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Achievement Differences between Large and Small Schools in Texas

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The purpose of this study was to determine whether there exists a relationship between student achievement in Texas, as measured by the Texas Assessment of Knowledge and Skills (TAKS) test, and the size of the high school at different socioeconomic levels. This study compared five size categories of Texas high schools to determine which size high school had the highest percentage of eleventh grade students passing all four sections (reading, writing, math, and science) of the TAKS test. Data were examined for statistical significance using an ANOVA and a post hoc Scheffé test. The findings indicate that smaller rural schools experience higher percentages of students passing all four parts of the eleventh grade TAKS test in Texas than the larger urban and suburban schools where 25 % or more of the students are living in low socioeconomic situations.

Introduction

Educational leaders are continually searching for the best methods to produce the conditions most favorable for learning and success of students in PK-12 public education. Researchers have considered school size among other facets of education while searching for optimal conditions for learning. Does the size of a school really make a difference in improving student achievement, and if so, why? Ornstein and Levine (2000) made the observation that district, campus, and class size issues have become a popular topic among educators. High stakes testing and the overall cost associated with graduation are just a couple of the reasons for the increased interest in school size.

With the push for accountability in the United States, educators have begun searching for ways to improve scores on state mandated high-stakes testing (Olson, 2000). An interest in the optimal school and class size for student learning has been a natural outgrowth of the accountability trend. Educators are interested in defining the most advantageous size schools and classes for optimal learning conditions and increasing student achievement. How does school size impact student achievement?

The costs associated with preparing students for graduation from high school has been an ongoing concern for policy makers at both the state and federal level (Bard, Gardener, & Wieland, 2005). Stiefel, Iatarola, Fruchter, and Berne (1998) reported that some have suggested that economies of scale exist in larger schools, but these researchers are quick to add that policy makers need to consider the cost per pupil for graduation rather than just the cost per pupil per year. They noted that expenses associated with graduation in four years must be compared to the costs associated with graduation for those students who go beyond the four year period. Stiefel et al. found that high schools with higher retention rates cost more per pupil in funding due to the extra year or so it takes for a student to graduate.

Research indicates that high schools with 400 to 900 students tend to hold more promise for student academic success than the larger schools (Irmsher, 1997). High schools with 400 to 900 students have higher rates of attendance, lower drop-out rates, and higher participation rates in extracurricular activities, (Irmsher, 1997; Gewertz, 2001). With schools facing issues related to high stakes testing and rising costs associated with graduation, it has never been more important than now to rethink the size of our public schools.

Research on the correlation between high school size and achievement has shown mixed results. Gewertz (2001) reported that some studies indicated no statistically significant difference in achievement as measured by standardized test scores, while other studies indicated higher test scores for students in low-income families in smaller schools. One study in particular concluded that students from low-income families performed better on state mandated testing when they were in relatively smaller schools (Howley & Bickel, 1999). The same study found that wealthier students performed better when they were in larger schools. A study conducted in Tennessee concluded similar results when measuring the mathematic achievement of middle and high school students (Hopkins, 2005). Additionally, Hopkins found that students in the smaller rural locales scored higher on the American College Test (ACT) scores than their larger non-rural locales.

While there are no standard definitions among researchers for small and large high schools and there are no standard definitions of rural and non rural schools, some generally accepted guidelines were followed in this study. The literature generally refers to small high schools as those with less than 400 pupils enrolled (Roellke, 1996). Numbers greater than 900 are generally considered large high schools. The researcher also has further defined rural to be schools that are located in smaller rural communities, while the non rural schools are those found in larger urban and suburban populations.

A study of the impact school size has on student achievement is not new. However, since Texas implemented the Texas Assessment of Knowledge and Skills (TAKS) test which is aligned with the state curriculum known as the Texas Essential Knowledge and Skills (TEKS), one can more effectively compare the larger suburban and urban schools with the smaller rural schools because each school is given the same curriculum and the same state wide test to assess the curriculum. This alleviates any differences that might occur due to a misaligned curriculum that might occur in a school with fewer resources, such as a small rural school. In addition the state has an almost equal percentage of low SES and non-disadvantaged students (Texas Education Agency, 2007). This allows the researcher to consider students from low SES backgrounds and students who are not from low SES families while considering the difference in academic achievement of smaller rural schools and their larger urban counterparts.

