis reflected more current information in alignment with the TAKS. A benefit of the duplicated analyses was the enhanced validity of findings.

Identical procedures were employed in both analyses. Mean scores were calculated for each grade level reported in Table 2, reflective of percentages of students passing the reading assessments over the measured time periods. Then, campus-level mean scores for the elementary and middle school were calculated by averaging grade-level mean scores for grades three through five and grades six through eight respectively. Since high school reading was assessed by the TAAS in the tenth grade and by the TAKS in the ninth grade, the three tenth grade scores from 2000 through 2002 were added to the seven ninth grade scores from 2003 through 2009 and divided by ten to derive the ten-year high school mean score. The five-year high school mean score was computed by simply averaging ninth grade passing percentage scores from 2005 through 2009.

These grade- and campus-level mean scores were reported numerically in Tables 3 and 4, and the numerical data were then converted into graphical format to facilitate the visual identification of evolving trends. The data were combined into a single graph whereby the grade-level scores were plotted linearly and campus-level data were plotted by histogram in Figures 1 and 2.

To methodically analyze the findings in a non-biased fashion, the application of a quantitative data

analysis technique was employed. Individual students' state-mandated standardized reading assessment results were not available to the researchers, thus data collection was limited to the combined percentages of students passing the reading assessments as displayed on the school's AEIS reports. This effectively reduced the analysis to two categories of students – those who passed and those who failed the state-mandated standardized reading assessment. Since only passing percentages were reported on the AEIS reports, the need for enrollment data came into play to calculate an estimated number of students tested. These data were also collected from the AEIS reports. However, it should be noted that student enrollment per grade level, as reported on the AEIS reports, did not necessarily represent the exact number of students who were actually tested in all cases. For example, an enrolled student could have been absent on the day of an assessment. Although this is problematic from a strict academic research perspective, the purpose of this study is to demonstrate these methods to school leaders and not to make generalizations, therefore it ceases to be a problem because school leaders will have access to their exact enrollment and test participation counts which should obviously be used in place of the more general and publicly accessible enrollment data reported on AEIS documents as used by the authors of this study. Consequently, for demonstration, in accordance with the stated purpose of this study, these calculations included all enrolled students in the frequency counts as test takers. Simple mathematical procedures were used to calculate passing and failing frequency counts by campus. Percentage passing rates were multiplied by the respective student enrollments in the tested grade-levels on each campus to determine a total number of students passing the assessments. Then, by subtracting this number from the total enrollment counts, the total number of students failing the assessment per campus was derived. These techniques were applied in both the ten- and five-year analyses.

Based on the categorical assessment results (passing or failing per campus), the chi-square test was used to quantitatively analyze the data. The chi-square was the most appropriate statistical test, because the data being analyzed consisted of frequency counts (calculated from percentages) of students passing and failing (categories) the state-mandated reading assessment. As noted by Gravetter and Wallnau (1996),

The chi-square test for goodness of fit uses sample data to test hypotheses about the shape or proportions of a population distribution. The test determines how well the obtained sample proportions fit the population proportions specified by the null hypothesis. (p. 548)

The null hypotheses stated that no relationship would exist between the independent and dependent variables for the population. For the purposes of this

Table 3

Ten-year mean scores reflecting the percentage of students meeting the passing standard in grades 3 through 8 and 10 on the reading TAAS and in grades 3 through 9 on reading TAKS from 2000 through 2009

Campus:	Elementary				Middle School			High School	
Grade:	3	4	5	6	7	8	9	10	
% Passing	94.4	91.6	91.5	95.3	95.6	98.3	95.1	98.7	
		92.5			96.4		96.2		

analysis, the independent variable was the middle school scheduling scheme requiring delivery of reading and ELA instruction in two separate classes with the dependent variable being student performance on the state-mandated standardized reading assessment.

Two methods of setting up the chi-square test for goodness of fit are (1) no preference, where nothing is known about the potential outcome, and all categories are weighted equally, and (2) no difference from a comparison population, where information is known about the probable outcome based on prior knowledge (Gravetter & Wallnau, 1996). Since the null hypotheses stated that no relationship would exist between the middle school scheduling scheme and student reading achievement as compared with equivalent elementary and high school reading assessment results, "No Difference from a Comparison Population" was deemed most appropriate for this analysis.

