School Size and Class Size in Texas Public Schools

Introduction

In response to an enrollment increase of 666,961 students over the past 10 years, Texas public schools have increased in both number and size. The highest growth in both the number of schools and average size of schools that offer regular instruction occurred at the high school level. The number of Texas high schools with over 2,000 students increased by 35 percent from 1987-88 to 1997-98, and these very large schools now make up 14 percent of all regular instructional high schools. Furthermore, the number of elementary and middle schools with 900 or more students increased by 30 percent and 53 percent respectively from 1987-88 to 1997-98.

While school size increased in Texas, research has been conducted over the past two decades suggesting that the academic achievement of many students suffers at large schools. Smaller schools are thought to be more efficient at providing conditions more conducive to student learning. One of those conditions is smaller classes.

This is the first in a series of Policy Research Reports on the topic of school size and class size in Texas public schools. This report presents an overview of the findings from school size research conducted nationally over the past two decades. Moreover, school size trends in Texas are described and the relationship between school size and student academic performance in Texas is analyzed. In addition, Texas policy related to student-teacher ratios and class size is reviewed and the relationship between student-teacher ratios and school size is examined. Finally, a review of class size research conducted nationally presents findings in the areas of school climate, student academic achievement, and principal, teacher, and parent perceptions. Financial considerations in decisions to reduce class size are also discussed.

With Texas public school enrollment projected to increase at more than twice the national rate over the next decade, education administrators and taxpayers will continue to face difficult decisions related to school facilities. The report concludes with a discussion of some of the ways educators are exploring to organize schools and classrooms of all sizes to provide a better learning environment to increase achievement for all students.

Class size in Texas public schools will be examined more closely in the next phase of the study. Topics that will be explored include the relationship between school performance and student-teacher ratios, characteristics of large schools with small student-teacher ratios, and an evaluation of school-level class size data.

School Size

Debates over school size continue to surface in discussions about student academic achievement. Generally, larger schools are endorsed because of their ability to provide academic choices and efficient economies of scale. However, small school proponents maintain that student achievement improves because smaller schools have higher class and school participation, parental involvement, attendance, and graduation rates, as well as a better school climate, more individual attention, and fewer dropouts and student discipline problems.

While the United States population increased significantly from 1938 to 1990, the number of public school districts declined from 119,001 to 15,367 (NCES, 1998). During the same time period, the number of public elementary and secondary schools decreased nationwide from approximately 247,127 to 83,425 (NCES, 1998). Thus, individual schools experienced significant enrollment increases due to district and school consolidations.

Throughout the 1990s, both the size and number of schools continued to increase as enrollments nationally increased. By 1995-96 there were 87,125 public elementary and secondary schools in the United States (NCES, 1998). Average school size was 476 students in elementary schools and 703 students in secondary schools. Based on NCES data, Texas elementary schools enrolled on average about 75 more students than public elementary schools nationally and Texas secondary schools had about 24 fewer students than secondary schools.

Although enrollment nationally increased 16 percent between 1984 and 1996, only a 6 percent enrollment increase is projected for the next 12 year period (NCES, 1998). Projected increases vary dramatically between regions and among states. A 14 percent increase in public school enrollment is forecast for Texas between 1996 and 2008. Texas elementary school enrollment is projected to increase by only 10 percent; high school enrollment may surge 24 percent. Only North Carolina, Arizona, California, and Nevada are projected to have greater increases than Texas in high school enrollment. Although Texas Education Agency pupil projections for high school through the year 2003 are more conservative than the NCES projections, Texas clearly ranks as one of the high growth states.

Involvement and Participation

Ordinarily, conceptions of effective schools include practices and organizational structures characteristic of small schools (Howley, 1997; Raywid, 1998; Unks, 1989). Smaller schools are perceived as more manageable because they cultivate more familiarity and interaction between students, staff, and parents; greater sharing of responsibilities; and less opposition to curricular changes (Miller, Ellsworth, & Howell, 1986; Unks, 1989). In addition, research has identified a relationship between small schools and increased associations among students and staff. Although some argue that the people, not the size of the school, make the difference, studies report that students feel a greater sense of belonging and self-regard at small schools (Cotton, 1996; McGuire, 1989; Meier, 1995; Unks, 1989). Although students at smaller schools also have fewer relationships with adults in their school life, established relationships are "more intense and enduring" (Wynne & Walberg, 1995, p. 531). While larger schools appear to produce a less positive social environment, less social integration, less participation, and less identity with the school, smaller schools are associated with reports of greater personal efficacy for teachers and administrators (Cotton, 1996; Gladden, 1998; McGuire, 1989).

Research also demonstrates that students participate less at larger schools (Finn, 1998). Often, fewer students at large schools participate in school activities due to feelings of isolation or seclusion (Schoggen & Schoggen, 1988). In addition, the number of students who can participate in roles and activities is limited at larger schools (Pittman & Haughwout, 1987). In contrast, students at smaller schools often are more eager to participate and have more opportunities to do so (Sergiovanni, 1995). In addition to increased student participation in small schools, parents tend to participate more often in school matters at small schools (Alspaugh, 1994).

Student Achievement

Increasingly, evidence suggests that school size, directly or indirectly, interacts with student learning. Proponents perceive small schools as more efficient at raising student achievement and accruing other benefits as well. In addition to concluding that student achievement suffers in schools with enrollments over 2,000, Farber (1998) concluded that gains for reading and mathematics are best for all students, regardless of wealth, who attend high schools with 600 to 900 students. A study by Lee and Smith (1997) using National Educational Longitudinal Study (NELS) 1988 data on students from small and large schools demonstrated that mathematics and reading gains for students in high minority and high economically disadvantaged schools with 600 to 900 students were comparable to their counterparts at low minority and low economically disadvantaged schools. However, the analysis noted an increasing achievement gap between high-minority and low-minority schools, as well as high-economically disadvantaged and low-economically disadvantaged schools when enrollment surpassed 900. Miller, Ellsworth, and Howell (1986) studied 12 elementary schools in Kansas Unified School District #259. They also determined smaller elementary schools are associated with better reading achievement levels.

Raywid (1998), reporting on a study of Philadelphia and Alaska schools, noted that students in small high schools were more likely to pass core subjects than students in larger high schools. Moreover, results from the Alaskan schools indicated that disadvantaged students at small schools significantly outperformed those at large schools on standardized tests of basic skills. Although some studies endorse large schools as the best setting for preparing students for college, others maintain that small schools are equally good, if not better, at preparing students for achievement in school, college, and the future (Cotton, 1996). For example, Jewell (1989) found that states with smaller schools have higher SAT and ACT scores.

The prominence of school size effects on students who are economically disadvantaged prompts advocates of small schools to tailor their recommendations for situations when small school size will be most advantageous for specific types of students. A California study demonstrated that while large schools may help affluent students, smaller schools increasingly benefit economically disadvantaged students (Friedkin & Necochea, 1988). In addition, "the negative effects on the achievement of impoverished students are much stronger than the positive effects of size on affluent students" (Howley, 1995,

p.15). Thus, large schools are believed to be less detrimental to students from affluent backgrounds than to those from more disadvantaged backgrounds (Howley, 1997; Raywid, 1998). Yet, secondary students who are economically disadvantaged and minority are generally concentrated at the larger schools. Findings suggest that minority and economically disadvantaged students at these schools could benefit if the size of the school were reduced to a range between 600 and 900 students (Lee & Smith, 1997).

Considerations about school size must include the interaction between school size, student socioeconomic status, and student achievement. The consensus is that students learn less and have fewer academic gains in larger schools if they are economically disadvantaged or the school they attend has students who are predominately economically disadvantaged (Lee & Smith, 1997). According to Howley (1995), the negative effects to students who are economically disadvantaged increases as school size increases. Again, schools with less than 1,000 students appear to disrupt the negative effects of socioeconomic status in predicting student achievement (Farber, 1998).

Recent findings on school size demonstrate that most high schools are too large for learning to be maximized (Lee & Smith, 1997). "It is not impossible to have a good large school, it is simply more difficult" (Goodlad, 1984, p. 309). While the advantages of small schools have been explored, limited attention has been directed towards understanding the negative effects of large schools on achievement and behavior. This is disturbing considering large, crowded schools are sometimes believed to be an "incubation area for gangs and delinquent behavior" (Achilles, 1996, p. 39). Consequently, although reducing school size alone may not improve student achievement, it may mitigate the negative effects imposed by large schools.

Attendance, Dropouts, and Graduation Rates

Regardless of whether measuring graduation rates or dropout rates, small schools are more likely to keep students in school (Cotton, 1996; Gladden, 1998). Nationally a relationship has been established between school size and student attendance. Overall, the percentage of students absent on a typical day increases as school size increases.

In general, large schools, especially in larger cities, have higher dropout rates (Cotton, 1996; Felter, 1989, 1997; Jewell, 1989). Student dropout rates remain lower in small school districts (Gladden, 1998). In addition, school districts that maintain only one transition between schools for students after sixth grade show lower dropout rates than those where students must change schools more than once after sixth grade (Alspaugh, 1998). Finally, large schools may produce environments that induce students to exit school sooner by dropping out (McGuire, 1989).

Small schools generally are able to demonstrate higher attendance and graduation rates. A study of New York City Schools reported that graduation rates were 7.3 percent higher for small schools than large schools (Viadero, 1998). In addition to graduating more students, smaller schools appear to be able to graduate more students on time.

Economies of Scale

The phrase "economy of scale" is a business term meaning that production of a greater number of units will result in lower costs per unit (Jewell, 1989). Applying this concept to school operations leads to the conclusion that larger schools are more cost efficient. However, although some believe increasing the size of a school contributes to a school's economic efficiency, others contend creating schools deemed too large results in poorer quality, inefficiency, and less productivity (Alspaugh, 1994; Cotton, 1996; Howley, 1997; Sergiovanni, 1995). Meanwhile, some evidence suggests similar per-unit costs in the smallest and largest schools. A U-shaped graph represents this phenomenon. In other words, as enrollment increases the cost per pupil declines, maintains a relative balance, and finally begins to increase again as the student population grows (Cotton, 1996; McGuire, 1989; Walberg & Fowler, 1987).

Schools with either extremely small or large enrollments require additional costs and tend to be relatively expensive to operate (Alspaugh, 1994). Additional costs for large schools may include more resources in terms higher salaries and benefits; need for additional staff positions including administrative positions; maintenance and operations costs; and increased transportation requirements (McGuire, 1989). Cost and efficiency in public education may relate more directly to school operations than school size.

In terms of cost, a study of New York City's schools found small high schools match their large high school counterparts in providing educational opportunities (Viadero, 1998). Although the cost per pupil in small schools approximated $1,410 more per year than for New York City large schools, actual costs per graduate were only an additional $25.