Background Information

Brief History of School Size

Studies examining school size issues have been prevalent over the past few years, therefore much has been written on the topic (Bard, Gardener, & Wieland, 2005; Cotton, 1996; Cushman, 1999; Howley, 1994; Howley, Strange, & Bickel, 2000). There has been a great deal of attention by policy makers, educators, and parents concerning the size of campuses, districts, and classes, since the mid 1970's (Raywid, 1996). The increased interest is due in part to the reality that society has called upon public educators in the United States to fulfill an increasing number of responsibilities with an increasing number of students per campus, while simultaneously expecting an increase in the productivity and effectiveness of public schools. The task has become an arduous one; one that some believe educators have failed to accomplish. The National Commission on Excellence in Education (1983) produced the now classic report which indicted public educators in the United States for creating a system full of mediocrity. The report, known as *A Nation at Risk*, criticized public education for failing our students and the country (The National Commission on Excellence in Education, 1983).

While expectations for achievement were increasing, so too were the size of campuses, districts and classes. School district and campus sizes have experienced phenomenal growth over the past 70 years, and, according to Herzog and Pittman, (1995) the following factors have driven the growth in campus and district size: (a) the overall population of the United States has seen a increase, (b) many families have moved to metropolitan areas from sparsely populated rural areas, and (c) legislators have been looking for ways to cut spending thus requiring schools and districts to be more efficient.

During this period of proliferation in the numbers of larger high schools, many educational leaders and researchers have been considering ways to create smaller units within large high schools. Gregory (2000) identified four societal forces that have driven educators to seek ways to divide large schools into smaller schools. The four leading forces behind the drive to create smaller learning environments are (a) the information age, (b) the emergence of an adolescent culture, (c) the students' rights movement, and (d) our changing views of the proper functioning of organizations. According to Gregory, these four forces have resulted in making large schools less effective than their smaller counterparts.

School Size and Socioeconomic Status (SES)

According to Howley and Bickel (1999), studies conducted in California, Alaska, and West Virginia found that small school size mitigated the negative effects of poverty on student achievement. Howley and Bickel's (1999) study, referred to as the Matthew Project, has become a seminal study on the affects of school size on poverty. Through the use of regression equations, these two researchers worked to predict overall school achievement from measures of size, socioeconomic status (SES), and the product of size and SES in Ohio, Georgia, Texas and Montana. The Matthew Project illustrated the need for smaller learning environments (Howley, Strange, & Bickel, 2000). It was further noted that most high schools in the four states studied were too large to maximize achievement among the economically disadvantaged populations.

Research by Cotton (1996), which concurs with data from the Mathew Project, suggested that economically disadvantaged students are better served in the social realm in smaller schools, due to the close-knit nature of the relationships between staff and students. Hopkins (2005) agreed with Cotton and suggested that small rural schools offer a sense of community not found in their larger urban counterparts. Students in small schools experience higher rates of extracurricular participation, higher attendance rates, higher overall grades, lower dropout rates, and have fewer discipline problems than do their contemporaries in larger schools (Cotton, 1996; Viadero, 2001). Having a climate conducive to student participation at school is extremely important for students living in "at-risk" situations (Baas, 1991). Raywid (1997) stated, "In small schools, otherwise marginal or at-risk students are much more likely to become involved, to make an effort, and to achieve" (p. 38). Due to the evidence in support of the social and academic benefits found in smaller schools, which is backed by large-scale quantitative studies from the late 1980s and early 1990s, researchers and educational leaders are calling for policy makers in the United States to create an environment which fosters smaller schools (Raywid, 1999).

Studies on School Size

The Carnegie Corporation has issued information on the subject of smaller schools. They commissioned a seminal study on urban high schools. In the report, Baldwin (2001) asserted that smaller learning environments set the stage for greater student achievement. The report indicates there is much data available from the quantitative and qualitative areas of research to support smaller learning environments.

Another study conducted by Nathan and Febey (2001) considered 22 case studies of schools from 12 states (Arizona, California, Colorado, Illinois, Kansas, Massachusetts, Minnesota, New York, Ohio, Oregon, Texas and Washington) and reaffirmed other school size research. They reported that smaller schools on average provide (a) a safer place for students, (b) a positive challenging environment, (c) higher achievement, (d) higher graduation rates, (e) fewer discipline problems, and (f) much greater satisfaction for families, students and teachers (p. 7).

The National Association of Secondary School Principals (NASSP), while not addressing the specific issue of size, has addressed the need for a reduction in the number of students for which one person is responsible in public high schools. The organization has suggested that having one adult responsible for fewer students will allow for more opportunities for students to feel a connection in the school (NASSP, 2004). Smaller high schools have the advantage of producing these one-on-one relationships with adults (Irmsher, 1997).

