Elementary School Size and Student Performance: A Conceptual Analysis*

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Abstract

In this article, we reviewed the empirical literature concerning the relationship between school size and student performance with a focus was on determining the extent to which school size, specifically elementary school size, was related to student academic achievement. Most of the extant literature was on secondary school size with fewer studies published on elementary school size and even fewer studies published on middle school size. In this review, we provide a critical analysis of the available research on school size. Moreover, the benefits and disadvantages of small versus large schools were analyzed. Despite an abundance of published research studies, definitive answers regarding school size and student performance remain unanswered. Decisions about school size appear to be complex and involve a variety of factors such as costs, community support, and students with special educational needs.

1 NCPEA Publications

NOTE: This manuscript has been peer-reviewed, accepted, and endorsed by the National Council of Professors of Educational Administration (NCPEA) as a significant contribution to the scholarship and practice of education administration. In addition to publication in the Connexions Content Commons, this module is published in the *International Journal of Educational Leadership Preparation*,[1] Volume 6, Number 4 (October - December, 2011), ISSN 2155-9635. Formatted and edited in Connexions by Theodore Creighton and Brad Bizzell, Virginia Tech and Janet Tareilo, Stephen

*Version 1.2: Dec 12, 2011 10:53 am US/Central
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[1]http://www.ncpeapublications.org

F. Austin State University. The assignment of topic editor and double-blind reviews managed by Editor, Linda Lemasters, George Washington University.

2 Sumario en espanol

En este artículo, nosotros revisamos la literatura empírica con respecto a la relación entre tamaño de escuela y desempeño de estudiante con un foco estuvo en determinar el punto hasta que tamaño de escuela, específicamente tamaño de escuela de enseñanza primaria, fue relacionado al estudiante logro académico. Mmost de la literatura existente estuvo en el tamaño de instituto de enseñanza secundaria con menos estudios publicados en el tamaño de escuela de enseñanza primaria e incluso menos estudios publicaron en el tamaño de colegio. En esta revisión, nosotros proporcionamos un análisis crítico de la investigación disponible en el tamaño de la escuela. Además, los beneficios y las desventajas de pequeño contra escuelas grandes fueron analizados. A pesar de una abundancia de estudios publicados de investigación, respuestas definitivas con respecto a tamaño de escuela y desempeño de estudiante se quedan no contestado. Las decisiones acerca de tamaño de escuela parecen ser el complejo e implicar una variedad de factores como costos, como apoyo de comunidad, y como los estudiantes con necesidades educativas especiales.

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3 Introduction

In this article, we reviewed the empirical literature concerning the relationship between school size and student performance with a focus was on determining the extent to which school size, specifically elementary school size, was related to student academic achievement. To understand the ensuing debate about large schools versus small schools, the historical context of the growth and changes of elementary schools throughout the United States was examined. Further, various theories used to support both large and small schools were explained. After an analysis of numerous studies related to large and small schools and student performance, optimal school sizes are suggested in Table 2. Finally, we propose a rephrasing of the question, "Does school size matter?' by offering direction for future researchers and implications for educators.

4 Brief Historical Overview

From about 1930 to 1970, the number of elementary schools in the United States was reduced by 100,000 because of centralization. In fact, nearly two thirds of the schools were eliminated through consolidation (Berry, 2004). In 1940, the typical elementary school was a one-room schoolhouse located in rural areas throughout the United States. It was estimated that in these 114,000 one-room elementary schools in 1940, most housed fewer than 200 students and six or less teachers. Over the next 30 years, the number of one-room schools decreased from 114,000 in 1940 to 2,000 in 1970 (Hampel, 2002).

Historically, small schools were noted for providing students an intimate learning environment where teachers and students knew each other well (School Renaissance Institute, 2000). In fact, the school was a symbol of community pride and the school facility provided students the opportunity to walk or ride a horse to school in the most remote locations (Young & Green, 2005). Yet, these rural settings had disadvantages such as a lack of utilities (e.g., electricity and water), outdated curricular materials, no support services, and limited extracurricular options for students (Young & Green, 2005). After World War II, policy makers decided that consolidations of these small schools could provide students with more educational opportunities than were possible for students in small, isolated schools (School Renaissance Institute, 2000). Some of the central reasons to consolidate were refocused from costs savings on utilities to the idea of "community pride and improved opportunities for students" (Young & Green, 2005, p. 4).

5 Theories Used in School Size Research

A few theories were located in the literature to frame the investigations of advantages and disadvantages of small and large schools. The economy of scale theory, popular in the economics literature, is generally used by large-school advocates. On the other hand, the school connectedness theory, which highlights the relationships formed in smaller settings, is purported by small-school advocates. Both theories are discussed in the next two sections.

5.1 Economies of Scale as a Theoretical Framework

The quality of education and the ability to provide this quality at a lower cost in a larger school setting were advantages touted by large school proponents who were encouraging consolidation efforts (School Renaissance Institute, 2000). Furthermore, fixed costs are distributed over a large school or school district in an economies of scale model (Young & Green, 2005), and this model has been used previously in industry. Presently the model is applied to the educational setting to improve the efficiency of cost and to measure the quality of education (Young & Green, 2005). The size and design of schools have changed over time to accommodate the need to provide a high quality education in an efficient manner (School Renaissance Institute, 2000). Consequently, the number of elementary schools with more than 900 students enrolled increased by 30% from 1987–1988 to the 1997–1998 school year (Office of Policy Planning and Research, 1999).