Curriculum

Larger schools are thought to maintain an advantage over small schools by offering a more extensive curriculum and greater choice of programs (Howley, 1997; Roellke, 1996; Unks,

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School Size Trends in

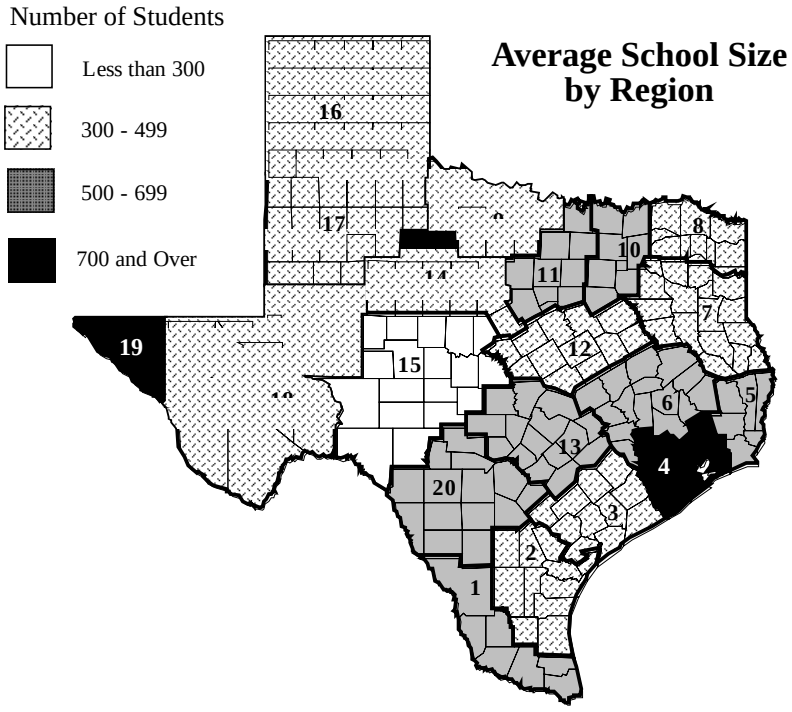
In the 1987-88 school year, 5,747 Texas public schools housed 3,224,916 students. By 1997-98 the number of schools had grown to 7,053, a 21 percent increase. Enrollment also grew by 21 percent over the same period (TEA, 1998b).

The number of elementary schools increased by 429, from 3,292 in 1987-88 to 3,721 in 1997-98, a 13 percent increase. While the average size of elementary schools grew by only 15 students, regular instructional schools grew by 20 students. In addition, individual schools experienced significant enrollment changes over the decade. Of the 3,060 schools that operated as elementary schools in both 1987-88 and 1997-98, 39 percent had enrollments that were more than 5 percent higher in 1997-98 and 48 percent had enrollments that were more than 5 percent lower.

The number of middle/junior high schools increased by 296, from 1,072 in 1987-88 to 1,368 in 1997-98, a 28 percent increase. The average school size increased by only 8 students; however, the size of regular instructional schools increased by 32 students. Over half of the existing middle/junior high schools were more than 5 percent larger in 1997-98 than in 1987-88; one-fourth were more than 5 percent smaller.

The number of high schools increased by 45 percent from 1987-88 to 1997-98. Most of the growth can be attributed to an increase in the number of alternative high schools and juvenile justice alternative education programs (JJAEPs). From 1987-88 to 1997-98, regular instructional high schools increased by only 71, a 7 percent increase. The average size of regular instructional high schools increased by 86 students, from 820 students in 1987-88 to 906 students in 1997-98. The number of high schools with over 2,000 students grew from 117 to 158. As a result, very large high schools now account for 14 percent of all regular instructional high schools.

Growth of regular instructional schools in urban areas (major urban and other central city school districts) kept pace with enrollment increases. The number of urban schools increased by 16 percent while the average school size decreased by 8 students. In suburban areas on the other hand, although the number of regular instructional



	Region	Average School Size
1	Edinburg	679
2	Corpus Christi	464
3	Victoria	387
4	Houston	769
5	Beaumont	531
6	Huntsville	503
7	Kilgore	400
8	Mt. Pleasant	364
9	Wichita Falls	350
10	Richardson	624
11	Fort Worth	593
12	Waco	397
13	Austin	579
14	Abilene	309
15	San Angelo	246
16	Amarillo	367
17	Lubbock	337
18	Midland	439
19	El Paso	746
20	San Antonio	586

schools increased by 23 percent, average school size also increased by 59 students from 1987-88 to 1997-98. Nonmetropolitan schools, which include schools in independent town school districts as well as fast growing and stable nonmetropolitan districts, also increased in size. The number of regular instructional schools located in rural school districts decreased by 1.

All types of communities saw large increases in the number of alternative education schools and JJAEPs from 1987-88 to 1997-98, and a reduction in the average number of students enrolled in these schools. The large increase in the number of alternative education schools and JJAEPs can be attributed in part to a 1995 law mandating that districts provide alternative education programs for placement of students who commit certain offenses (TEC §37.008).

Across the 20 education service center regions, the San Angelo region had the smallest average school size of 246 students. While 17 of the regions maintained an average school size between 300 and 699 students, average school size in the Houston and El Paso regions exceeded 700 students.

Growth in Number and Size of Texas Public Schools

	1987-88		1997-98		Change 1987-88 to 1997-98		
	Number of Schools	Average Size	Number of Schools	Average Size	Number of Schools	Percent Change	Average Size
All Schools							
Elementary	3,292	507	3,721	522	429	13%	15
Middle/Junior High	1,072	609	1,368	617	296	28%	8
High School	1,070	798	1,548	662	478	45%	–136
Combined Grades	313	158	416	192	103	33%	34
Regular Instruction							
Elementary	3,284	508	3,681	528	397	12%	20
Middle/Junior High	1,065	611	1,310	643	245	23%	32
High School	1,037	820	1,108	906	71	7%	86
Combined Grades	232	197	252	277	20	9%	80
Alternative/JJAEP							
Elementary	8	163	40	48	32	400%	–115
Middle/Junior High	7	253	58	24	51	729%	–229
High School	33	105	440	47	407	1233%	–58
Combined Grades	81	48	164	60	83	102%	12
Community Type							
Regular Instruction							
Urban	1,644	748	1,910	740	266	16%	–8
Suburban	1,495	725	1,835	784	340	23%	59
Nonmetropolitan	1,678	448	1,786	473	108	6%	25
Rural	801	187	800	197	–1	0%	10
Alternative/JJAEP							
Urban	75	83	209	81	134	179%	–2
Suburban	30	72	178	53	148	493%	–19
Nonmetropolitan	18	98	243	28	225	1250%	–70
Rural	6	43	72	8	66	1100%	–35

Data Source: TEA Fall Survey of Pupils 1987-88; TEA PEIMS 1997-98; TEA ANALYZE Categories 1987-88, 1996-97.

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1989). Although large schools often offer more courses, many of the additional courses are introductory or vocational in nature rather than enrichment in areas such as mathematics, science, or foreign languages (Monk & Haller, 1993). Furthermore, though large schools may have the availability of on-site programs, restructuring efforts have enabled small schools to remain competitive in offering varied curricular programs. These efforts include "alternative teaching assignments, higher education cooperatives, inter-district sharing, and use of instructional technologies" (Roellke, 1996, p. 1). In addition, reportedly only a small percentage, 5 to 12 percent, of students in large schools take advantage of extra courses offered (Cotton, 1996).

School Size Recommendations

Most researchers and practitioners avoid specifying an 'optimal' or 'ideal' school size. Instead, schools within the ranges indicated below are most often found to be associated with supportive learning environments and relatively better student achievement. Recommendations for school size range from 200 to 400 students for elementary schools (Heath, 1994; Williams, 1990) and 400 to 900 students for junior and senior high schools (Conant, 1959; Farber, 1998; Goodlad, 1984; Lee & Smith, 1997; Williams, 1990). Very large schools with over 2,000 students are considered by some as ineffective for most students (Farber, 1998). School size is considered to positively affect student achievement as student enrollment rises to about 200 students in elementary schools and 400 to 600 students in secondary schools, levels off, and then begins to decrease after the top of the size range is reached (Bracey, 1998a; Fine, 1998; Williams, 1990). Although a direct cause-effect relationship does not necessarily exist between school size and student achievement, maintaining a recommended school size does seem linked to environmental conditions capable of contributing to increased learning (Miller, Ellsworth, & Howell, 1986).

School Size in Texas

The following is an analysis of school size for Texas public schools. Schools were selected for analysis if they fell into one of the following categories based on 1996-97 grade configuration.

Elementary schools:
early childhood/prekindergarten/
kindergarten/Grade 1 – Grade 5

Middle/junior high schools:
Grades 6 – 8

High schools: Grades 9 – 12

Each grade configuration represents the most common grade configuration in Texas public schools for the school type. The study was limited to these schools to remove the effects of grade configuration from the analysis. To be included in the study, schools also had to meet the following conditions.

- Schools received 1997 ratings of *Exemplary, Recognized, Acceptable,* or *Low-performing* under the accountability rating system for Texas public schools.
- Schools were in existence with the same grade configuration since 1994-95 and changes in enrollment from 1994-95 to 1996-97 did not exceed limits set for study. Only three schools were eliminated due to enrollment changes.

There were 1,529 elementary schools, 641 middle schools, and 808 high schools that met all the conditions to be included in the study. The 808 high schools represent 55 percent of high schools and 85 percent of students enrolled in high school in 1996-97. The 641 middle schools represent 48 percent of middle schools and 54 percent of students enrolled in middle school. The 1,529 elementary schools represent 42 percent of all elementary schools and 46 percent of students.

The schools excluded from the study include elementary, middle, and high schools with other grade configurations, such as kindergarten through Grade 6 elementary schools and middle schools with Grades 7 and 8 only. Elementary and secondary schools with grades combined on the same campus, such as kindergarten through Grade 12 schools, are excluded. Alternative schools that do not receive a rating under the standard accountability system are also excluded from the study.

The schools included in the study are similar to the state in student demographics such as socioeconomic status, race/ethnicity, mobility rate, and limited English proficiency, but differ slightly from the state in district size and community type. Small schools are underrepresented in the study and large schools are overrepresented, especially at the high school level. Because school grade configurations vary by community type, elementary schools located in urban districts are also overrepresented in the study and those located in nonmetropolitan areas are underrepresented.

Profile of Texas Schools Studied

For purposes of this study, schools are grouped into five categories based on size – from very small schools with fewer than 300 students, to very large schools with 2,000 or more students. Average enrollment at the schools in the study is 1,039 students in the high schools, 704 students in the middle schools, and 585 students in the elementary schools. The largest high school in the study has 4,434 students; 17 percent of the high schools have

2,000 or more students. The largest middle school and elementary school enrolled 1,717 students and 1,456 students, respectively.

Schools are also grouped into eight categories based on the community type of the district in which they are located. Factors such as district size, growth rates, and proximity to urban areas are used to determine the appropriate category. About 21 percent of the schools in the study are located in major urban districts. These are the largest school districts in the state that serve the six metropolitan areas of Austin, Dallas, El Paso, Fort Worth, Houston, and San Antonio. As Table 1 shows, medium, large, and very large schools are overrepresented in major urban districts, as might be expected. Medium, large, and very large schools are also overrepresented in major suburban districts, which are other school districts located in and around the major urban areas. Only one-fourth of the major suburban schools in the study has fewer than 600 students, although almost half of the schools in the study fall into the small and very small size categories.

At the other end of the distribution, all of the schools located in rural districts have fewer than 600 students and 85 percent have fewer than 300 students. This is due in part to the methodology for assigning districts to community type categories, which is based partially on district size. Small and very small schools are also overrepresented in nonmetropolitan districts. It is interesting that both small and large or very large schools are overrepresented in other central city and other central city suburban districts – the major school districts in and around the remaining large Texas cities. Large schools are overrepresented in independent towns, although these communities include schools in all size categories.