After researchers began calling for smaller schools, the next big question on the horizon was, "How big is small?" Most of the researchers settled on a number somewhere between 400 and 900 students in a high school (Gewertz, 2001; Irmsher, 1997; Raywid, 1999). It is worth noting that some of the research even suggests that one size will not fit all situations due to socioeconomic circumstances (Bickel, Howley, Williams, & Glascock, 2000).

Another question raised during discussions of size was, "How much does it cost to operate different size schools?" While some researchers suggested larger schools experience economies of scale, others suggested the possibilities of diseconomies (penalties) of scale in the larger schools (Sergiovanni, 1995). Some held to the position that smaller schools are more economical due to the consideration of the cost per student to graduate rather than the cost per student to attend in a given year. Raywid (1999) suggests that there is a lower cost per pupil to graduate in smaller schools due to the higher retention rates in larger schools.

Small School Issues

Small schools also experience their own set of challenges, although researchers suggest the problems are not insurmountable (Worzbyt & Zook, 1992). The shortages of resources often translate into a deficiency in extracurricular programs available for students in smaller schools. Educational leaders and researchers believe smaller schools will need to become more resourceful in their use of limited resources, but it needs to be noted that large schools are beginning to face some of the same type of issues related to scarce resources. The research suggests that once a school reaches a population of around 400 students, one has a sufficient size for providing an adequate curriculum (Howley, 1994).

Ways to Create Smaller Learning Environment within Larger Schools

Many reform efforts are underway to break larger schools into smaller units. Some larger schools are beginning to look at breaking existing schools into small schools within the larger school. Others are creating new smaller independent high schools. Some communities are creating schools referred to as House Plans, and some leaders are creating mini-schools (Cushman 1999; Meier, 1996; Raywid, 1996). It remains to be seen the impact, if any, these various plans will have on student success in the larger schools, especially with low SES students.

Research Design

Purpose of this Study

The purpose of this study was to determine whether there exists a relationship between student achievement in Texas, as measured by the Texas Assessment of Knowledge and Skills (TAKS) test, and the size of the high school at different socioeconomic levels. This study compared the five categories of Texas high schools, as defined by the University Interscholastic League (UIL), to determine which size high school had the highest percentage of eleventh grade students passing all four sections (reading, writing, math, and science) of the TAKS test.

The University Interscholastic League is an organization that establishes rules and conferences in Texas for participation in competitions among Texas public schools. The number of high school students attending each category of school as designated by the UIL is as follows: 5A high schools are composed of 1,985 students or more, 4A high schools have between 950 and 1,984 students, 3A high schools are composed of between 415 and 949 students, 2A high school have 195 to 414 students in attendance and 1A schools are composed of less than 195 students (University Interscholastic League, 2007).

Based on an understanding gleaned from studies regarding the relationship between socio-economic status and student achievement, this study compared different size traditional Texas high schools where the socio-economic conditions were comparable. The Matthew Project suggested an inverse relationship exists between student achievement and the size of a high school in which high populations of economically disadvantaged students attend (Howley, Strange, & Bickel,

2000). In order to accomplish the goal of comparing similar socioeconomic levels, this study divided the high schools in Texas into four quartiles. The divisions were made based on the percentage of economically disadvantaged students in the district where the high school was located.

The criteria used to define economically disadvantaged student populations in this study were the same as those used by the Texas Education Agency (TEA) to define economically disadvantaged students and families. Economically disadvantaged students are those students coded as eligible for free or reduced-price lunch or whose families are eligible for other public assistance (Texas Education Agency, 2001).

Population

All traditional public high schools in Texas reporting eleventh grade TAKS data in 2005-06 were used for this study. A traditional school is defined in this study as a high school that was not labeled a DAEP, AEP, JJAEP, or Charter school. Most of the alternative schools mentioned above would skew the data; the intent of this study was to compare the larger, more urban and suburban schools, with the smaller, mostly rural schools.

In the 2005-06 school year, Texas high schools enrolled 4,505,572 students. The ethnic composition was 14.7% African Americans, 45.3.6% Hispanics, 36.5% Whites, 3.1% Asian/Pacific Islanders, and 0.3% Native Americans. Economically disadvantaged students made up 55.6 % of the total population (TEA, 2007).