The obtained frequencies derived from mean passing and failing frequency counts by campus were compared to test the null hypotheses. In testing the first null hypothesis, the elementary passing and failing percentages were applied to the middle school enrollment to calculate expected passing and failing frequencies – thus in applying the “No Difference from a Comparison Population” chi-square methodology, the elementary served as the comparison population against which the middle school results were analyzed. Likewise, in testing the second hypothesis, the middle school served as the comparison population against which the high school results were analyzed.

The obtained passing/failing frequencies for the elementary, middle, and high schools were 838.05/67.95 where $n = 906$; 836.75/31.25 where $n = 868$; and 287.64/11.36 where $n = 299$ respectively for the ten year

analysis where $N = 2073$. For the five-year analysis the obtained passing/failing frequencies for the elementary, middle, and high schools were 371.90/44.10 where $n = 416$; 417.88/25.12 where $n = 443$; and 142.60/10.40 where $n = 153$ respectively where $N = 1012$. The expected frequencies defined an ideal hypothetical situation. For the ten-year analysis the passing/failing $f = 802.90/65.10$ for the middle school and $f = 288.24/10.76$ for the high school. Similarly, for the five-year analysis, the passing/failing $f = 396.04/46.96$ for the middle school and $f = 143.33/8.68$ for the high school. A rigorous alpha level of $\alpha = 0.005$ was used for the level of significance, and with only two categories – passing and failing – the degrees of freedom equaled one. For $df = 1$ and $\alpha = 0.005$, the critical chi-square value was 7.88 (Gravetter & Wallnau, 1996).

Results

The findings were organized into two main categories. The first category reports ten years of student reading assessment data organized by campus and by grade level as measured by the reading TAAS and TAKS. The second category reports five years of reading assessment data organized by campus and by grade level as measured by TAKS.

Ten-Year Grade Level and Campus Findings

In objectively analyzing the relationship between the scheduling scheme practiced in the middle school and student reading achievement assessed via the state-mandated standardized reading assessment, as compared with student performance on equivalent elementary and high school reading assessments, the ten years of reading TAAS/TAKS student performance data collected from AEIS reports resulted in $N = 2073$ students beginning in 2000 and ending in 2009. The data reported in Table 3 were obtained from campus- and grade- level mean