As educational leaders and communities plan schools, the theory of economies of scale is a critical component of the planning process to ensure an efficient use of the money needed to operate schools (Howley, 1996b). An economy of scale is demonstrated within schools or school districts when larger organizations can derive a lower cost per student due to the ability to distribute the expenses for fixed costs over more students (Porter, 2008). For example, because both large and small schools typically need administrators, teachers, and cafeteria staff, the cost per student might be less in larger schools than in smaller schools.

One study using the economy of scale theory was conducted by Dodson and Garrett (2004) who analyzed data from Arkansas school districts and noted that large economies of scale were present and savings were realized in personnel costs, supplies, and materials. "A consolidated school district can produce an equivalent level of output at a lower cost per student by avoiding redundant expenditures" (Dodson & Garrett, 2004, p. 271). Specific examples noted within this study included the fact that fewer administrators or specialists were needed as small schools were consolidated. Dodson and Garrett proposed that by consolidating Arkansas schools, teacher salaries would show a 30.6% cost savings per student compared teachers salaries at cost per student for each isolated rural district. Further, when smaller districts consolidate, they might be able to offer more competitive salaries than before, thereby retaining more qualified teachers (Dodson & Garrett, 2004).

Other researchers have applied the theory with mixed results. Cotton (2001) reported that at some point the costs continue to rise as the school increases in student enrollment. Imazeki (2006) indicated that in districts in California, economies of scale were demonstrated as well as a lack of economies of scale. Imazeki further reported that the average cost of education was lowest in a district that enrolled 28,992 students, but as the district continued to grow, the cost per student continued to rise. Slate and Jones (2005) reviewed literature and concluded that initially, increasing school size created positive results including training for teachers and the ability to recruit highly qualified teachers. However, as schools continued to increase in size, the effects of the increasing student population and the lack of needed resources tended to reverse the once positive effects of increasing school size. Ferris and West (2004) argued that savings projected using economies of scale might not apply to individual schools as well as the model could be applied to school districts. School districts might not be able to calculate an accurate cost per student because of several varying factors among schools that can affect costs such as school safety issues, teacher development needs, and special needs of students served in the school. As a result, Ferris and West (2004) contended that these external factors can create complex analyses which cannot be included in a cost function model.

5.2 Cost Effectiveness and Consolidation

Although Young and Green (2005) noted a focus on improving educational opportunities for students as an impetus for consolidation, cost effectiveness has been the motivational factor of the consolidation effort of small schools and districts for many years (Overbay, 2003). In fact, the topic of consolidation has been a controversial issue since the 1800s (Bard, Gardener, & Wieland, 2005). "Some reformers have argued that small rural schools are inefficient and ineffective and that consolidating them into larger organizations is the best, if not only, remedy" (Arnold, 2000, p. 2). Similarly, Conant (1959), a proponent of consolidation in the 1950s, asserted that large schools could provide a more diverse curriculum while maintaining a lower per student cost than smaller schools. As noted earlier, through consolidation, schools increased in enrollments from an average of 170 to 2,300 students per school between 1930 and 1970 and simultaneously, the numbers of schools and districts decreased as the numbers of students attending schools increased (Berry, 2004). As a result, the average school district was 14 times larger in 1970 as compared to 1930 (Berry, 2004).

Even though cost effectiveness has been and continues to be a major factor in widespread consolidation in the United States, researchers have challenged the cost effectiveness argument (e.g., Arnold, 2000; Bard et al., 2005; Howley, 2005; Monk & Haller, 1993). Plecki (1991) asserted that methodological errors occurred in most efficiency research regarding school size and costs. As such, most findings were based on district-level data that did not account for funding sources that might have been available to some schools but not equally to all schools within the district. For example, when student population characteristics differed greatly among schools within a district, the deviations affected the reported district average of available resources and the reported resources might have inaccurately reflected funds available at the campus level (Plecki, 1991). Furthermore, Fox (1981) noted a pattern in expenditures where spending was higher per student at the extreme ends of the school size spectrum. Schools that had the smallest populations and schools that had the largest populations demonstrated the largest expenditures per students. Bickel, Howley, Williams, and Glascock (2001) analyzed "single-unit schools" (p. 22), which contained Grades Kindergarten (K) through Grade 12. The only school in a small rural school district, the single-unit school, typically housed all elementary and secondary students in one building. This setting was deemed to be educationally and economically efficient (Bickel et al., 2001). For example, the researchers stated a cost savings of $1,017 per student expenditures within a single-unit Grades K-12 school. However, schools with such limited grade spans as Grades 3-5 were more costly per student than schools with wider grade spans.