Procedures for Data Collection

Data were gathered from the Texas Education Agency's Academic Excellence Indicator System available online. The 2005 TAKS scores were selected and downloaded in an Excel file format. The data were disaggregated using the following procedure:

1. Non-traditional high schools were extracted. These non-traditional high schools included Alternative Education Programs (AEP), Disciplinary Alternative Education Programs (DAEP), Juvenile Justice Alternative Education Programs (JJAEP), and Charter Schools.
2. The remaining traditional high schools were divided into five size categories as indicated by the UIL system.
3. Schools were further divided within the UIL categories into SES quartiles. Quartiles were used to create a manageable way of comparing similar socioeconomic levels of schools.
4. The percentage of eleventh grade students passing all four parts of the TAKS test within the five different size schools were compared within each SES quartile using a one-way ANOVA to test for significant differences between the mean passing rates. The Statistical Package for the Social Sciences (SPSS) program version 15.0 was used to compute the one-way ANOVA and the Scheffé analyses. The alpha level was set at the .05 level of significance.

Data Analysis

The methodology employed in this study was a quantitative, non-experimental, ex post facto design. According to McMillan and Schumacher (1997), the "ex post facto design is used to explore possible causal relationships among variables that cannot be manipulated by the researcher (p. 38)." This study considered if there was a relationships between student achievement in Texas, as measured by the TAKS test, and the size of the high school at different socioeconomic levels, thus no manipulation of any conditions were performed. The comparison of the mean test scores of each school within each of the SES quartiles were considered using a one-way analysis of variance (ANOVA) procedure to test for statistically significant differences in the means, followed by a Scheffé test to determine if any difference in the means were detected between any size schools within the same SES quartile.

Findings

The purpose of the study was to answer the question: Is there a relationship between student achievement in Texas, as measured by the Texas Assessment of Knowledge and Skills (TAKS) test, and the size of the high school at different socioeconomic levels? The data from this study suggest a relationship does exist. Table 1 indicates the percent of eleventh graders who passed all parts of the eleventh grade TAKS test in Texas in 2006 (see Table 1 below).

The data in Table 1 indicate that in all but the 1st SES quartile, smaller schools experience higher percentages of students passing all four parts of the eleventh grade TAKS test in Texas than the larger schools. Table 1 indicates that 69.83 % of the students in 1A schools passed all four parts of the TAKS exam, while 66.74 % of students passed all four parts of the TAKS exam in 5A schools in the 2nd SES quartile. In the 3rd SES quartile, 64.01 % of the students passed all four parts of the eleventh grade TAKS exam in 1A schools, while 57.84 % of students in 5A schools passed. In the 4th SES quartile, 53.80 % of the students in 1A schools passed all four parts of the TAKS exam, while 50.56 % of students in 5A schools passed.

Table 1

Developmental level percentile rank table of means

UIL Classification	Mean				Standard Deviation				SES Quartiles			
	*1st	*2nd	*3rd	*4th	*1st	*2nd	*3rd	*4th	*1st	*2nd	*3rd	*4th
1 A School	72.50	69.83	64.01	53.80	20.00	14.93	15.89	18.75	10	109	89	25
2 A School	78.70	69.82	62.72	56.00	7.86	12.53	14.52	17.75	37	181	82	10
3 A School	78.81	67.01	57.70	49.04	7.90	9.72	12.99	14.29	36	95	40	27
4 A School	77.22	66.01	51.31	45.86	8.43	8.71	9.90	9.30	46	83	49	58
5 A School	81.72	67.44	57.84	50.56	7.56	8.39	9.54	10.02	72	77	44	27

Note. **1st represents <25% socioeconomic disadvantages student population.*
**2nd represents 25% to 49% socioeconomic disadvantages student population.*
**3rd represents 50% to 74% socioeconomic disadvantages student population.*
**4th represents 75% to 100% socioeconomic disadvantages student population.*

In the 1st quartile, according to Table 1, the larger schools tend to experience higher percentages of students passing all four parts of the TAKS test. This is an interesting phenomenon that raises two important questions. Why do students in larger urban schools score better than their contemporaries in smaller rural schools when there are fewer students living in low socioeconomic situations? And, why do small rural schools seem to better serve students living in low socioeconomic situations, as measured by the percentage passing all four parts of the TAKS test in Texas?

Table 2 indicates the smaller 1A and 2A schools experienced higher rates of students passing all four parts of the TAKS test than the 3A, 4A, and 5A schools in the third socioeconomic quartile (see Table 2 below).