As Table 2 on page 8 shows, the percentage of students in the school who are racial/ethnic minorities increases - as does the percentage of students with limited English proficiency - as school size increases for all three types of schools. Elementary schools are more ethnically diverse than middle schools and high schools, and have over twice as many students with limited English proficiency. Most students who enter kindergarten or first grade with limited English

Table 1.
Number of Schools in Study by School Size and Community Type

Community Type	School Size (Number of Students)					
	Very Small Under 300	Small 300-599	Medium 600-899	Large 900-1,999	Very Large 2,000+	All Study Schools
Major Urban	18	171	210	181	34	614
Major Suburban	5	173	318	166	60	722
Other Central City	18	214	126	77	31	466
Other Central City Suburban	22	74	52	50	9	207
Independent Town	12	57	36	59	2	166
Nonmetropolitan: Fast Growing	59	57	14	6	0	136
Nonmetropolitan: Stable	96	235	68	20	0	419
Rural	212	36	0	0	0	248
All Study Schools	442	1,017	824	559	136	2,978

Data Source: TEA PEIMS 1994-95, 1996-97; TEA ANALYZE Categories 1996-97.

Shaded cells represent categories in which the number of schools is higher than would be expected, illustrating the relationship between community type and school size in Texas.

Table 2.
Profile of Study Schools by Size — 1996-97 School Year

Grade EE/PK/K/1-5 Elementary School Size	Percent Economically Disadvantaged	Percent Minority	Limited English Proficient	Mobility Rate	Per-pupil Instructional Expenditures	Student/ Teacher Ratio
Very Small: under 300 students	63%	52%	12%	21%	$3,128	14
Small: 300-599 students	58%	57%	15%	22%	$2,773	16
Medium: 600-899 students	52%	58%	20%	20%	$2,543	17
Large: 900-1999 students	56%	68%	30%	20%	$2,448	18
Grade 6 - 9 Middle/Junior High School Size						
Very Small: under 300 students	45%	35%	4%	16%	$2,930	13
Small: 300-599 students	49%	46%	6%	18%	$2,675	14
Medium: 600-899 students	51%	58%	9%	21%	$2,762	15
Large: 900-1999 students	44%	59%	12%	18%	$2,599	16
Grade 9 - 12 High School Size						
Very Small: under 300 students	33%	30%	2%	16%	$3,881	11
Small: 300-599 students	34%	38%	3%	18%	$3,336	13
Medium: 600-899 students	34%	45%	6%	18%	$2,973	14
Large: 900-1999 students	35%	55%	8%	22%	$2,812	16
Very Large: 2000 or more students	32%	58%	9%	21%	$2,651	17

Data Source: TEA PEIMS 1994-95, 1996-97; TEA AEIS 1996-97.

Texas school characteristics vary by grade level and school size.

proficiency develop proficiency before they complete elementary school. There is little variation in the socioeconomic status of the student populations among the size categories of high schools. About 34 percent of the high school students in the study are identified as economically disadvantaged and no category of high schools varies substantially from this average. About 47 percent of the middle school students and 55 percent of the elementary students in the study are economically disadvantaged. There is some variation in the socioeconomic status of the student populations among the size categories for middle schools and elementary schools, but no clear pattern emerges in relation to school size. The larger percentages of economically disadvantaged students in elementary schools are attributed primarily to higher participation in the free and reduced price lunch programs at this level.

A student is considered to be mobile if he or she has missed six or more weeks at a particular school (TEA, 1997c). Student mobility is slightly higher in large and very large high schools than in medium, small, and very small high schools. Among middle schools, it is the medium sized schools that had the highest average mobility rate. There is little variation in mobility rates among elementary school size categories. According to a 1997 report on student mobility in Texas public schools, mobile students had lower passing rates on the Texas Assessment of Academic Skills (TAAS) than stable students even after controlling for their previous test scores and their socioeconomic status (TEA, 1997e).

Instructional expenditures decrease as school size increases in all types of schools. High schools have the highest per pupil expenditures and the largest range in expenditures by size, ranging from an average of $3,881 per student in very small high schools to $2,651 in very large high schools – a $1,230 difference. Lower operating expenditures have traditionally been cited as one of the advantages of operating larger schools. However, the increased expenditures at smaller schools are associated with lower student-teacher ratios. Smaller classes are cited as one of the advantages of small schools and are credited with contributing to higher student performance. (See page 9 for more information about the relationship between school size and instructional expenditures.)

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Per-Pupil Expenditures, School Size, and Student-Teacher Ratio in Texas

Campus instructional expenditures per pupil for 1996-97 were analyzed for the study schools. Campus instructional expenditures are the sum of expenditures budgeted for instruction and instructional leadership. Instruction costs include all activities directly related to the interaction between teachers and students, including computer assisted instruction and expenditures to provide resources for Juvenile Justice Alternative Education Programs. Instructional leadership covers costs associated with managing, directing, supervising, and providing leadership for staff who provide instructional services (TEA, 1997c). In this study, campus instructional expenditures are divided by the number of students in the school for comparison between schools of different sizes.

Elementary schools in the study had the lowest expenditures, averaging $2,634 per student, compared to $2,673 for middle schools and $2,854 for high schools. In general, per pupil expenditures decrease as school size increases. An exception to this pattern is found in middle schools, where expenditures for medium sized schools are $87 per pupil higher than those for small schools.

The greatest difference in expenditures is between very small and small schools at all levels. As size increases, the savings accrued from larger size diminish. For example, there is a $545 difference in per pupil expenditures between very small and small high schools, compared to $161 difference between large and very large high schools. Although variation in expenditures by size is apparent at all levels, the greatest variation in expenditures is found in high schools.

Lower per-pupil expenditures are often cited as one of the advantages of large schools. However, advocates of small schools counter that the higher expenditures associated with smaller schools and smaller class sizes contribute to higher student achievement. In order to analyze the relationship between school size, student-teacher ratio, and per-pupil expenditures, schools were grouped into five categories based on student-teacher ratios. Although per-pupil expenditures decrease as school size increases, the largest schools are not always the most cost effecient when student-teacher ratios are taken into consideration.

Among the elementary schools in the study, per-pupil instructional expenditures decrease as school size increases regardless of the student-teacher ratio. For the middle schools, however, it is small (300-599 students) schools that have the lowest per-pupil expenditures for schools with student-teacher ratios ranging from 12 to 15 students per teacher. The medium sized high schools also have the lowest average per-pupil expenditures for high schools with student-teacher ratios of 12 to 15 students per teacher. Very large high schools, those with 2,000 or more students, have the lowest per-pupil expenditures among schools with student-teacher ratios greater than 15 to 1; however, expenditures are not substantially higher for large schools (900-1,999 students).

Per-Pupil Expenditures by School Size and Student-Teacher Ratio for Study Schools 1996-97 School Year

School Size	Students Per Teacher: Less than 12	12 or 13	14 or 15	16 or 17	More than 17
Grade EE/PK/K/1 – 5 Elementary Schools					
Very Small	-	$3,341	$2,934	-	-
Small	-	$3,164	$2,836	$2,700	$2,437
Medium	-	-	$2,791	$2,590	$2,359
Large	-	-	-	$2,579	$2,305
Grade 6 – 9 Middle Schools					
Very Small	$3,085	$2,981	$2,751	-	-
Small	-	$2,897	$2,636	-	-
Medium	-	$3,169	$2,796	$2,554	-
Large	-	-	$2,756	$2,572	$2,396
Grade 9 – 12 High Schools					
Very Small	$4,240	$3,450	-	-	-
Small	$3,780	$3,411	$3,098	-	-
Medium	-	$3,225	$2,908	-	-
Large	-	$3,300	$2,925	$2,758	$2,436
Very Large	-	-	-	$2,741	$2,429

Data Source: TEA PEIMS 1994-95, 1996-97; TEA AEIS 1996-97; TEA ANALYZE Categories 1996-97.
Dash (-) indicates that less than 30 schools were in this category.

(Continued from page 8)

Performance

For this study, a number of performance indicators are examined in relation to school size. Some of the indicators can be considered measures of basic performance. They reflect the extent to which students at the school remain in school, attend school regularly, are promoted from grade to grade with their class, and pass the Texas Assessment of Academic Skills (TAAS), the state's criterion-referenced testing program administered in Grades 3-8 and 10. Other indicators reflect the extent to which students at the school reach higher levels of performance. They include average TAAS scores as measured by the Texas Learning Index (TLI), completion of advanced courses, performance on college admissions examinations, and meeting a standard on the TAAS equivalent to a passing rate on the Texas Academic Skills Program (TASP) test required of all students entering Texas public colleges and universities.

To examine the magnitude of the relationship between school size and academic performance it is necessary to control for other factors known to be associated with school performance. Table 3 shows the relationship between school size and performance after controlling for the following school characteristics: student socioeconomic status, race/ethnicity, limited English proficiency, and mobility. Difference in performance for each additional 500 students on an array of indicators is shown. That is, two schools with exactly the same percent of students who are economically disadvantaged, percent of students who are minorities, percent of students with limited English proficiency, and mobility rates, but that differ in size by 500 students would differ in performance on each indicator by the amount shown. The differences are based on actual performance of the schools in the study in the 1996-97 school year.

Attendance. Although attendance rates are not a direct measure of student performance, Texas studies have found a consistent relationship between attendance and achievement for students in the elementary grades. Higher student attendance was associated with higher teacher ratings of overall student progress and mastery of the essential elements of the Texas curriculum for 1995-96 first graders (TEA, 1997b). Higher 5-year attendance rates were also associated with fewer grade level retentions and higher passing rates on the Grade 5 Texas Assessment of Academic Skills (TAAS) for students entering first grade in 1992-93 (TEA, 1998a). As Table 3 shows, elementary schools have the highest attendance rates. Elementary students missed an average of 6 days during the 1996-97 school year, compared to 8 days for middle school students and 12 days for high school students.

Attendance rates decreased slightly as school size increased for middle schools and high schools in the study. The greatest decrease was found in middle schools. After controlling for other school characteristics, on average the attendance rate in middle schools decreased by 0.4, about three-fourths of a day a year, with each additional 500 students. For high schools, the difference was 0.2 or one-half day a year.

Retention. Grade level retention, defined as having a student repeat a grade he or she was unable to successfully complete, is one indicator that a student is not making sufficient academic progress (TEA, 1997d). Students in Texas public schools are retained at the highest rate in Grade 9. In 1996-97, 18 percent of all ninth grade students were retained in grade at the end of the school year. The higher retention rates for the high schools in the study reflect these high ninth grade retention rates. African American and Hispanic students are retained at higher rates than Asian or White students – about one-fourth of African American and Hispanic ninth graders were retained in 1996-97. Economically disadvantaged students are also retained at higher rates than their classmates who are not economically disadvantaged.

At the elementary level, the highest retention rate is found in first grade. In 1996-97, the retention rate for first graders was almost 6 percent. As in the higher grades, African American and Hispanic students were retained at higher rates than Asian or White students. Students who are economically disadvantaged were also retained at higher levels than students who were not economically disadvantaged. A study of Texas elementary students with limited English proficiency found that these students are also retained at higher rates than students who enter school proficient in English (TEA, 1998a).

In this study, a relationship between school size and retention rates was found at the high school level only. In 1996-97, retention rates increased as school size increased both for all students and for students who are not economically disadvantaged in the study high schools. On average, the retention rates for all students increased by 0.5 percentage point with each additional 500 students, when controlling for other school characteristics. By comparison, the retention rates for students who are not economically disadvantaged increased by 0.4 percentage point.