In exploring construction costs of large and small schools, Howley (2005) analyzed two national datasets. He compared the means of construction costs of 168 different projects including large and small high schools and made projections about the final construction costs. Howley discovered that smaller high schools, with 138–600 students, were less expensive than larger high schools, with 601–999 students, per square foot. Howley (2005) reported that this cost difference might have occurred because administrators typically over-estimated the predicted student enrollment of larger schools and underestimated the enrollments of smaller schools. Both large and small schools typically cost the same amount per student because smaller schools allocated 26% more space per student than did larger schools. Howley (2005) also reported another relevant variable impacting construction costs: the wealth of the community. If the community wealth surrounding the school was high, then the construction costs were increased to meet the community's expectations for facility upgrades. As a result, the expected efficiency with larger schools was not evident in Howley's (2005) study and he concluded that larger schools were not more efficient than smaller schools.

Conversely, Brown, Johnson, Doughty, Cecil, and Keck (2005) analyzed school enrollments and the cost per square foot between two smaller elementary schools compared to one larger elementary school. The researchers wanted to determine which building option for a new school was the most cost efficient. Two building prototypes were examined: (a) a two-school option with 640 students in Grades Pre-Kindergarten–3 and 400 students in Grades 4–5 and (b) a consolidated elementary school of 1,040 students in Grades Pre-kindergarten–5. The consolidated elementary school equated to a space savings of 23,058 square feet and a personnel cost savings in excess of $115,000. Within the first year, the projected cost savings for the one school option was over $3 million. In this same study, Brown et al. (2005) analyzed new building designs with architects to determine if the smaller elementary schools were as cost efficient as the larger consolidated

elementary schools. Researchers reviewed schools of varying enrollments and grade spans and concluded that larger schools resulted in a cost savings per square foot and required less square footage per student than smaller schools. Deriving a similar conclusion in South Carolina elementary schools, Carpenter (2006) noted that per pupil operating costs in larger schools were less than operating costs in smaller elementary schools.

In another study related to consolidation, Streifel, Foldesy, and Holman (1991) examined 19 consolidated schools throughout the United States. They analyzed expenditures and revenues for each of the identified school districts for 3 years following the consolidation, comparing these financial data to the average spending for education in each state. Administrative costs were lower after consolidation and the authors noted that the administrative costs might be less than 5% of the overall budget. However, this additional cost might not be a substantial expenditure, especially in small rural districts where the number and cost of administrators are minimal. Expenditures that were not statistically significantly different compared to the state average were instruction, transportation, operations and maintenance, total costs, total revenue, and capital projects. The authors recommended that school district leaders understand their unique communities and that expenditures and revenues should be analyzed from all angles before a decision to consolidate is considered. In another similar study, Chakraborty, Basudeb, and Lewis (2000) analyzed cost and expenditure data from 40 school districts in Utah over a 3-year period and noted that economies of scale were present at both the school district and school level. The researchers concluded that as the school size increased, the average expenditures per student decreased. They recommended considering consolidation of schools or school districts to reduce the cost of education.

Although many of the studies cited thus far have focused on the differing operating costs of large and small elementary schools, Imazeki (2006) refined the analyses by examining subgroups of students and costs related to specific educational needs. Imazeki (2006) defined the *base cost* of education as the amount per pupil needed in a school district to serve students having a few special needs and the *marginal cost* as the amount needed to serve students whose needs require more money. Some examples of additional characteristics are a large economically disadvantaged population, a large population of students identified as LEP, or a concentrated number of students with severe disabilities. Imazeki noted that many states, including California, which was the state analyzed, provide some adjustments for these additional costs of education. Imazeki concluded that many of these adjustments were added to the school district funding formula after initial financial calculations were conducted. These additions were not directly linked to the true cost of education nor were these amounts sufficient to meet the unique needs of these special student populations.

Furthermore, Imazeki (2006) analyzed student achievement data for California to determine if school districts that were experiencing financial challenges were able to create school environments where students were demonstrating academic success. Using the financial information for each school district, the researcher examined how students were performing in districts with financial challenges compared to other districts not experiencing the same financial challenges. To measure performance, Imazeki averaged the Stanford-9 scores for each school district and created a summary score, the Academic Performance. Districts with larger numbers of students with more costly educational needs, such as large numbers of students from economically disadvantaged backgrounds, demonstrated lower student achievement in the API than did districts with smaller numbers of students with similar needs. Lower achievement was also predicted in higher cost districts because the funding provided was not sufficient to provide the quality of education needed to overcome the additional challenges. "Summed up across all the districts, the total cost to appropriately compensate all districts for their needs would be just over $49 billion, or roughly thirteen percent more than the cost of maintaining the status quo" (Imazeki, 2006, p. 28).

Other researchers have examined other variables besides financial data to determine effectiveness. Steifel, Berne, Iatarola, and Frucher (2000), in an attempt to focus on the substantial dropout rate in larger schools, refined the definition of cost effectiveness by calculating cost per on-time graduates instead of cost per enrolled student. Furthermore, Ferris and West (2004) purported that economies of scale for schools cannot be measured by production of student achievement alone. Rather, the measurement of the success of the cost of the function should be determined using external factors such as increased school violence and the perception of students regarding the quality of the school environment in addition to student achievement

to determine the overall success rate of a school. Slate and Jones (2005) concluded that economic efficiency and educational outcomes represented two separate sets of analyses, each of which has its own correlation to school size. The influence of these factors might be affected by more complex analyses such as poverty level of the student population and the surrounding community. Slate and Jones (2005) recommended carefully considering a comprehensive evaluation of additional analyses that might influence student academic success in the school setting.