Table 2

Average Number of Eleventh Grade Students Passing All Four Parts of the Exit Level TAKS Test in the Third Socioeconomic Quartile in Texas in 2006

Size of High School	Number of High Schools	Sum	Mean	Variance
1 A School	89	5697	65	252
2 A School	82	5143	62	211
3 A School	40	2308	59	169
4 A School	49	2514	53	98
5 A School	44	2545	57	91

It should also be noted that after employing the one-way ANOVA that at least two of the means were significantly different. Due to the indication from the one-way ANOVA, the Scheffé test was conducted which indicated significant differences existed between 1A and 4A and between 2A and 4A Texas high schools. The mean for 1A high schools in the third quartile was 65.00 % while the mean for the 4A high schools in the third quartile was 58.5 %. These data indicate 1A high schools experienced a higher level of academic achievement than 4A high schools in Texas. The mean for 2A high schools in the third quartile was 62.00 % and again the mean for the 4A high schools in the third quartile was 58.5 %. These data indicate 2A high schools experienced a higher level of academic achievement than 4A high schools in Texas.

Implications

So what can we learn from the data? There are at least three considerations that arise as one contemplates the data gathered in this study. These three findings should be considered in light of the reality that most small 1A and 2A schools are located in rural areas, 3A schools are found in both urban and suburban areas, while the larger 4A and 5A schools are generally located in urban and suburban areas of Texas. This breakdown was derived from the data set collected for this study from the Texas Education Agency we page, (Texas Education Agency, 2007). The study was not intended to consider each of the districts in terms of the new urban-centric classification system with four major local categories of city, suburban, town and rural, which are further divided into three subcategories by the National Center for Educational statistics (Provasnik, S. et al., 2007). Rather, the researcher was only interested in discerning between the larger 4A and 5A schools, mainly located in urban and suburban areas and the smaller 1A and 2A schools predominantly located in the more rural areas of Texas.

First, the data would indicate that students from small schools are more academically successful than larger schools. Therefore, a close examination by larger urban schools as to why smaller rural schools are more successful when working with low SES students should be considered. There are many plausible considerations as to why smaller rural schools are promoting student academic success; however the overarching theme of "family" seems to dominate the environment of small rural schools. According to Marshall, Sampson, and Stewart (2008), one successful rural school in East Texas reported having a "family atmosphere"; one where everyone felt a part of the school community. Strong community relationships are not solely given to smaller schools, but do tend to show up in most of the small rural schools (Hopkins, 2005). Hopkins suggested "The possibility exists that close-knit, economically disadvantaged rural locales offer a sense of community not found in other economically disadvantaged locales which enables rural students to achieve at a higher level mathematically than their nonrural peers" (p.21). The evidence of the academic success of the 1A and 2A rural schools found in this study seems to coincide with Hopkins' findings.

What can larger urban and suburban schools do about this finding? Schools in urban areas need to send teachers and administrators to smaller rural successful schools for visits. The small school atmosphere can be sensed in many of these small rural schools after a short time visiting with the teachers, parents, students, and administrators. Perhaps the visit could be viewed as a case study for the visiting team. The team can interview teachers with specific questions related to how they view their jobs and students. If the other studies hold true, such as the one by Marshall, Sampson, and Stewart (2008), the team might discover methods of dealing with students and parents that they can take back to their larger urban school system. The research has already offered some ways to make larger urban schools feel like smaller rural schools; these include school-within-schools, freshman academies, academic units, and advisory periods (NASSP, 2004; Raywid, 1996).

What should smaller rural schools do about this finding? The smaller rural schools need to conduct their own investigations through action research. They need to question why they are being successful with students that are often overlooked in the larger urban and suburban areas of the state. These finding then need to be reported in journals for further consideration by researchers who are trying to assist larger urban and suburban schools that are experiencing a rise in populations of students from low SES families.

Second, public policy makers should not be in a hurry to consolidate smaller schools into larger schools before accurately assessing the downside to larger school systems. The financial circumstances facing Texas legislators, due to court decisions, have prompted some to consider consolidation of schools. This is an ongoing issue that proponents of smaller rural schools are continuously dealing with in Texas; there seems to be little to no merit (economies of scale) in consolidating the small rural districts into larger districts made up of several small towns (Patterson, 2006).

Once again, data from this study indicate that the smaller rural 1A and 2A schools are serving the students well; their academic needs are being met at levels that exceed the larger 4A urban and suburban schools located in the third quartile of low SES. This is important data due to the reality that 55.6 % of Texas students came from low SES families at the time this data collected by the state (Texas Education Agency, 2007). With more than half of the students in the state coming from families classified as low SES, and with the data from this study suggesting smaller rural schools do a better job at educating this type of student, it would seem logical to keep as many of these small rural schools as possible to educate students in Texas.