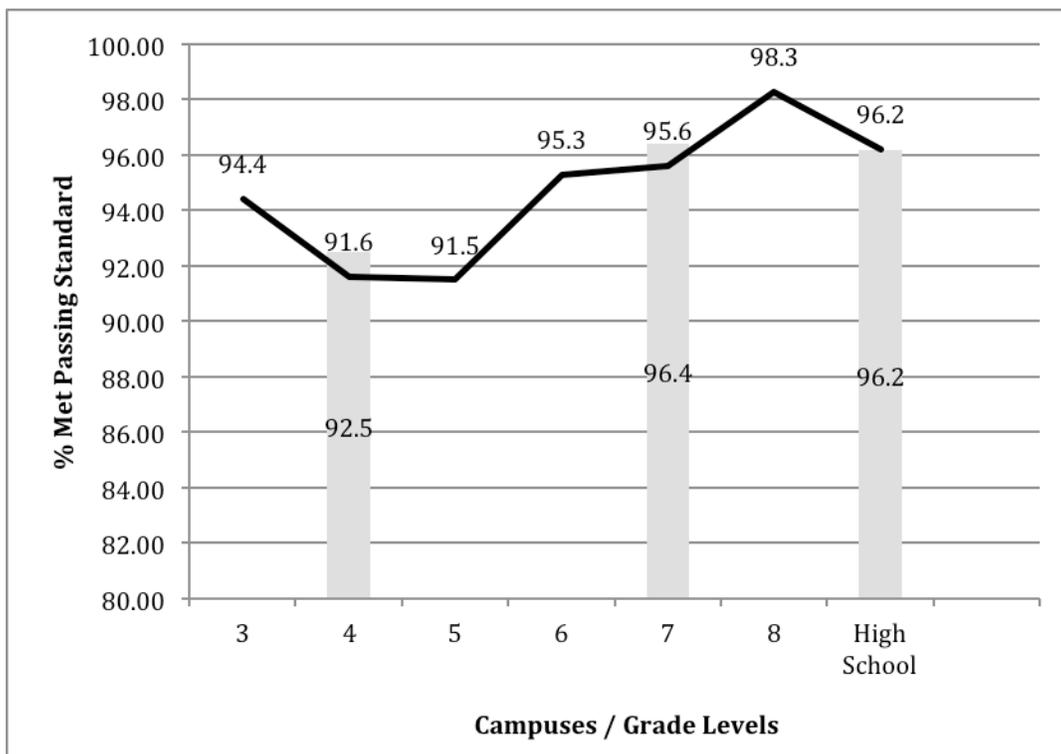


Figure 1. Ten-year cumulative mean scores by grade level of all students tested in grades 3 through 8 and 10 on TAAS and in grades 3 through 9 on TAKS who met the passing standard established by the state of Texas for reading from 2000 to 2009.

The data from Table 3 were converted into graphical format in Figure 1 to reveal the linear trends that evolved by grade level, while campus scores were plotted via histogram.

A grade level examination of the data revealed an initial drop in passing percentages from the third to the fourth and fifth grades, followed by successive increases to the eighth grade. There was a difference of 6.8 points from the fifth grade low score of 91.5 to the eighth grade high score of 98.3. The eighth grade high score was then followed by a 2.1 point drop as students moved into high school. By campus, the ten-year cumulative data revealed that the percentage of students passing the reading TAAS/TAKS climbed from the elementary through the middle school years, followed by a slight decline as they moved into high school.

The chi-square test for goodness of fit was used, as describe in the methods section, to determine the significance of the differences observed in the campus mean scores. Setting up the chi-square test in accordance with the “No Difference from a Comparison Population” method, resulted in the testing of two hypotheses. The first null hypothesis stated that there would be no significant difference from the elementary score to the middle school score, and the elementary score served as

the comparison population for determining the probable outcome of the middle school score. Similarly, the second null hypothesis stated that there would be no significant difference from the middle school score to the high school score, and the middle school score served as the comparison population for determining the probable outcome of the high school score. With only two categories of analysis—passing and failing—the $df = C - 1 = 2 - 1 = 1$ and with the the rigorous alpha of $\alpha = 0.005$, the critical chi-square of $\chi^2_{crit} = 7.88$. The results of the chi-square tests are reported in Table 4.

Consequently, pursuant to standard hypothesis testing procedures, the decision was to reject the null hypothesis stating that maintaining two separate classes for reading and ELA in middle school will have no impact on student reading achievement as measured by the reading TAAS/TAKS. Once students moved from the middle school campus to the high school campus, even though the percentage of students passing the reading TAAS/TAKS dropped, the statistical test indicated that the drop was not significant, thus the decision was to fail to reject the null hypothesis stating that combining the subjects of reading and ELA into one course in high school will have no impact on student reading achievement as measured by the reading TAAS/TAKS.

Table 4

Chi-square results in testing the goodness of fit using the “No Difference from a Comparison Population” methodology applied to ten years of compiled data

Campus	N	f_o		f_e		χ^2	χ^2_{crit}	Significant
		Passing	Failing	Passing	Failing			
Elementary	906	(.925)(906) 838.05	(.075)(906) 67.95	N/A	N/A	N/A	N/A	N/A
Middle School	868	(.964)(868) 836.75	(.036)(868) 31.25	(.925)(868) 802.90	(.075)(868) 65.10	19.03	7.88	Yes
High School	299	(.962)(299) 287.64	(.038)(299) 11.36	(.964)(299) 288.24	(.036)(299) 10.76	0.03	7.88	No
Totals	2073	1962.44	110.56	1091.14	75.86			

Table 5

Five-year mean scores reflecting the percentage of students meeting the passing standard in grades 3 through 9 on the reading TAKS from 2005 through 2009

Campus:	Elementary			Middle School			High School
Grade:	3	4	5	6	7	8	9
% Passing	94.0	86.0	88.2	93.8	92.6	96.6	93.2
		92.5			96.4		96.2