5.3 School Connectedness as a Theoretical Framework

Besides cost efficiency and student achievement, another argument used to support smaller schools is that of school connectedness. School connectedness determines the degree to which students feel supported and cared for by teachers and staff in the educational setting (Blum, 2005a). To examine school connectedness, Blum (2005) studied children of military personnel who had to relocate frequently, which often resulted in interrupted schooling and social connections. Blum determined that students responded better and achieved at higher levels in learning environments that were individualized and considerate of the needs of each student. Consequently, Blum theorized that school connectedness resulted in a learning environment where relationships were valued. As such, many of these relationships have been documented in the small school setting.

Cotton (2001) applied the theory of school connectedness in a study and reported that the positive support found in smaller schools has been shown to reduce violence in schools and protect students from dropping out of school. Cotton argued that teachers in small schools are more likely to know the specific learning strengths of each student and such personalized instructional knowledge is more difficult in a large school environment. "When teachers and students are able to build relationships, both are motivated to work and to make a success of the schooling enterprise" (Cotton, 2001, p. 29). In another study, Brookmeyer et al. (2006) noted that connectedness provided students with a safeguard to overcome other barriers that might hinder academic development such as poverty.

6 Small Schools Studies

Several researchers have concluded that smaller schools promote high academic achievement through the intimate environment that facilitates relationships, belongingness, and a sense of community (Friedkin & Necochea, 1988; Howley, 1996b; Howley, Strange, & Bickel, 2000; Lee & Smith, 1993, 1997). Supporting the theory of school connectedness, many researchers have concluded that small schools are better able to develop a sense of community that supports engagement (Cotton, 2001; Lashway, 1999; Mitchell, 2000). Advocating for small schools almost 100 years ago, Kennedy (1914) concluded that "if there are twenty or thirty children and an efficient teacher we have the essential factors of a good school" (p. 64). Several studies have been conducted to examine several variables in smaller schools. Some of these variables have been student engagement, achievement, student discipline, and poverty levels.

6.1 Student Engagement

Nearly 50 years ago, Barker and Gump (1964) asserted that small schools created an environment conducive to developing relationships and opportunities for student engagement. They compared student engagement of students in small schools compared to large schools and reported that student participation was much higher in smaller schools than in larger schools. In smaller schools, every student was needed as a key member so that teams could compete in athletic, academic, and extracurricular activities. In larger schools, so many possible participants were available that each individual's participation was not as critical. Later, Lindsay (1982) analyzed extracurricular activity participation rates among 14,668 high school students in 328 schools. The author indicated that schools with 100 students or less had a higher extracurricular activity participation rate, student satisfaction, and attendance when the data were controlled for the socioeconomic status of the student population and student ability levels. Cotton (1996) confirmed earlier research that

small schools demonstrated an important relationship between indicators such as student engagement and higher extracurricular participation.

6.2 Student Achievement

Cotton (1996) reviewed 103 school size studies and research projects and concluded that a statistically significant relationship was present between small school size and higher student achievement in about one half of the studies, whereas the other one half of the studies did not confirm that relationship. In another meta-analysis, Leithwood and Jantzi (2009) reviewed 57 studies of school size effects and student achievement and concluded that students in smaller schools demonstrated higher achievement compared to larger schools. According to the researchers, this trend was critical to students from diverse and disadvantaged backgrounds as they consistently demonstrated higher academic achievement in small schools.

6.3 Student Discipline

Examining the relationship between discipline and school size, the National Center for Education Statistics (NCES, 2006) surveyed principals and discovered that discipline problems were related to school size. In schools of more than 1,000 students, 34% of principals reported patterns of office referrals occurring at least once a week due to students being disrespectful to teachers. This result was compared to 21% of principals in schools with 500–999 students, 17% schools of principals in schools with 300–499 students, and 14% of schools of principals in schools less than 300 students. Cotton (1996, 2001) also affirmed that students in small schools exhibited positive social behaviors at school noted by the lack of discipline incidents, higher attendance rates, lower dropout rates, a positive concept of school, and the ability to experience success for every student.

6.4 Small Rural Schools and Poverty

Students who have disadvantaged economic backgrounds and who live in rural environments might encounter complex obstacles. Consequently, high academic success has not typically been the norm in high poverty schools in Texas or throughout the United States whether the setting is rural or urban (Kannapel & Clements, 2005). Beeson and Strange (2000) described rural schools as geographically isolated and more likely to have a larger percentage of economically disadvantaged students. Rural areas are more likely to demonstrate significant levels of economic distress in the United States as compared to metropolitan areas. Of the 250 poorest counties in the United States, 244 counties were rural (Beeson & Strange, 2000). Researchers have noted that small, rural schools still face barriers to providing a high quality education to all students. Some barriers include poverty, school finance formulas, isolation, and difficulty competing for high quality teachers and administrators (Arnold, 2000). Some small, rural schools have overcome these challenges, whereas others struggle to maintain successful schools despite a multitude of economic barriers. However, some rural area educators are suspicious of reform efforts for their schools due to negative past experiences with consolidation reform efforts as well as a mistrust of reform efforts initiated by political entities outside the local district (Arnold, 2000).