Finally, it is imperative that educational leaders and policy makers begin to consider why schools with larger populations of low SES students perform lower than schools with smaller populations of low SES students. Figure 1 indicates an inverse relationship between low SES populations and test scores. Again, this study suggests the school system best equipped to deal with these students is the smaller rural schools. A recommendation from this researcher is for the larger urban districts to visit the smaller rural schools in order to better understand how these schools are dealing with students who come from low SES families.

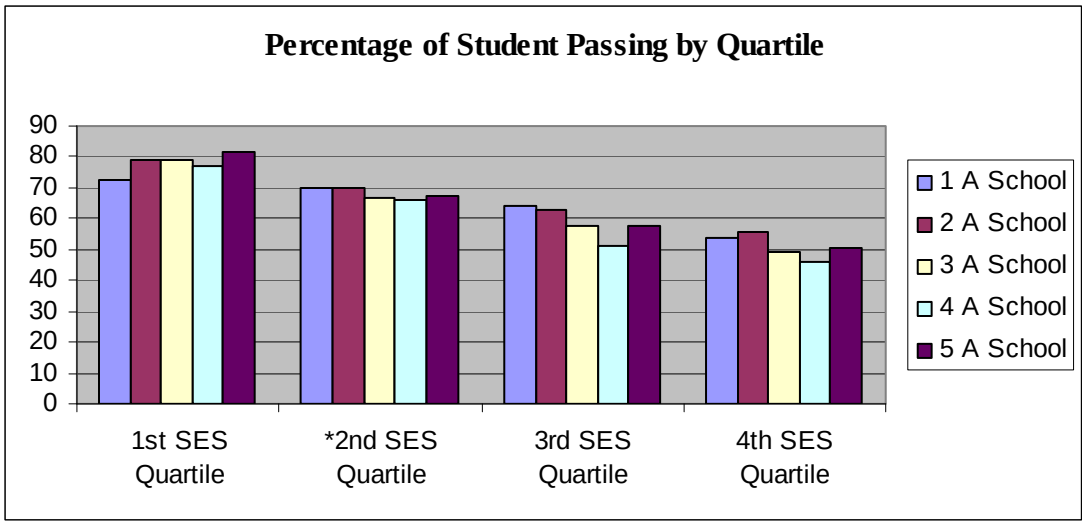

Figure 1. Percentages of eleventh grade students passing all four parts of the eleventh grade TAKS test in 2005-06 by socioeconomic quartile

Future Studies

Two ideas for future studies came to mind when these data were examined from this study. First, the data suggest that small schools in Texas experience greater percentages of students passing all four parts of the TAKS exam when the school is made up of at least 25 % low SES students. Case studies will need to be conducted to ascertain what is occurring in these small rural schools that improves the chances of academic success of underprivileged students. Finally, the data indicate that as schools experience greater percentages of low SES populations, the overall chances of academic success diminish. Studies need to be conducted to understand this phenomenon. Our system of democracy is contingent on an educated electorate; therefore we must do a better job educating all students.

Conclusion

Educational leaders and policy makers must make an effort to understand what is driving the success of small rural schools academically. Greater percentages of students in small rural schools, at least in Texas, are scoring better than their contemporaries in larger urban and suburban schools on the state mandated TAKS test in the eleventh grade. There is no evidence to suggest that smaller schools have brighter students or that smaller schools have more capable teachers or administrators. So what is happening? The answer to this question can only be found through in depth case studies of small schools.

Sampson and Marshall (2007) found, among other factors, that the success of the small schools in their study was due to the strong relationships that were forged between the school board, community members, teachers, students, and administrators. These strong relationships, while not exclusively proprietary to smaller rural schools, do tend to be easier to develop in these rural settings, for a variety of reasons (Kennedy, 2003; Hopkins, 2005). We must learn how to nurture and develop the same type of high quality relationships that are prevalent in smaller rural schools.

If our leaders do not listen to the evidence that smaller rural schools are doing a better job educating students, particularly from low SES backgrounds, and if they continue to press for these small rural schools to be consolidated into the larger suburban school systems, then our students will pay the price. Student achievement will likely falter if they do not receive the care that is being offered to them from these smaller rural districts. Our students are depending on us to find the answers.

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