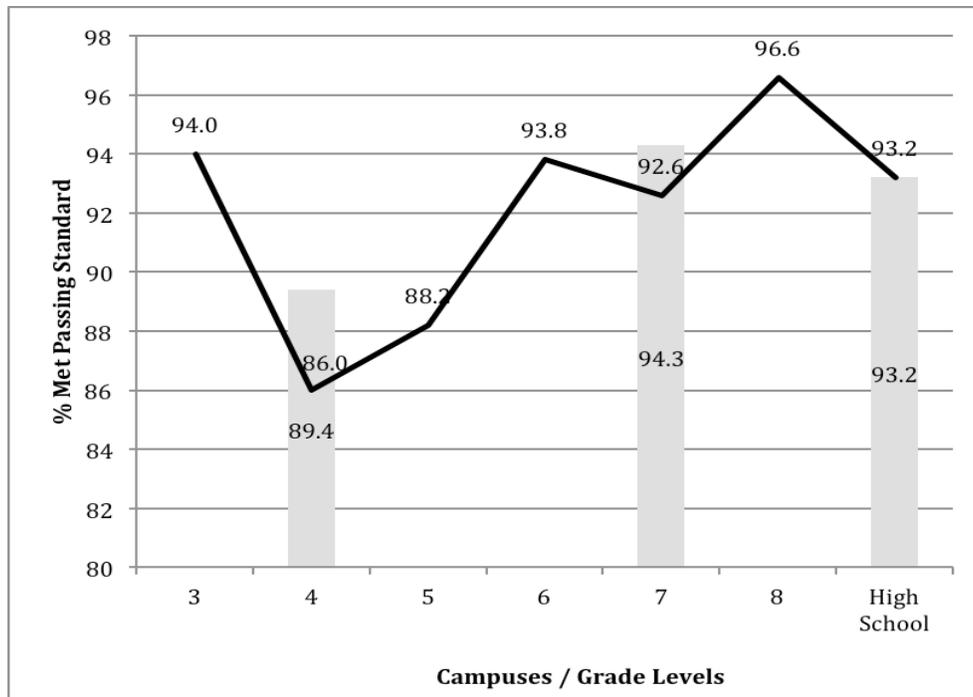


Figure 2. Five-year mean scores reflecting the percentage of students meeting the passing standard in grades 3 through 9 on the reading TAKS from 2005 through 2009.

Five-Year Grade Level and Campus Findings

The next analyses employed identical processes described in the preceding section, but with five, in place of ten, years of reading TAKS student performance data. There were N = 1012 students enrolled in the grade levels from which these data were collected beginning in 2005 and ending in 2009, as reported in the AEIS documents. As in the preceding section, mean scores, representing five years of test results were calculated and reported in Table 5. The data in Table 5 were converted into graphical format in Figure 2 to reveal the linear trends that evolved by grade level, while campus scores were plotted via histogram.

A grade level examination of the data revealed an initial drop in passing percentages from the third to the fourth grade, followed by successive increases to the sixth grade, a slight decline in the seventh grade, and a notable increase in the eighth grade. This was followed by a decline in the ninth grade. There was a difference of 10.6 points from the fourth grade low score of 86.0 to the eighth grade high score of 96.6. The eighth grade high score was then followed by a 3.4 point drop as students moved into high school. By campus, the five-year

cumulative data revealed that the percentage of students passing the reading TAKS climbed from the elementary through the middle school years, followed by a slight decline as they moved into high school.

In following the pattern established with the ten-year data set, to determine the significance of differences observed in the five-year campus mean scores, the chi-square test for goodness of fit was used. The two null hypotheses mirrored those tested in with the ten-year data set, where the first null hypothesis stated that there would be no significant difference from the elementary score to the middle school score, and the second null hypothesis stated that there would be no significant difference from the middle school score to the high school score. The same two categories of analysis—passing and failing—were used, thus the $df = C - 1 = 2 - 1 = 1$ and $\chi^2_{crit} = 7.88$ resulted from the selection of the rigorous alpha of $\alpha = 0.005$. The results of the chi-square tests are reported in Table 6. While the numbers obviously varied, the results of the hypothesis tests for the five-year data set were the same as those for the ten-year data set. The findings from elementary to middle school were significant, whereas the findings from middle school to high school were not.