Small schools have demonstrated a particular effectiveness for impoverished students (Howley, 1996a). Johnson (2006) suggested that consolidating small disadvantaged districts to create larger high schools would likely increase the economic barriers of poverty on student academic achievement. “The larger the district, the more magnified the negative effects of poverty over student achievement, and the smaller the district, the more poverty’s effects are muted” (Johnson, 2006, p. 8). Stevenson (2006) revealed that small schools demonstrated trends of keeping disadvantaged students in school longer, which prepared these students with the skills needed to be more able to fulfill graduation requirements. Stevenson also noted that small schools were better able to fulfill the personal needs of students, resulting in future productive citizens. Cotton (1996) and Stevenson (2006) both observed how small schools added value to the school experience for these disadvantaged students by providing them opportunities for success in a small school setting versus allowing them to become dropouts in a larger school setting. Bickel, Howley, Williams, and Glascock (2001) examined

the relationship among school size, student achievement, and the cost of education per student by analyzing 1,001 high schools in Texas. The researchers noted that smaller schools lessened the effects of economic disadvantages for students, whereas larger schools exaggerated these economic disadvantages. Furthermore, Cotton (2001) concluded that small schools can provide opportunities for poor and minority students to perform at high academic levels.

In reviewing the option to consolidate small, rural districts with high levels of poverty, Slate and Jones (2005) proposed that any educational initiative should be examined as to whether it improves the academic achievement of students. Similarly, Bard et al. (2005) concluded that educational stakeholders must consider financial implications of consolidation along with student achievement and the community surrounding the school. "More and more it seems that small schools hold particular promise for helping impoverished students maximize their potential to achieve academically. This hardly means that small schools are the best choice for all students under all circumstances" (Howley, 1996b, p. 5).

7 Large Schools Studies

7.1 Trends for Larger Schools

The one-room schoolhouse of the 1900s is a rare event in today's schools (School Renaissance Institute, 2000). In the mid-1900s, students were being educated in 117,000 school districts throughout the United States. Within 50 years, the number of school districts had dropped below 16,000 whereas the population of the United States had grown by 70% (Lashway, 1999). In theory, the consolidation of small school districts provided students equitable opportunities for class choices, labs, library resources, and kept the cost of schools lower while serving more students (Lashway, 1999).

The trend toward large schools continues in the 21st century. Mitchell (2000) reported that about 40% of the secondary schools in the United States now have more than 1,000 students and some schools have enrollments as high as 5,000. Many secondary schools average between 2,000 and 3,000 students. In fact, from the 1990s into the 21st century, "the number of high schools with more than 1,500 students doubled" (Mitchell, 2000, p. 13). Moreover, DeJong and Locker (2006) stated that families are attracted to large schools as they seek out schools that offer a variety of extracurricular activities and diverse course offerings for students.

An example of a very large school was DeWitt Clinton High School in the Bronx, New York that claimed a student population of more than 12,000 in 1934; however, population and demographic shifts caused this high school's student enrollment to rise and fall over the years (Allen, 2002). In 2002, Clinton High School had a student population of 3,864 and was in the process of whole school reform. Allen described a reform process of creating houses within the school to meet the needs of the diverse student population. These houses, or small groups of students, encouraged the development of relationships with other students and faculty as a strategy for increasing student performance. Allen noted challenges in communicating with parents and the community that educating students in a large school was feasible.

7.2 Benefits of Large Schools

Howley and Bickel (1999) replicated a study in seven states throughout the United States (i.e., California, Alaska, West Virginia, Ohio, Georgia, Texas, Montana). Interestingly, they concluded that students in high socioeconomic status communities might benefit from larger schools whereas students from low socioeconomic status might struggle to perform at high academic levels in larger schools. Johnson (2006) suggested that large schools have the ability to offer a variety of classes. On the other hand, the participation rates of the diverse classes offered at larger schools were lower than in smaller schools. As such, Johnson noted that students in larger schools with a plethora of classes might avoid taking challenging classes and might avoid being noticed.

7.3 Trends in Creating Small Schools Within Large Schools

Creating groups of smaller schools-within-schools was recommended by Lee and Smith (1997). Duke and Trautvetter (2001) promoted updating and redesigning existing buildings in need of improvements with a new design, which would allow for smaller learning environments within larger facilities. Three examples of schools within schools were (a) freestanding small schools, which manage their own budget, administration, and staff; (b) multiplexes, which encompass several small schools in one building with the small schools sharing the same administration; and (c) a school within school, which is a small school housed within a larger school. Overbay (2003) recommended creating the positive attributes of smaller schools within existing schools by redesigning the school and classroom cultures. Terms such as academies and houses have been noted by several researchers (e.g., Clark, Hager, & Nikolova, 2006; Cotton, 1996, 2001; DeJong & Locker, 2006; Duke & Trautvetter, 2001; Lee & Smith, 1997). Houses have a common curricular focus and team approach whereas academies might have a career orientation that offers students opportunities to build skills in a specialized area (DeJong & Locker, 2006; Duke & Trautvetter, 2001). Academic teaming has been another approach used in large schools where teams of teachers share a common group of students to provide a more connected and integrated curricular learning environment (The Office of Policy Planning and Research, 1999). Several of these organization patterns (i.e., houses, academies, teaming) have been offered as a way to make large schools seem smaller and more personal for students.