Dropouts. In 1996-97, the Texas statewide annual dropout rate was 1.6 percent for Grades 7-12. Dropout

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Table 3.
Relationship Between School Size and Academic Performance for Study Schools 1996-97 School Year

Performance Indicators	Elementary Schools		Middle Schools		High Schools	
	Average	Difference with Additional 500 Students	Average	Difference with Additional 500 Students	Average	Difference with Additional 500 Students
Attendance Rate	96.5	-	95.3	–0.4	93.2	–0.2
Retention Rate						
All Students	2.3	-	2.2	-	9.6	+0.5
Economically Disadvantaged	2.9	-	3.2	-	14.3	-
Not Economically Disadvantaged	1.6	-	1.3	-	7.3	+0.4
Dropout Rate						
All Students			0.3	-	1.7	-
Economically Disadvantaged			0.4	-	2.0	-
TAAS Percent Passing						
Reading						
All Students	84.1	–1.6	83.8	-	85.8	-
Economically Disadvantaged	74.5	-	72.8	-	73.9	-
Not Economically Disadvantaged	92.0	-	92.1	-	91.2	-
African American	73.8	-	74.6	-	79.4	-
Hispanic	76.3	-	74.0	-	75.9	-
White	92.1	-	93.8	-	94.4	-
Mathematics						
All Students	84.4	–2.0	78.0	–1.4	72.1	–0.5
Economically Disadvantaged	75.7	-	66.3	-	58.1	-
Not Economically Disadvantaged	91.6	-	86.7	–1.9	78.4	–0.6
African American	70.9	-	61.6	-	54.5	-
Hispanic	78.2	-	67.9	-	59.6	-
White	92.1	-	89.7	-	84.9	-
Writing						
All Students	88.4	-	81.0	-	88.4	-
Economically Disadvantaged	81.9	-	69.5	-	78.8	-
Not Economically Disadvantaged	93.8	-	88.6	-	92.6	-
African American	79.8	-	71.4	-	83.4	-
Hispanic	84.4	-	71.0	-	79.9	-
White	93.4	-	90.9	-	95.6	-
TLI Score						
Reading	76.7	-	75.2	-	77.9	-
Mathematics	77.1	-	72.9	–0.6	74.5	-
TLI Average Growth						
Reading	6.2	-	4.7	-	6.4	-
Mathematics	5.1	-	2.7	-	5.5	-
Advanced Courses					17.2	-
SAT/ACT						
Participation					64.2	-
Performance					25.7	+2.1
TAAS/TASP Equivalency					41.8	+0.5

Data Source: TEA PEIMS 1994-95, 1996-97; TEA AEIS 1996-97.

Dash (-) indicates no statistically significant relationship found between campus size and performance on indicator. Statistics were included in the table if the R-square for the regression model was .4 or higher and the contribution of campus size shown was statistically significant at the .05 level.

Where there is a relationship between school size and performance in Texas, the relationship is typically negative — after controlling for student socioeconomic status, race/ethnicity, limited English proficiency, and mobility, performance declines as school size increases.

(Continued from page 10)

rates for all the high school grades are higher than 2 percent, but Grade 12 had the highest dropout rate in 1996-97 at 2.5 percent (TEA, 1998c). African American and Hispanic students drop out at higher rates than their White classmates. Although statewide economically disadvantaged students drop out at the same rate as students who are not economically disadvantaged, among the middle schools and high schools in this study, economically disadvantaged students had a slightly higher dropout rate. The average dropout rate for all high school students in the study was 1.7 percent, compared to a rate of 2.0 percent for economically disadvantaged high school students. The average dropout rates for middle schools in the study were 0.3 percent for all students, and 0.4 percent for economically disadvantaged students. After controlling for other school characteristics, no statistically significant relationship was found between school size and dropout rates for the middle schools and high schools in the study.

TAAS Performance. School performance on the Texas Assessment of Academic Skills (TAAS) is one of three base indicators used to determine school performance ratings. In 1996-97, the TAAS performance indicator was the percentage of non-special education students passing each test (reading, mathematics, and writing) summed across grades, for students who were enrolled in the district as of the end of October. The indicator is evaluated for each student group (African American, Hispanic, White, and economically disadvantaged), as well as for all students.

Performance gains in recent years have decreased the performance gap between economically disadvantaged students and students who are not economically disadvantaged, and between African American and Hispanic students and their White classmates. Nevertheless, in 1996-97 students who were not economically disadvantaged outperformed economically disadvantaged students on all three TAAS tests at all three school levels. White students also outperformed African American and Hispanic students on all three tests at all three school levels.

A relationship was found between school size and performance on the TAAS reading test at the elementary school level only. For each additional 500 students, the passing rate on the reading test decreased by 1.6 percentage points on average, after controlling for other school characteristics in elementary schools.

At the same time, a relationship was found between school size and student performance on the mathematics test at all three school levels. The percentage of students passing the TAAS mathematics test decreased as school size increased at all three levels. The passing rate for all students decreased by 2.0 percentage points in the elementary schools, 1.4 percentage points in the middle schools, and 0.5 percentage point in the high schools with each additional 500 students.

At the middle and high school levels, there was a relationship between school size and percent passing the TAAS mathematics test for students who are not economically disadvantaged. The passing rate for students who are not economically disadvantaged decreased by 1.9 percentage points in the middle schools and 0.6 percentage point in the high schools with each additional 500 students.

No statistically significant relationship between school size and TAAS passing rates on the writing test was found after controlling for other school characteristics.

TLI. The Texas Learning Index (TLI) was developed to assess student progress across grades on the TAAS reading and mathematics tests (TEA, 1998d). A TLI score of 70 corresponds to the passing standard at each grade level. In 1996-97, the TLI could range from 4 to 100, depending on the subject and grade level of the test. School average TLI scores give a broader indication of school performance than the percent passing because they measure each student's test score rather than only indicating how the student performed in relation to the passing standard.

As Table 3 on page 11 shows, there is a relationship between school size and TLI scores in mathematics at the middle school level. On average, middle school TLI mathematics scores decrease by 0.6 point with each additional 500 students after controlling for other school characteristics.

Texas uses the TLI to compute two measures of performance gains – TLI average growth and school comparable improvement. For Grades 4 through 8, TLI average growth is a comparison of current year performance with the prior year performance for the same students. For the Grade 10 TAAS, TLI average growth is a comparison of current year performance with prior performance on the Grade 8 TAAS for the same students. These growth calculations are limited to those students who scored a TLI of less than 85 in the prior year. TLI average growth is a longitudinal measure of absolute gains for individual students and can be considered a measure of value added for the school (King & Mathers, 1997).

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Advanced Courses in Texas High Schools

In 1996-97 there were 134 different advanced courses offered to high school students in Texas public schools. Advanced courses include College Board Advanced Placement (AP) courses and International Baccalaureate (IB) courses, as well as other advanced courses in science, fine arts, English language arts, social studies, mathematics, computer science, and languages. Traditionally, larger schools are believed to have the capacity to offer more courses (Howley, 1997; Roellke, 1996; Unks, 1989), and this is true of the Grade 9 through 12 high schools in the study. High schools with 2,000 or more students offered an average of 25 different advanced courses, compared to 6 different courses in high schools with fewer than 300 students.

Although the average number of advanced courses increased as school size increased, the range of advanced courses varied dramatically within the school size categories. For example, the very small, medium, and large school size categories included schools that offered no advanced courses. Small and very large schools offered as few as two advanced courses. At the same time, there were very small schools that offered as many as 25 different advanced courses. One very large high school offered 54 different advanced courses, thus offering the most advanced courses by any school in the study.

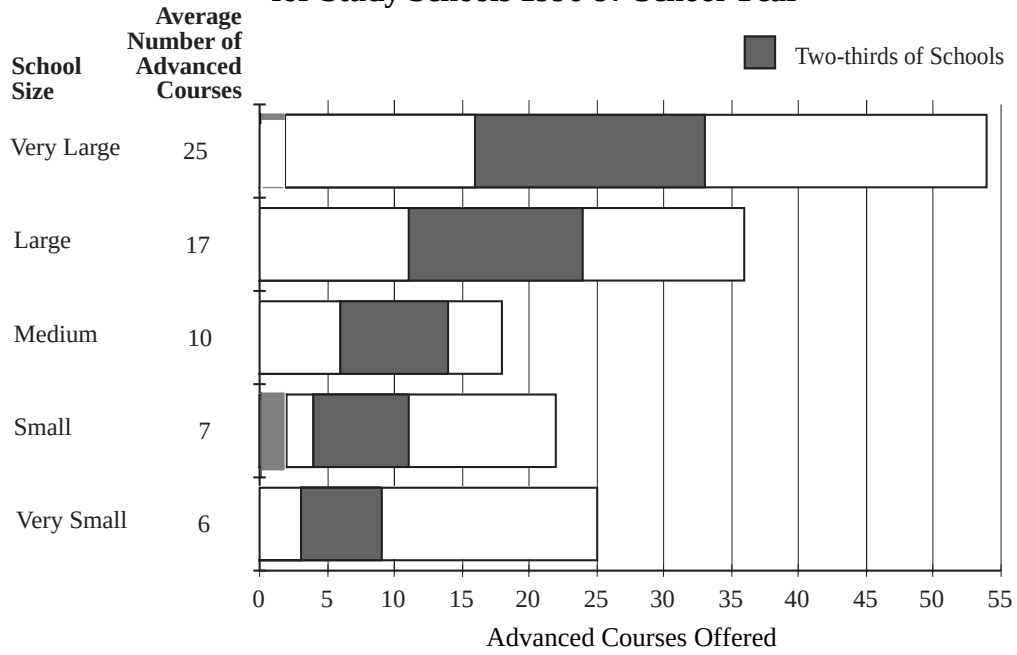
The most commonly available advanced course in high schools statewide in 1996-97 was pre-calculus, which was offered at 907 high schools. Eleven advanced courses were offered at 300 or more schools. These included three mathematics courses, three English language arts courses (two of which were AP courses), two fine arts courses, two science courses, and one computer science course. The highest level advanced courses and IB courses in languages such as Arabic, Chinese, German, Hebrew, Italian, Japanese, Latin, and Russian are taught at very few schools.

Most Commonly Offered Advanced Courses in All Texas High Schools 1996-97 School Year

Course	Campuses
Pre-calculus	907
Music IV Band	742
Biology II	629
Anatomy and Physiology	580
Trigonometry	535
Calculus	529
Computer Science I	458
English Literature and Composition (AP)	434
Creative/Imaginative Writing	361
Music IV Choir	342
English Language and Composition (AP)	326

Data Source: TEA PEIMS 1994-95, 1996-97; TEA AEIS 1997-98.

Number of Advanced Courses Offered by School Size for Study Schools 1996-97 School Year



Data Source: TEA PEIMS 1994-95, 1996-97; TEA AEIS 1997-98.

(Continued from page 12)

School comparable improvement is a statutorily mandated measure developed to evaluate an individual school's improvement in relation to other schools with similar student demographics. Comparable improvement does not affect a school's accountability rating but it has been used to determine financial rewards for high-gain schools. TLI average growth for each target school is compared to the 40 schools that most closely match the target school in student socioeconomic status, race/ethnicity, limited English proficiency, and mobility. Schools are ranked within the group and a quartile distribution is determined.