Table 6

Chi-square results in testing the goodness of fit using the “No Difference from a Comparison Population” methodology applied to five years of compiled data

Campus	N	f^o		f^e		χ^2	χ^2_{crit}	Significant
		Passing	Failing	Passing	Failing			
Elementary	416	(.894)(416) 371.90	(.106)(416) 44.10	N/A	N/A	N/A	N/A	N/A
Middle School	443	(.9433)(443) 417.88	(.0567)(443) 25.12	(.894)(443) 396.04	(.106)(443) 46.96	11.36	7.88	Yes
High School	153	(.932)(153) 142.60	(.068)(153) 10.40	(.933)(153) 143.33	(.0567)(153) 8.68	0.024	7.88	No
Totals	1012	932.38	79.62	539.37	55.64			

Discussion and Conclusions

In summary, ten years of state-mandated standardized reading assessment data were collected and trend analyses were conducted. The first analysis captured the full ten years of test results through the calculation of campus-level mean scores and the second analysis captured the five most recent years of test results through the calculation of campus-level mean scores. Both analyses yielded similar patterns when plotted linearly, where scores rose from the elementary to middle school, followed by a drop in high school.

The compilation of third, fourth, and fifth grade scores into a single campus score revealed that the lowest performing campus in the ten- and five-year analyses was the elementary. However, there was a statistically significant growth from the elementary to the middle school—perhaps a sign of history, maturation, and more test-wise skills to some extent as described by Gall, Borg, and Gall (1996), but also indicative of increases in students' levels of reading achievement as a result of additional time allocated in the school curriculum for direct instruction in reading and other aspects of ELA. The compilation of sixth, seventh, and eighth grade scores into a single campus score revealed that the highest performing campus in the school district was the middle school. Although the drop in test scores from the middle school to the high school was not statistically significant at the 0.005 alpha level, from the perspectives of school leaders, declining scores will still raise pragmatic concerns.

While several explanations may be offered for the improvement in students' reading achievement from the elementary to the middle school, for researchers external to the school district, it is imprudent to overlook the purposeful separation of reading and ELA in separate classes as a major contributor. The advantage school leaders have over external researchers is an intimate working knowledge of the internal environment. Reiterating that the purpose of this study is to demonstrate trend analysis techniques for use by school leaders, in this final section of the study, the researchers, external to the school, can only speculate on factors leading to the student performance differences observed from campus to campus. Nonetheless, those speculations should serve as a guide for school leaders to use as they engage in these same processes with the added benefit of internal organizational knowledge. For example, while the clear separation of reading and ELA is obvious to a researcher viewing a class schedule, there is no way to know from an external view how reading and ELA are structured (combined or separated) in the self-contained elementary classroom. However, school leaders have the advantage of being privy to that type of information to better inform the conclusions they draw.

From the vantage point of the external lens

through which the researchers viewed these findings, the decline in students' reading achievement from middle school to high school may be accounted for by at least two factors that should be investigated proactively by school leaders. First, the transition from middle school to high school is a big step for students involving changes in expectations, maturity, faculty and administration, supervision, and participation in extracurricular activities (National Middle School Association, 2003), and these factors may have contributed to the reduced performance on the reading assessment. Second, it is possible that high school content area teachers (other than ELA teachers) need to devote more instructional time to reading instruction to increase students' literacy development in the absence of separate reading and ELA classes.

In conclusion, school leaders must use data from state assessments to take direct action to improve classroom instruction and curriculum development (Slavin et al., 2013). While the separation of reading and ELA into separate courses at the middle school level is not mandated in Texas, the data in this study would initially suggest to school leaders in this district that the additional time devoted to reading instruction in the middle school resulted in increased passing rates on state-mandated standardized reading assessments. Consequently, it seems prudent, especially to middle school leaders, to continue to allocate additional time to reading instruction in the school curriculum. In terms of the decline in reading performance at the high school level, although not significant, proactive school leaders may consider measures for staff development in reading instruction and other aspects of literacy development to improve classroom instruction across the curriculum to prevent a decline in reading performance from middle to high school from becoming significant. In addition, school leaders might consider instituting opportunities for content area teachers to collaborate with peers in their respective academic disciplines to support them in their efforts to more effectively integrate effective reading instruction into the classroom context.

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