To address the various barriers identified in larger schools, Bill and Melinda Gates have funded over $284 million towards creating small schools within large schools in fast growing cities such as New York City and Chicago so that these growing urban areas can implement educational reform in existing school facilities (Gates Foundation, 2005). For example, Chicago Public Schools implemented a small schools initiative in 2001 and developed nine small schools from larger existing schools. Moreover, the leaders of the initiative have sought to open 30 more small schools (Gates Foundation, 2003). As planned, the new small high schools housed no more than 100 students per grade with a total student population limited to 400 students. The focus of the initiative was to combine the personalization of relationships characteristic of small learning environments and the breadth of course offerings existing in larger schools (Gates Foundation, 2003). A further example of implementation of small schools within large urban schools is the New York City Smalls Schools Initiative, which has graduated over 70% of its students for the second consecutive year (New York City Department of Education, 2007). The graduation rate of the 47 Small School Initiative Schools was 35% in 2002 before the new program was implemented. More than two thirds of students in the New York City Small School Initiative's graduation class entered these schools demonstrating academic performance below grade level. In excess of 90% of the students were Black or Hispanic, and 30 of the 47 small schools resided in buildings that were previously planned for closure (New York City Department of Education, 2007).

8 School Size and Student Achievement

Over the past 20 years, a small number of researchers have examined elementary school size and student achievement. A summary of these studies is shown in Table 1. National studies were located whose authors reported in five out of eight studies that students in smaller schools demonstrated higher student achievement (Abbott, Joireman, & Stroh, 2002; Alspaugh & Gao, 2003; Johnson, Howley, & Howley, 2002; Office of Policy Planning and Research, 1999; Plecki, 1991). One researcher reported larger schools had higher student achievement (Roeder, 2002) than did smaller schools. In addition, in two studies, the authors did not demonstrate statistically significant results at the elementary level (Howley, 1996a; Lamdin, 1995).

Kiesling (1967) analyzed achievement test data for elementary schools and compared that data to school size while controlling for socioeconomic status of the student population. Kiesling (1967) concluded that a negative relationship was present between elementary school size and student achievement. Almost 50 years later, the Office of Policy Planning and Research (1999) confirmed this finding. They observed a negative relationship with each additional 500 students added to the school in the area of math achievement at the elementary, middle, and secondary schools. Reading achievement demonstrated a negative relationship to larger school sizes only at the elementary level. The Office of Policy Planning and Research (1999) also

commented in their study that "elementary schools are more ethnically diverse than middle schools and high schools, and have over twice as many students with limited English proficiency" (p. 7). Friedkin and Necochea (1988) studied California student achievement from four different grade levels. They concluded that a smaller school size was advantageous to communities with a large representation of disadvantaged students whereas a larger school size was advantageous to schools serving students of a higher socioeconomic status.

Moreover, Alspaugh and Gao (2003) examined student achievement data of fifth-grade students in a large urban school district in Missouri. The study involved 39 elementary schools, which received the same allocation of funding, instructional materials, and curricular support. Variables analyzed were school size, percentage of disadvantaged students, and levels of performance demonstrated on student achievement assessments. Though socioeconomic status was held as a constant, Alspaugh and Gao (2003) revealed that small schools demonstrated an academic advantage over larger schools. New suburban areas tended to have larger schools whereas the smaller schools tended to be in the older urban school areas. As a result, this pattern was more marked in low-income schools compared to schools that were more affluent.

Clark, Hager, and Nikolova (2006) conducted a statistical analysis of achievement testing, attendance, dropout, and retention rates in Kentucky for school years 2001–2005. Elementary schools averaged 400 students and high schools averaged 800 students. Since 1987, Clark et al. noted a decrease in the number of schools in the smaller and larger categories at the elementary and high school grade configurations in Kentucky. At the same time, medium-sized schools, which have typically 400 to 599 students, were increasing in number.

Clark et al. (2006) noted that scores for elementary students were higher at the largest elementary schools but scores at the smallest and largest elementary schools were similar. Thus, the authors suggested that students at larger schools should be offered more diverse curricula choices. Moreover, administrators should consider organizing the school with instructional teams, schools within schools, and small groups within the larger school systems. One of the limitations of this type of study asserted by Clark et al. (2006) was that parents with high performing children might seek out larger schools that were perceived to be better at serving high performing students because of the more diverse curricular opportunities. Consequently, the researchers cautioned that these results might also demonstrate the choices families make so that they can ensure their children have the most successful academic experiences. Parents and students might seek out larger schools with an established reputation for high performing students and a wide range of curricular choices.

Researchers have identified some concerns with elementary school size studies. Alspaugh and Gao (2003) noted that less research has been conducted regarding the effect of school size on student achievement in elementary schools as compared to secondary schools. They also reported that researchers frequently group both elementary and secondary schools together in the same study and this practice skews the results for instructional levels due to the differences in instructional approaches and developmental levels of the students. Stevenson (2006) reviewed and analyzed the relationship of school size and student achievement. Among eight studies conducted in South Carolina, Stevenson (2006) surmised that the relationship of school size with student achievement was inconclusive. As such, school size appeared much more multi-faceted than the number of students enrolled. Issues such as the number of disadvantaged students and the community served might mask conclusions when analyzing student achievement data to determine an optimal school size. Additional studies were recommended to foster the understanding of the relationship of school size.