No statistically significant relationship was found between school size and TLI average growth. Table 4 shows the school comparable improvement quartile distributions for the elementary schools, middle schools, and high schools in the study. The quartile distributions vary by school size; however, the patterns do not reveal strong relationships with school size. The most distinct pattern is for high school mathematics. Schools with fewer than 900 students are overrepresented in the high gain quartiles (Q1 and Q2) on mathematics gains and larger schools are overrepresented in the lower gain quartiles (Q3 and Q4).

It is interesting that in four of the distributions – elementary, middle, and high school reading and elementary school mathematics – very small schools are overrepresented in both the highest and lowest quartiles. Also, in the high school distributions for both reading and mathematics, very large schools ranked higher than large schools in comparable improvement gains.

College Readiness. In 1996-97, almost 20 percent of high school students statewide completed at least one advanced course; 17 percent of the students in the study high schools completed one advanced course. Advanced courses include College Board Advanced Placement and International Baccalaureate courses, as well as other high level courses in all areas of the curriculum. No statistically significant relationship was found between percentage of students completing at least one advanced course and size of the high schools in the study. (See page 13 for additional information on advanced courses in Texas high schools.)

Statewide, 64 percent of Texas public school graduates take one of two college admissions tests – the College Board's SAT I or ACT Inc.'s (Enhanced) ACT Assessment. The percentage of students taking the test who score at or above an established criterion score is used as a measure of school SAT/ACT performance. Currently, Texas criterion scores are an SAT I Total score of 1110 or an ACT Composite score of 24. There was no relationship between SAT/ACT participation rates and school size for high schools in the study. However, a relationship existed between SAT/ACT performance and school size. After controlling for other school characteristics, performance on college admissions tests improved as school size increases. As Table 3 indicates, the percentage of students scoring at or above the criterion on college admissions tests increased by 2.1 with each additional 500 students.

Table 4.
Comparable Improvement Quartiles for Study Schools
1996-97 School Year

School Size	Elementary Schools				Middle Schools				High Schools			
	Reading				*Reading*				*Reading*			
	Q1	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Very Small	**34**	18	24	**35**	**40**	32	24	**36**	**48**	35	25	**58**
Small	206	**187**	162	**168**	20	**48**	34	24	46	38	34	**50**
Medium	**177**	137	**139**	110	37	43	**47**	**40**	26	**28**	22	18
Large	**39**	29	**36**	17	50	**69**	**67**	30	61	**59**	**56**	46
Very Large									**39**	32	**45**	20
	Mathematics				*Mathematics*				*Mathematics*			
	Q1	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Very Small	**32**	24	23	**36**	**39**	**39**	27	27	**64**	34	44	41
Small	**193**	159	164	**207**	**33**	35	27	**31**	**56**	**43**	32	37
Medium	138	**142**	**142**	141	33	40	**60**	34	**34**	21	19	20
Large	28	**31**	**30**	32	45	**63**	**70**	38	63	46	**60**	**53**
Very Large									21	**42**	**46**	27

Data Source: TEA PEIMS 1994-95, 1996-97; TEA AEIS 1996-97.

Shaded cells represent quartiles in which the number of schools is higher than would be expected. There is not a consistent pattern in the relationship between school size and comparable improvement quartile.

The Texas Academic Skills Program (TASP) test is a basic skills test of reading, writing, and mathematics required of all persons entering Texas public colleges and universities for the first time. The TAAS/TASP equivalency indicator shows the percent of graduates who performed well enough on the exit-level TAAS to have a 75 percent likelihood of passing the TASP test. Statewide, about 42 percent of graduates in the class of 1997 met this standard. Like the college admissions test standard, there was a positive relationship between school size and performance on the TAAS/TASP equivalency standard. The TAAS/TASP equivalency rate increased by 0.5 percentage point for each increase of 500 students, after controlling for other school characteristics.

Performance Overview

The previous analysis indicates that performance of Texas schools varies by school size for some students – a finding that is consistent with results of school size research conducted over the past decade. However, the nature of the relationship between school size and performance in Texas differs somewhat from that found elsewhere. Where a relationship between school size and performance in Texas exists, the relationship is typically negative, that is, after controlling for other school characteristics, performance declines as school size increases. In contrast, research conducted in other states has overwhelmingly suggested that performance is highest at medium sized schools, with performance declining at both larger and smaller schools. This analysis shows that performance of very large Texas high schools is not substantially worse than that of large high schools. In other states, very large high schools are found to have substantially worse performance than large high schools.

Texas data for middle and high schools support findings elsewhere that smaller schools have higher attendance rates. Also, Texas high school retention rates increase as school size increases after controlling for other factors. Furthermore, after controlling for other school characteristics, no statistically significant relationship was found between school size and dropout rates in Texas middle schools and high schools. Other studies have found higher dropout rates and lower graduation rates at large schools compared to smaller schools.

There is a relationship between school size and reading performance in Texas elementary schools — as school size increases, reading performance declines. Overall, mathematics performance of Texas students is more adversely affected by school size than is reading or writing performance. Other state studies have found both reading and mathematics performance to be adversely affected by school size.

Although the size of the decline in performance is larger at the elementary and middle level, the performance of Texas high school students on indicators of basic performance is more likely to decline with increases in school size. Much of the school size research has focused on high schools. Those studies have found that students at smaller (but not the smallest) schools outperform students at larger schools in core subjects and on tests of basic skills.

There is a positive relationship between high school size and performance on some indicators related to college readiness. No relationship was found between high school size and percentage of students completing advanced courses or taking the SAT/ ACT. However, as high school size increases, SAT/ACT performance and TAAS/TASP equivalency rate increase. Some proponents of large campuses endorse them as the best setting for preparing students for college. At the same time, small school proponents contend that small schools prepare students for college as adequately as large schools do (Felter, 1997; Gladden, 1998; Monk & Haller, 1992; Pittman & Haughwout, 1987; Unks, 1989).

At the middle and high school levels in Texas there is a negative relationship between school size and performance of students who are *not* economically disadvantaged. In contrast, school size research conducted outside of Texas over the past two decades has found that economically disadvantaged students are more likely to perform worse as school size increases than students who are not economically disadvantaged. Although the performance gap has narrowed in recent years, performance of students who are economically disadvantaged remains lower than that of non-economically disadvantaged students in reading, mathematics, and writing across all school types.

Texas students have shown remarkable performance gains over the past 5 years since the state began rating schools and districts under an integrated accountability system. The highest performance gains have been for Hispanic, African American, and economically disadvantaged students, student groups that are overrepresented in major urban schools. These recent performance gains may be part of the reason that the effects of school size are not as strong in Texas and the relationship between school size and student performance differs from other states.

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School Size and Student-Teacher Ratios

Student-teacher ratios, the total number of students in a school divided by the number of teachers, provide an indication of average class size at the school level. Student-teacher ratios are lower than average class sizes because student-teacher ratios include students in special instructional programs and time teachers spend outside the classroom. Student-teacher ratios in 1996-97 for the study schools were examined.

Student-teacher ratios increase as school size increases in elementary, middle, and high schools. The lowest average student-teacher ratios, 11 to 1, are found in very small high schools. The average student-teacher ratio in very large high schools is 17 to 1.

Student-Teacher Ratio by School Size and Per-Pupil Expenditures for Study Schools 1996-97 School Year

School Size	Campus Instructional Expenditures Per Pupil: Under $2,340	$2,340 – $2,596	$2,597 – $2,860	$2,861 – $3,299	$3,300 and Over
Grade EE/PK/K/1 – 5 Elementary Schools					
Very Small	16	15	14	14	12
Small	17	16	16	15	14
Medium	18	17	17	16	14
Large	19	17	17	17	-
Grade 6 – 9 Middle Schools					
Very Small	14	13	13	13	12
Small	15	15	14	13	12
Medium	17	17	15	14	13
Large	18	17	16	15	14
Grade 9 – 12 High Schools					
Very Small	-	-	-	13	11
Small	-	-	14	13	12
Medium	15	15	14	14	13
Large	19	17	16	15	14
Very Large	18	18	17	16	15

Data Source: TEA PEIMS 1994-95, 1996-97; TEA AEIS 1996-97; TEA ANALYZE Categories 1996-97.
Dash (-) indicates that less than 5 schools were in this category.

for Study Schools 1996-97 School Year

Very small elementary schools have an average student-teacher ratio of 14 to 1, compared to 18 to 1 in large elementary schools. Average student-teacher ratios in middle schools are lower than those in elementary schools, ranging from 13 to 1 in the smallest middle schools to 16 to 1 in the largest.

Payroll represents 73 percent of all school district expenditures and 82 percent of current operating expenditures (TEA, 1998f). Therefore, it is not surprising that student-teacher ratios decrease as campus instructional expenditures per pupil increase within each size category. In fact, the highest-spending large and very large schools have student-teacher ratios similar to those on the lowest-spending small and very small schools. This illustrates that larger schools can achieve the low student-teacher ratios associated with smaller schools, but at a cost. In general, the highest student-teacher ratios are found in the largest schools with the lowest instructional expenditures per pupil. The lowest student-teacher ratios are found in the smallest schools with the highest instructional expenditures per pupil.

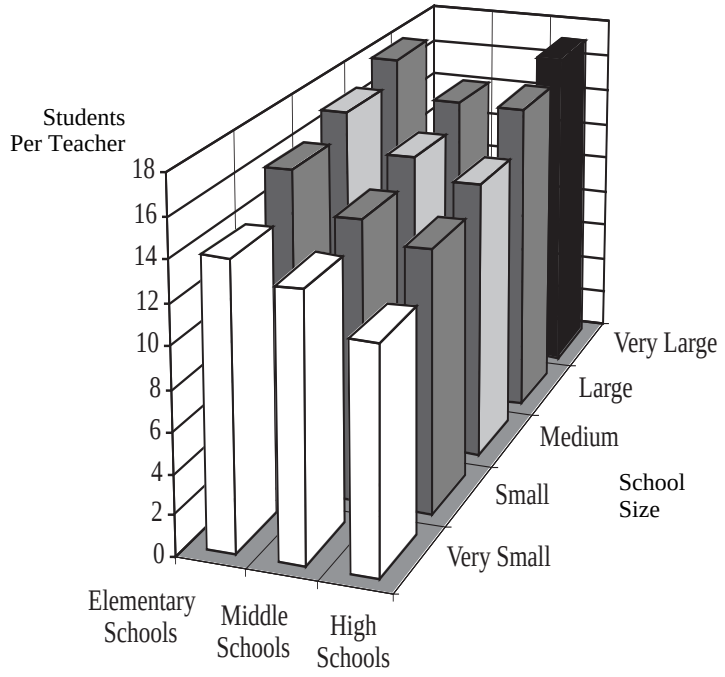
Student-teacher ratios also increase with greater proximity of school districts to urban areas. This trend is seen for elementary, middle, and high schools within most size categories. For example, very small and small elementary schools located in rural school districts have student-teacher ratios of 13 to 1 and 14 to 1, respectively, compared to 15 to 1 and 16 to 1 for those located in urban areas. It is possible that school size within size categories increases with greater proximity to urban areas.

Student-Teacher Ratio by School Size and Community Type for Study Schools 1996-97 School Year

School Size	Community Type: Rural	Non-Metro	Suburban	Urban
Grade EE/PK/K/1 – 5 Elementary Schools				
Very Small	13	14	14	15
Small	14	15	16	16
Medium	-	16	17	17
Large	-	-	18	18
Grade 6 – 9 Middle Schools				
Very Small	12	13	14	-
Small	-	14	14	15
Medium	-	15	15	15
Large	-	15	17	17
Grade 9 – 12 High Schools				
Very Small	10	11	12	-
Small	-	13	13	-
Medium	-	14	14	16
Large	-	15	16	17
Very Large	-	-	17	17

Data Source: TEA PEIMS 1994-95, 1996-97; TEA AEIS 1996-97; TEA ANALYZE Categories 1996-97.
Dash (-) indicates that less than 5 schools were in this category.

Student-Teacher Ratio by Level and School Size for Study Schools



Data Source: TEA PEIMS 1994-95, 1996-97; TEA AEIS 1996-97.

(Continued from page 15)

Class Size

Some identify limiting class size as one method for schools to achieve their academic goals. Class size studies endorse small classes for their ability to produce effects comparable to the effects of smaller schools. Small classes create classroom conditions that afford students the opportunities to participate, learn, and achieve socially and academically (Achilles, 1997; Olson, 1977). Echoing the concerns of proponents and opponents of school size, conversations about class size elicit varied reactions among parents, educators, researchers, and legislatures. "The impact of class size reduction reforms, their cost, and their relationship to professional development are major questions facing current education reform in the United States" (USDE, 1998b, p.10).

Class Size Policy

Texas Policy

Texas has laws related to both student-teacher ratios and class size. Student-teacher ratios are the total number of students in a school or district divided by the total number of teachers. Student-teacher ratio requirements give districts a great deal of flexibility in making teaching assignments as long as the total number of teachers employed remains at a sufficient level. Class size limitations are much more rigid, requiring that the number of students in each class remain at or below the specified limit for all or part of the school year. In 1975, the Texas Legislature passed its first state law related to student-teacher ratios, requiring districts to maintain a student-teacher ratio of 25 to 1 at all grade levels beginning with the 1975-76 school year (TEC §16.054, 1984). That law remained in effect until 1984, when the student-teacher ratio was reduced to 20 to 1 effective with the 1984-85 school year (TEC §16.054, 1988). At that time, class size limits were also imposed for kindergarten through Grade 4. Class size limits for kindergarten through Grade 2 were effective with the 1985-86 school year. Texas school districts could not enroll more than 22 students in kindergarten through Grade 2 classes. The law extended to Grades 3 and 4 in the 1988-89 school year. These student-teacher ratio and class size limits have not changed substantively since 1984 (TEC §§25.111-25.112, 1998).

In 1984, the Texas Legislature also made provisions for prekindergarten programs for four-year-old children who were economically disadvantaged or had limited English proficiency, beginning with the 1985-86 school year (TEC §21.136, 1986). Beginning with the 1989-90 school year, state funding for prekindergarten programs was extended to include three-year-old children. The law implementing prekindergarten programs did not address the subject of class sizes for those programs; however, State Board of Education (SBOE) rules extended the 22 student class size limit to prekindergarten classes (19 TAC §75.141(g), 1988). The SBOE class size restrictions for prekindergarten were eliminated in 1995 when the rule was repealed under the SBOE's revised rule making authority, which now allows adoption of rules only when specific authority to do so is granted in the *Texas Education Code*. Currently, districts are not required to offer prekindergarten programs for three-year-olds, and are not required to offer programs for four-year-olds if fewer than 15 eligible students are identified or if offering the program would require the district to construct new classroom facilities (TEC §29.153, 1998). Also, as noted above, the 22 student class size limits do not apply to prekindergarten classes.

The state makes provision for districts that cannot maintain required elementary class size limits. The class size limits do not apply during the last 12 weeks of school, or to any 12-week period selected by districts with large migrant student populations (TEC §25.112, 1998). Also, the commissioner of education may exempt the district from maintaining class size limits for one semester if the limits cause undue hardship for the district (TEC §25.112, 1998). A district can apply for a class size waiver under this provision if the district lacks facilities, cannot acquire a sufficient number of qualified teachers, or one section at any grade level at a school exceeds the class size limit by one or two students due to unanticipated enrollment increases during the school year. In 1997-98, class size waivers were requested for 577 schools for the fall semester and for 696 schools for the spring semester. Almost 98 percent of the waivers cited unanticipated growth during the school year as one reason the waiver was requested, 65 percent cited lack of facilities, and 21 percent requested waivers due to teacher shortages.

In 1997-98, Texas elementary schools maintained an average class size of 20 students in classes serving regular student populations. As Table 5 shows, average class sizes are lower in kindergarten through Grade 4 than stipulated by the mandatory class size limits. However, more than one-third of kindergarten through Grade 4 classes have over 20 students. On average there are 22 students per class in Grades 5 and 6 compared to an average of 19 students in the lower elementary grades. Class sizes in secondary schools range from an average of 21 students in English, foreign language, and mathematics classes to 23 students in social studies classes. Advanced academic courses, which often enroll fewer students, are not included in the averages. Average class size at the elementary level declined by less than one student per class from 1990-91 to 1997-98.

Average size of secondary mathematics classes has not changed; average class sizes in other secondary subjects have increased by about one student per class.

Districts do not report actual class size averages; these values are derived using student counts and teacher full-time equivalent values from staff responsibility records reported to the Texas Education Agency. Districts have choices about the level of detail reported on teacher responsibility records, particularly at the elementary level. Therefore, these averages can only be considered an indication of current practice, not exact figures.

Table 5.
Class Size in Texas Public Schools
1997-98 School Year

	Average Class Size	Number of Classes With Over 20 Students	Percent of Classes With Over 20 Students
Elementary			
All Grades	20		
Prekindergarten	19		
Kindergarten	19	6,139	36%
Grade 1	19	8,872	37%
Grade 2	19	9,471	35%
Grade 3	19	9,539	34%
Grade 4	19	10,369	35%
Grade 5	22		
Grade 6	22		
Secondary			
English	21		
Foreign Language	21		
Mathematics	21		
Science	22		
Social Studies	23		

Data Source: TEA PEIMS 1997-98.
NOTE: About 84% of elementary class size records submitted in 1997-98 were used in computing class size information by grade due to variations in data reporting.

In Texas, the lowest average class sizes are found in the elementary grades. Elementary grades have statutory class size limits.

Other State Class Size Policies

As Table 6 on page 20 shows, many states have policies related to class size or student-teacher ratios. Policies vary in grade levels covered and in whether they are applied at the class, school, or district level. Some states place absolute limits on the maximum number of students in a class, others require that schools or districts maintain an average across all classes. Non-academic classes such as physical education and music are often exempt from the class size policies. Furthermore, several states allow classes to exceed the minimum if an instructional aide is assigned to the class to assist the teacher.

In 1996, California initiated a major class size reduction program. Currently, the California proposal provides $800 per student in each kindergarten to Grade 3 classroom that limits class size to 20 students or lower. However, California's initiative has been heavily criticized for its inability to secure certified teachers and facilities to accommodate the demands placed on schools.

Wisconsin, one of several states in which class size limits are negotiated in teacher contracts, offered a statewide class size reduction initiative that allowed schools in which 30 percent or more of the students are economically disadvantaged to apply for funding to reduce their average class sizes to 15 in kindergarten through Grade 2. The first year of the program included 84 kindergarten classrooms, 96 first grade classrooms, and 5 mixed grade classrooms (WDPI, 1997). Schools were awarded up to $2,000 per child for participation in the class size reduction initiative. Initially, Wisconsin began implementing the class size reduction in kindergarten and first grade in 1996-97 and progressed a grade level each successive year until Grade 3 had been included. The class size reduction measures were part of the Student Achievement Guarantee in Education (SAGE) program. In an effort to raise student achievement, the SAGE program connected class size reduction, staff development and accountability, curriculum, and human services to link the school with the community.

In 1989, Nevada's policies reduced class size to 16 students in Grades 1 and 2 and some kindergarten classes for students at-risk. Although the program expanded to third grade,

(Continued on page 21)

Table 6. Class Size Policies

Alabama	18 maximum (higher with aide) in K-3 26 maximum (higher with aide) in Grades 4-6 29 maximum (higher with aide) in Grades 7-8 21 to 1 student-teacher ratio in Grades 9-12
Alaska	Information not available
Arizona	None
Arkansas	10 maximum (up to 20 with aide) in PK 20 maximum (up to 22 with aide) in K 23 average, 25 maximum in Grades 1-3 25 average, 28 maximum in Grades 4-6 30 maximum in Grades 7-12 150 students per teacher daily maximum in Grades 7-12
California	20 maximum in K-3
Colorado	None
Connecticut	Negotiated in teacher contracts
Delaware	22 maximum (up to 33 with aide) in K-3
District of Columbia	15 maximum (up to 20 with aide) in PK 20 maximum in K-2 25 maximum in Grades 3-12
Florida	20 maximum in K-3 15 maximum in critically low-performing schools K-3
Georgia	18.2 average districtwide, 21 maximum (up to 24.2 average districtwide, 28 maximum with aide) in K 21.5 average districtwide, 25 maximum (up to 28.6 average districtwide, 33 maximum with aide) in Grades 1-3 28.6 average districtwide, 33 maximum in Grades 4-8 30.8 average districtwide, 35 maximum in Grades 9-12
Hawaii	Information not available
Idaho	None
Illinois	None
Indiana	30 to 1 student-teacher ratio for K-12; special funding available for districts to reduce class sizes in K-3
Iowa	None
Kansas	None
Kentucky	24 maximum in K-3 28 maximum in Grade 4 29 maximum in Grades 5-6 31 maximum in Grades 7-12
Louisiana	26 maximum in K-3 33 maximum in Grades 4-12
Maine	None
Maryland	None
Massachusetts	25 average in K
Michigan	Negotiated in teacher contracts
Minnesota	None
Mississippi	22 maximum (up to 27 with aide) in K 27 maximum in Grades 1-4 30 maximum in self-contained Grades 5-8 33 maximum in departmentalized Grades 5-12 150 students per teacher maximum in Grades 5-12
Missouri	25 maximum in K-2 27 maximum in Grades 3-4 30 maximum in Grades 5-6 33 maximum in Grades 7-12
Montana	20 maximum in K-2 (aide mandatory if limit exceeded) 28 maximum in Grades 3-4 30 maximum in Grades 5-12 150 students per teacher daily maximum in Grades 9-12
Nebraska	None
Nevada	15 maximum in K-3
New Hampshire	25 maximum in K-2 30 maximum in Grades 3-12
New Jersey	25 maximum (higher with aide) in K
New Mexico	15 maximum (up to 20 with aide) in K 20 maximum (up to 22 with aide) in Grade 1 22 average in Grades 2-3 24 average in Grades 4-6 27 maximum in English Grades 7-8 30 maximum in English Grades 9-12 135 students per teacher daily maximum in English Grades 7-8 150 students per teacher daily maximum in English Grades 9-12 160 students per teacher daily maximum other Grades 7-12
New York	Grants available to reduce class size below 20
North Carolina	26 maximum in K-2 26 average districtwide, 29 maximum in Grades 3-9 28.5 average districtwide, 32 maximum in Grades 10-12 150 students per teacher daily maximum in Grades 7-12
North Dakota	25 maximum in K-3 30 maximum in Grades 4-12
Ohio	25 to 1 student-teacher ratio districtwide for K-12
Oklahoma	20 maximum (higher with aide) in K-6 140 students per teacher daily maximum in Grades 7-12
Oregon	None
Pennsylvania	None
Rhode Island	Negotiated in teacher contracts
South Carolina	30 maximum in K-3 30 maximum in English/language arts and mathematics Grades 4-6 35 maximum in other Grades 4-6 35 maximum in Grades 7-12 28 to 1 student-teacher ratio for K-5 21 to 1 student-teacher ratio districtwide in reading and mathematics Grades 1-3 150 students per teacher daily maximum in Grades 6-12
South Dakota	None
Tennessee	20 average, 25 maximum in K-3 25 average, 30 maximum in Grades 4-6 30 average, 35 maximum in Grades 7-12
Texas	22 maximum in K-4 20 to 1 student-teacher ratio districtwide for K-12
Utah	None; special funding available for districts to reduce class size
Vermont	20 average (higher with aide) in K-3 25 average (higher with aide) in Grades 4-8 100 students per teacher average in English Grades 9-12 150 students per teacher average in other Grades 9-12
Virginia	25 maximum (up to 30 with aide) in K 30 maximum in Grade 1 35 maximum in Grades 4-6 25 to 1 student-teacher ratio for middle and high schools 25 to 1 student-teacher ratio districtwide for K 24 to 1 student-teacher ratio districtwide for Grade 1 25 to 1 student-teacher ratio districtwide for Grades 4-6 24 to 1 student-teacher ratio districtwide for English Grades 6-12
Washington	23 to 1 student to certified staff ratio districtwide for K-12
West Virginia	20 maximum in K 25 maximum in Grades 1-6
Wisconsin	Negotiated in teacher contracts
Wyoming	None