9 School Size, Ethnicity, and Student Achievement

Few studies in which the variables of elementary school size, student ethnicity, and student achievement were examined were located in the existing literature. Most of the researchers have focused such investigations at middle school or high school levels and with two particular ethnic groups: African American and Hispanic students.

9.1 African American Students

Johnson et al. (2002) examined the effects of race on student achievement, particularly with African American students. Johnson et al. divided all of the Arkansas schools into the top one fourth of schools that served the highest percentage of African American students and the lower three fourths of schools that served the lowest percentage of African American students. African American students overwhelmingly attended larger schools. This finding demonstrated that the relationship between poverty and school size was three times more powerful in schools that served the highest percentage of African American students compared to other schools. The authors recommended that policy makers and school administrators consider the student academic gains that might be available to larger schools and districts if these schools are divided into smaller schools and districts. Consequently, this recommendation is critical for larger schools that serve a high percentage of African American students. Johnson et al. (2002) noted a statistically significant relationship between small school size and student achievement for African American students. Further, African American students demonstrated higher academic success in schools that had smaller concentrations of economically disadvantaged students.

9.2 Hispanic Students

Slate and Jones (2007b) investigated the relationship between high school size and the academic achievement of Hispanic students in Texas. Data analyzed were TAKS scores in reading and math, end-of-course examinations, SAT I and ACT scores, percent of students who were coded as economically disadvantaged, attendance, dropout rates, and graduation rates for all Texas high schools. In this study, schools were defined in enrollment categories. Small schools were defined as schools that had 400–799 students, medium schools had 800–1,199 students, and large schools had 1,200 or more students enrolled. Slate and Jones (2007b) reported that Hispanic students in larger schools scored higher on the SAT I and ACT than did Hispanic students enrolled in smaller schools. On the other hand, Hispanic students in smaller schools were more likely to stay in school and graduate than students enrolled in larger schools. Their conclusion that small schools were better at connecting with students and keeping students in school confirmed prior research (e.g., Barker & Gump, 1964; Blum, 2005; Cotton, 2001; Howley & Bickel, 2000; Martin & Slate, 1998). Moreover, Slate and Jones (2007b) documented that students in small schools demonstrated higher achievement in reading and writing. Although end-of-course examination scores in algebra and U.S. History were higher in large schools, students in small schools scored higher in biology and English. Attendance rates and graduation rates were higher in small schools.

In another study, Gilmore (2007) examined middle school size and the academic performance of three ethnic groups. African American, Hispanic, and White middle school (Grades 6–8) students performed higher academically when they attended very large middle schools (Gilmore, 2007). In this study, very large middle schools were described as schools that enrolled more than 1,999 students. Gilmore (2007) affirmed other researchers' findings that larger-sized schools provided students an opportunity to experience more academic success than did smaller schools (Chavez, 2002; Raywid, 1999).

10 School Size, Gender, and Student Achievement

One study was located in which differences in boys' and girls' performance as a function of school size were examined. Specifically, Slate and Jones (2007a) investigated the relationship between high school size and the academic achievement of boys and girls in Texas. Data analyzed were Texas Assessment of Knowledge and Skills scores in reading and math, end-of-course examinations, SAT I and ACT scores, percent of students who were coded as economically disadvantaged, attendance, dropout rates, and graduation rates for all Texas high schools. As in the previous study, schools were defined in enrollment categories of small schools that had 400–799 students, medium schools with 800–1,199 students, and large schools with 1,200 or more students enrolled. No differences were noted between school size and gender for SAT I or ACT scores. Slate and Jones (2007a) cautioned that not all students take the SAT I or ACT examinations as they are preparatory assessments for college admissions and the assessments do not measure a specific set of curriculum that has

been provided to all students. Slate and Jones reported that both boys and girls in small schools performed better than did students from medium or large schools in the subject areas of reading, math, and writing. In addition, girls and boys from small schools demonstrated higher end-of-course scores in biology and English II than did students from medium or large schools. Moreover, in small schools, girls and boys demonstrated higher attendance and graduation rates than students enrolled in larger schools.

11 School Size, Socioeconomic Status, and Student Achievement

Socioeconomic status has received much attention as a variable in educational research (Sirin, 2005). Sirin (2005), in a recent meta-analysis of literature published between 1990 and 2000, reported that the family socioeconomic status for students had a relevant effect on the academic performance of students. At the school level, Sirin (2005) asserted that the relationship of socioeconomic status was more significant than it was at the individual student level. Furthermore, Sirin (2005) reported that when both characteristics were combined (i.e., the socioeconomic status of the family of each student and the socioeconomic status of the student population as a group), these two factors determined the type of school and educational environment in which the student had access. This educational opportunity, which was based on socioeconomic status, influenced the outcome of the student's academic success (Sirin, 2005).