Data Source: State policy documents and personal communications with state agencies, November 1998.
NOTE: Student-teacher ratio is total students divided by total teachers. Class size averages and student-teacher ratios shown apply at the campus level unless otherwise noted.

(Continued from page 19)

schools could use the funding for either third grade expansion or to fund other kindergarten through Grade 3 programs aimed at improving student achievement. Similar to the California initiative, Nevada's program failed to provide for adequate facilities. Thus, schools were allowed to have classrooms with 32 students and 2 teachers to maintain the 16 to 1 student-teacher ratio. The current policy reduces class size to 15 students.

Utah has a program that makes special funding available for districts to reduce class size. The class size reduction program was implemented in 1990 beginning with kindergarten through Grade 4, and expanded to Grades 5 and 6 in 1996-1997. Grades 7 and 8 will be added in 1998-99. Policies lowered class size to 10 students in kindergarten and 15 in Grades 1 through 3. Funding for Utah's class size reduction program initially earmarked half of the district allocation for kindergarten through Grade 2 implementation, effectively prioritizing implementation for these grades. Limited classroom space and rapidly increasing student enrollments created implementation difficulty.

In addition to appearing on numerous state agendas for educational reform, class size reduction holds a prominent position on the national education agenda. As part of a $12 billion, 7-year plan to hire 100,000 new elementary teachers, Congress recently approved $1.2 billion for the 1999-2000 federal budget plan. This provides enough money to hire 30,000 new teachers nationally in early elementary grades for the 1999-2000 school year. The initiative, supported by the National Education Association and the American Federation of Teachers, is intended to help schools nationwide reduce class sizes in Grades 1 to 3 to an average of 18 students.

Table 7.
National Average Class Size
1993-94 School Year

Campus Characteristic	Elementary School Class Size	High School Class Size
Total	24	24
Community Type		
Central City	25	25
Urban fringe/large town	25	25
Rural/small town	23	22
Percent Minority Students		
Less than 20%	24	23
20% or more	25	24
Percent Economically Disadvantaged Students		
Less than 6%	24	24
6% to 20%	25	24
21% to 40%	24	24
41% or more	24	24
Campus Size		
Less than 150	18	15
150 to 499	23	21
500 to 749	25	23
750 or more	26	25

Data Source: NCES (1997).
NOTE: NCES definitions for elementary and high schools differ from those used in Texas. As a result, Grade 6-8 middle schools are included in the elementary category.

Nationwide average class size increases as school size increases for both elementary and high schools.

Despite the recent trends to provide additional teachers, the average class size in regular instructional classrooms has only declined from 30 students to 25 students since the 1950's in elementary schools nationwide; and the additional teachers have worked primarily with students who have special needs (Toch & Streisand, 1997). NCES (1997) reported that class size in elementary and secondary schools during the1993-94 school year averaged 24 students. Table 7 shows that nationally class size decreases as school size decreases and elementary and secondary schools with fewer than 150 student have substantially smaller classes.

Class Size Research

Tennessee's Project STAR (Student-Teacher Achievement Ratio) remains the most renowned class size study to date. Project STAR, conducted as a longitudinal project from 1985 to 1989 with 6,000 students in kindergarten through third grade, included students in small classes averaging 13 to 17 students; regular classes averaging 22 to 25 students; and regular classes with a full time assistant (Achilles, 1996; Bingham, 1994). This study used interview data, test scores, attendance and discipline data, and specialized questionnaires.

The Lasting Benefits Study (LBS) tracked students in the initial Project STAR study and analyzed test scores for these students through the end of eighth grade. This study was designed to assess the long-term academic performance gains for students who participated in the small classes in the elementary grades.

Predating Project STAR, Project Prime Time began as an Indiana statewide initiative in 1984. During its first year of implementation, this initiative reduced class sizes to approximately 18 students in first grade classrooms. However, schools maintained the flexibility to increase class size to 24 if the classroom had an instructional aide. The succeeding two years added second grade and a choice between third grade and kindergarten respectively.

North Carolina established two class size reduction programs. In 1991-92, Burke County piloted an initiative to reduce class sizes to 15 students for first graders in four elementary schools. Following positive results on early assessments, the program was phased in to all first grade classrooms in all elementary schools within Burke County. The four initial pilot schools served as the sites for phasing-in second and third grade class size reductions. By 1995-96, all schools in Burke County had first and second grade classrooms of 15 students. Ten elementary schools had reduced class size to 15 students in third grade by 1996-97. The Success Starts Small (SSS) program, North Carolina's second initiative, focused on students in Grade 1 and reduced class size to 15 students.

Data collected from these initiatives over the past decade provide the foundation for much of the class size research conducted and many of the class size reduction policies considered and initiated today. The following is a summary of current class size research findings.

Class Size Findings

School Climate. According to the USDE (1998a), small classes promote improvement of the environmental quality of the classroom. Furthermore, defenders of small classes perceive small classes as useful in organizing classrooms so that the diverse academic needs of all students can be met.

According to many class size research studies, smaller classes have fewer classroom distractions. Consequently, teachers in small classes spend less time on classroom management and experience fewer discipline problems (Achilles, 1996; Finn, 1998; USDE, 1998a; WDPI, 1997). As revealed in the Success Starts Small project, the increased space per student may contribute to fewer distractions and classroom disruptions (Egelson, Harman, & Achilles, 1996).

As a result of an improved climate, teachers in small classes have more time available for instruction (WDPI, 1997). Small classes exhibit increased use of instructional materials and more direct interaction between teachers and students (Achilles, 1996; Finn, 1998). Findings from the STAR study indicated that instruction in small classes and regular classes with an aide differed from other classes in that basic instruction was completed more quickly and thoroughly; learning centers, supplemental texts, and enrichment activities were used more frequently; and use of other instructional strategies appropriate for elementary grades was incorporated (Achilles, 1996). Teachers in small classrooms are able to give students more individual attention, determine students' individual needs more quickly, and spend time with students who need assistance (USDE, 1998a; WDPI, 1997). In addition, teachers experience less fatigue in small classes (Achilles, 1996).

While supplying more opportunities for teachers to interact individually with students, small classes provide opportunities for more students to participate (Finn, 1993; Finn 1998; Olson, 1977; WDPI, 1997). Advocates for small classes maintain that parents are also more involved if their children are in smaller classes, and studies have found increased communication between school and home for students who are in smaller classes (Achilles, 1996).

Moreover, smaller classes in the early grades are perceived as a deterrent for later retention and remediation (Achilles, 1997; Bingham, 1994). The effects of small classes have not proven as beneficial for retained students during the retention year as using small classes as a prevention strategy (Harvey, 1994). For example, most of the counties who participated in the Project Challenge study, which applied the STAR study criteria to many of Tennessee's more economically disadvantaged counties, indicated a decrease in the number of retentions after reducing class size (Achilles, 1996). Finally, proponents of small classes note that deterring retention helps counterbalance the costs of implementing class size reduction initiatives.

Academic Achievement. Increases in student achievement accompany the benefits of class size reduction noted thus far. Glass, et.al (1982) demonstrated student achievement continues to improve as class size is reduced and as the years of participation in small classes increase. The results of the STAR study also illustrated that a significant advantage existed for kindergartners in small classes. In the STAR study, first grade students in small classes outperformed other students on a criterion-referenced test of basic skills in reading and math-

ematics (Achilles, 1996). The results from the second and third grade reflected this same pattern. Curious about the extent of the effect resource allocations had on fourth and eighth grade mathematics achievement, Wenglinsky (1997) found that reducing student-teacher ratios resulted in greater average mathematics achievement in fourth grade. However, the relationship between lower student-teacher ratios and mathematics achievement was not as directly linked in the eighth grade. Instead, lower student-teacher ratios at eighth grade seem to influence the environmental quality of the school and thus indirectly affected student mathematics achievement.

Some proponents regard class size reduction as a measure for improving the achievement of disadvantaged and minority students; thereby reducing the achievement gap between economically disadvantaged and minority students, and advantaged and White students (Bingham, 1994; Bracey, 1998a; Finn, 1998; USDE, 1998a; WDPI, 1997). A re-analysis of the STAR data indicated that minority students who participated in the small classes passed the reading portion of the basic skills test at a rate comparable to White students. In addition, using small classes, optimally beginning in kindergarten or first grade and continuing for at least two years, served as an intervention strategy capable of preventing the minority-White achievement gap (Achilles, 1996; Bingham, 1994; Finn, 1998). Performance reports from the Wisconsin Department of Public Instruction (1997) indicate that the achievement gap widened between African American and White students at control schools that did not have smaller classes. However, students at the schools participating in the SAGE program exhibited equal performance increases for African American and White students. According to Wenglinsky's (1997) report, economically disadvantaged students obtain the most gains from small class size.

The benefits accrued from small classes in elementary schools appear to have residual effects on student achievement in later years. The Lasting Benefits Study demonstrated that students who benefited from small classes in kindergarten through third grade had significantly better scores on both norm-referenced tests and criterion-referenced tests in reading and mathematics in fourth through eighth grades. In addition, the difference in achievement between students who had been in small classes and those who had been in regular classes or regular classes with an aide appeared in other areas tested such as science and social studies (Achilles, 1996). Students who participated in the STAR program experienced positive effects on achievement up to five years after their participation in small classes (Nye et. al, 1995).

Principal, Teacher, and Parent Perceptions. Teachers, administrators, and parents often support efforts to reduce class size. Achilles (1996) notes that the inclination for home schooling, private schooling, advanced classes, or other special programs demonstrates the desire for small classes and the benefits that may result from them. As a rationale for smaller classrooms, teachers often cite higher morale and better relationships with students (Glass, Cahen, Smith, & Filby, 1982; Olson, 1977). According to many class-size research studies, teachers believe that small classes are accompanied by decreases in discipline problems and increases in student learning. In addition, teachers also believe students can progress more at their own rate, stay on task more frequently, and achieve more in small classes (Egelson, Harmon, & Achilles, 1996). Teachers also believe they are able to provide more timely feedback, attention, and materials. Furthermore, teachers denote more interactions between school and home when students are in smaller classes (Achilles, 1997). Principals' perceptions of the effects of small classes include increased individual attention for students, quicker diagnosis of student needs, and overall decline in the number of retentions. Recently, 90 percent of superintendents surveyed for *Education Week* said they agreed that reducing class sizes would improve student achievement (Archer, 1998). The USDE (1998a) found that students, teachers, and parents generally report positively on their experiences with small classes.

Class Size Recommendations. Current research on class size indicates that class size reductions seem most beneficial in the early elementary grades (USDE, 1998a). Students benefit from smaller classes in kindergarten through Grade 3 (Achilles, 1997; Robinson & Wittebols, 1986); the greatest benefits are derived from smaller classes in kindergarten and Grade 1 (Word et al, 1990). The benefits accrued from smaller classes in elementary school appear to have residual effects on student achievement in later years (Nye et al., 1995). There is not corresponding evidence of higher academic achievement associated with smaller middle and high school classes because there have not been a sufficient number of class size studies at those grade levels.

Class size reductions have been associated with the greatest impact on student achievement when classes are reduced below 20 students. Class size reductions to between 15 and 19 students have been reported to yield the greatest results, especially for economically disadvantaged and minority students. Student achievement is not as great if class sizes remain at 20 students or more (Achilles, 1996; Finn, 1998; Glass et al., 1982; Illig, 1996; USDE, 1998a). The major class size studies have analyzed

different size classes at different grade levels using different methodologies and different measures of achievement. For that reason, it is not possible to make broad generalizations about the advantages of classes with 17 students versus those with 18 students, for example.

Adding teacher aides to large classes allows teachers to give students more individual attention and spend additional time with students who need assistance. A number of state class size policies give schools the option of a higher class size limit for classes with aides. There is some evidence of positive effects of adding teacher aides to large classes and these policies allow schools greater flexibility in implementing class size limits. However, adding teacher aides to large classrooms does not replicate all the conditions found in small classes (USDE, 1998a). Furthermore, large classes with teacher aides do not exhibit the higher levels of student involvement and academic achievement found in small classes (Word et al., 1990; Nye et al., 1995).

Financial Considerations

Costs for schooling are likely to increase with class size reductions. The need for additional staff and facilities are the primary reasons for increased expenditures. However, the benefits of reducing class sizes in elementary schools must be weighed against the cost of providing teacher aides, retentions, special education, or remediation later in school (Achilles, 1997; Bingham, 1994).

A number of factors must be considered when calculating the cost of a statewide class size reduction policy (McRobbie, Finn, & Harman, 1998).

- Average class sizes before reduction – the greater the decrease required to meet new class size limits the greater the cost.
- Flexibility in implementing the policy – rigid class size limits require schools to maintain smaller classes to ensure staying below the limit, which increases costs.
- Cost of additional teachers – experienced teachers cost more than new teachers. Also, increased demand may raise teacher salaries.
- Cost of facilities – operational costs for new facilities must be factored in, as well as construction costs.
- Potential savings accrued from smaller classes – in addition to improving academic performance of students, smaller classes have been attributed with reducing special education referrals, retention rates, and disciplinary problems which can reduce expenditures for remediation.

In 1985-86, the first year class size limits were required for kindergarten through Grade 2 classrooms in Texas public schools, 256 districts requested waivers due to lack of facilities (TEA, 1986). Based on construction costs at the time, it was estimated that the 1,800 new classrooms needed for compliance with the maximum class size requirement would cost districts approximately $106 million. The majority of waivers were granted to small, nonmetropolitan and rural districts. In addition, many districts that did not request waivers in 1985-86 cited the new class size requirements as a reason for needing to build additional facilities. The 451 districts responding to a survey regarding implementation of class size provisions reported constructing or purchasing 1,627 new classrooms and remodeling an additional 602 classrooms. Costs were estimated at $60 million. These districts also hired 3,152 additional kindergarten through Grade 2 teachers at a cost of $63 million. Moreover, an additional 457 teachers were needed statewide in 72 districts that requested waivers due to teacher shortages.

In a 1987 report to the legislature, it was estimated that the cost to Texas school districts of complying with class size limits for the 1988-89 biennium would be $610.5 million (Clark, 1988). This estimate included $98.0 million in additional teacher salaries and $189.7 million for facilities to maintain smaller classes in kindergarten through Grade 2. The remaining $322.7 million was the estimated cost of extending class size limits to Grades 3 and 4 the second year of the biennium - $109.7 million for additional teacher salaries and $213.0 million for facilities.

In 1997-98, Texas school districts budgeted $2.3 billion for debt service and capital outlay. These non-operating expenditures accounted for over 10 percent of total district expenditures. Until this year, school districts relied entirely on local tax revenue to fund the construction of new facilities. However, the Instructional Facilities Allotment (IFA) program, which was authorized by the 75th Texas Legislature in 1997 (TEC Chapter 46, 1998), now provides assistance to school districts in making debt service payments on qualifying bonds and lease-purchase agreements. Districts must apply to the Texas Education Agency to receive part of the $100 million appropriated for the IFA program each year of the current biennium. The amount of state aid a district receives under the IFA program is based on the district size, property values, and amount of annual debt service. Priority for funding is given to low-wealth districts.

Conclusion

Enrollment in Texas public schools is projected to increase at more than twice the national rate over the next decade. Consequently, education administrators and taxpayers will

continue to be confronted with difficult decisions related to school resources. Although longitudinal studies of cost effectiveness refute the argument that large schools are more economical, annual per-pupil expenditures of large schools in Texas are lower than those of small schools. However, lower expenditures at larger schools are achieved at least in part through higher student-teacher ratios. Educators and education policymakers will continue to explore reforms designed to overcome the disadvantages of large schools and classes by offering school and class size reduction alternatives.

Overall, analysis of Texas data show that Texas Assessment of Academic Skills (TAAS) reading and mathematics performance in elementary schools declines as school size increases. In Texas middle schools, attendance rates and TAAS mathematics performance decline as school size increases. High school retention rates increase as school size increases, and attendance rates and TAAS mathematics performance decline. The percentage of Texas high school students completing advanced courses and taking college admissions tests is not significantly different between large and small schools. However, performance on indicators of college readiness improves as high school size increases. These findings are consistent with findings from school size research conducted elsewhere.

While larger schools are exploring practices that will afford them some of the advantages of smaller schools, smaller schools are striving to provide better opportunities for college preparation. Analysis of Texas SAT results has found positive relationships between SAT scores and percentages of students passing the TAAS, student letter grades, and the number of academic courses students complete (TEA, 1998e). Recommendations to schools based on these analyses center on encouraging all students to take a greater number of academically challenging courses; increasing the number and diversity of rigorous, challenging courses offered; ensuring that all students are held to consistently high standards; and encouraging more participation in AP, IB, and college admissions testing programs.

On average, the number of different advanced courses offered by Texas high schools decreases as school size decreases. However, there are medium, small, and very small high schools that offer a large number of advanced courses, demonstrating that a diverse and challenging curriculum is not out of reach for smaller schools. The ability of small schools to use resources differently provides the potential to achieve curriculum breadth and depth similar to large schools. The percentage of high school students completing at least one advanced course increased from 12 percent in 1992-93 to almost 20 percent in 1996-97, illustrating that Texas students are willing to meet the challenge of more difficult courses when the opportunity is offered.

Some alternatives to large schools include programs such as schools-within-a-school, focus or magnet schools, and charter schools (Gladden, 1998; Haller, 1992; Lee & Smith, 1997; Raywid, 1997). Additionally, organizing schools into smaller components comprised of teacher teams provides some opportunities for students and teachers to experience the benefits of simulated small schools that are inclusive of all children (Oxley, 1994). About one-third of the Texas middle schools responding to a 1993 survey reported that they were partially or fully implementing practices designed to create a community of learners (TEA, 1994). Practices included academic teaming, in which an interdisciplinary team of teachers shares a common group of students; a second, common planning period for the academic team to allow better integration of curriculum and instruction; and advisory periods and mentoring programs to provide students daily interaction with adult mentors.

As indicated, small classes support an environment that often leads to more direct attention to students, wider use of resources, increased use of instructional methods, greater student participation, higher teacher morale, and fewer class disruptions (Jencks & Phillips, 1998; USDE, 1998a & 1998b; Wenglinsky, 1997). Although establishing a cause-effect relationship between class size and student achievement remains difficult, increased student achievement appears to be associated with the conditions created by class size reductions. The effects of class size reduction appear greater for students if they engage in small classes in the early elementary grades, especially kindergarten and first grade. Some studies, such as the Lasting Benefits Study, reveal that participation in small classes can have residual effects on student academic achievement. Furthermore, small classes have been found to facilitate reduction in gaps between minority and White students' academic achievement.

In a recent cost analysis for Mississippi, the SouthEastern Regional Vision for Education (1998) research and development group suggested limiting the scope of class-size reductions, alternative scheduling, and changes in staffing priorities as alternatives to full-scale class size reductions. In addition, year-round calendars have also been introduced to alleviate overcrowding. In 1996-97, there were 359 schools in 63 school districts operating on year-round calendars in Texas; three-fourths of these were elementary schools.

Adding teacher aides to large classrooms represents another alternative to reducing class size. Although adding

teacher aides to large classrooms does not necessarily replicate the conditions found in small classrooms, it may allow teachers to give students more individual attention and spend additional time with students who need assistance. In 1997-98 there were 48,626 educational aides employed by Texas school districts; educational aides accounted for almost 10 percent of total staff. There is some evidence of positive effects of adding teacher aides to large classes, effectively reducing the student-adult ratio within the classroom. However, large classes with teacher aides have not been found to exhibit the higher levels of student involvement and academic achievement found in small classes.

Based on the policies initiated in other states, further plans for class size reductions necessitate consideration of the available facilities and supply of teachers, as well as the quality of teachers available. In 1997-98, there were 254, 558 teachers teaching in Texas public schools (TEA, 1998). In 1996-97 about 96 percent of Texas public school teachers held a certificate issued by the State Board for Educator Certification (SBEC, 1998). Thus, only 4 percent of those teaching in 1996-97 did not hold a certificate issued by SBEC. However, as a result of teacher shortages and fluctuations in enrollment or course offerings, certified teachers often teach one or more courses outside their area of certification. At the high school level, 20 percent of the teachers teaching English/language arts, science, and social studies classes in 1996-97 were reportedly teaching at least one course for which they were not certified. In addition, 30 percent or more of the middle school and junior high teachers teaching in the core areas of language arts, mathematics, science, and social studies were teaching one or more courses for which they were not certified. Texas identified special education, mathematics, bilingual education, English as a second language, science, and foreign languages as teacher shortage areas for the 1998-1999 school year.

Small class reformers do not advocate any one school design or instructional methodology (Achilles, 1997; Fine, 1998: Raywid, 1997). Nevertheless, attention to the quantity and quality of the available teaching force is essential because class size reductions require qualified teachers to be effective (Bracey, 1998b; Hanushek, 1998; McRobbie, Finn, & Harman, 1998). Availability of adequate school facilities has also hampered the implementation of class size reduction policies in several states.

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