Several researchers have examined the variable of socioeconomic status in relation to school size. Plecki (1991) analyzed assessment data for more than 4,000 Kindergarten through Grade 6 schools for the 1986–1987 school year. The results indicated that students had lower achievement when enrolled in larger schools that had higher percentages of students in poverty and larger numbers of students identified as LEP. Suburban schools demonstrated the highest academic achievement when serving the smallest percentage of economically disadvantaged students. In urban areas, economically disadvantaged students demonstrated a negative correlation to increased school size. Plecki (1991) noted the difference in school size and student achievement relating to geographic location including urban, suburban, and rural. She identified a need for more research to determine if students' needs in various geographic locations differed when these communities served substantially higher numbers of economically disadvantaged students compared to similar areas that served less economically disadvantaged students.

Lamdin (1995) studied elementary schools from a school district in Baltimore, Maryland, which included 97 schools that had comparable data. For the achievement assessment, Lamdin analyzed assessment scores from the California Achievement Test that was given to all students in Grades 1–5 in reading and math. Analyses considered were socioeconomic status of the students, expenditures per student, and teacher-to-student ratios. "The largest school is nearly eight times the size of the smallest. The greatest expenditure per pupil is more than twice the lowest. The greatest average class size is twice that of the lowest" (Lamdin, 1995, p. 4). These results confirmed previous studies that socioeconomic status is the most influential factor in predicting student success in achievement. A relationship was not present between school size and student achievement in this study.

Howley (1996a) replicated a research design using data from West Virginia. This design was used previously with data from California and Alaska. As noted in these other studies, Howley (1996a) confirmed that smaller schools were able to increase student achievement with disadvantaged students. Howley and Bickel (1999) performed four additional replications in Georgia, Ohio, Montana, and Texas to demonstrate a diverse representation of the educational opportunities and geographic environments of students throughout the United States. These replication studies utilized assessments developed by the state agency of each state and all schools within the state were included in the analyses. From this research, the term "equity effects" was defined as the ability of smaller schools to serve low socio-economic students more effectively as compared to larger schools (Howley & Bickel, 1999, p. 5). In other words, the effect of poverty on student success was diminished in the small school setting.

Howley et al. (2000) stated in a summary of school size research that a large amount of time and study has been directed at closing the achievement gap of disadvantaged students compared to advantaged students since the late 1960s but educational strategies studied have not demonstrated consistent results. The replicated studies throughout seven states demonstrated that the relationship between school size and

student achievement provided students in poverty an opportunity to experience educational success. Further research has affirmed the importance of a small school for disadvantaged students and for students who are at risk of academic failure (Friedkin & Necochea, 1988; Lee & Smith, 1993).

Johnson et al. (2002) studied achievement levels of students from Arkansas and the correlation to poverty and enrollment size of the schools and school districts. Achievement was measured using Stanford 9 assessment data for 3 school years for Grades 5, 7, and 9. The researchers looked at how the size of the school related to academic performance. Johnson et al. (2002) also analyzed the effect of poverty to determine if poverty had a greater impact on student achievement in smaller or larger schools. They concluded that the larger the school and the more disadvantaged the student population, the larger the negative impact school size had on student achievement. The authors also noted that as the school district size grew larger, economically disadvantaged students scored lower on achievement measures. Negative effects on student achievement were related to the larger school size and the effect of poverty on student achievement in larger schools demonstrated "pronounced" results for the highest 50% of economically disadvantaged students (Johnson et al., 2002, p. 8). "Small schools weaken poverty's power over student achievement and narrow the achievement gap between children from more affluent communities and those from less affluent communities" (Johnson et al., 2002, p. 9). Smaller schools that were within larger school districts demonstrated higher student achievement especially with disadvantaged students than did larger schools within larger school districts.

In another study, researchers analyzed achievement data of third-grade students compared to school size, teacher-to-student ratios, socioeconomic status of the student population, and the years of parental schooling (Wendling & Cohen, 1981). The researchers noted an average enrollment of 447 students for high performing elementary schools and an average enrollment of 776 students for low performing elementary schools. Controlling for the variable of socioeconomic status, the researchers found that larger school sizes had a negative outcome on the achievement level demonstrated by the students. Researchers confirmed the findings of previous researchers that smaller schools who served a majority of disadvantaged students seemed to perform at a higher level than did larger schools with similar student populations (Howley et al., 2000; Johnson, 2006).

The Washington School Research Center sponsored a research study focused on school size, district size, socioeconomic status of the student population, and achievement data for students in Grades 4 and 7 (Abbott et al., 2002). This study was a replication of a previous study by Howley and Bickel (1999) who analyzed Grades 8 and 11 students in Georgia. Confirming the results of Howley and Bickel (1999), Abbott et al. (2002) concluded that small schools provided low socioeconomic students with the best educational environment to experience academic success. "Small schools appear to have the greatest equity effects, while large districts are the most detrimental" (Abbott et al., 2002, p. 21).

On the contrary, Roeder (2002) suggested that school size did not demonstrate an effect on student achievement when analyzing achievement data from two of the largest school districts in Kentucky. The socioeconomic status of the student population seemed to have the most significant effect on student achievement in elementary schools (Roeder, 2002). Diaz (2008) examined the relationship between school district size, socioeconomic status, expenditures, and student achievement in Washington. School districts within the size range of 500–2,000 students were analyzed. The researchers defined socioeconomic status as the percentage of students in each district who were identified and participating in the free or reduced lunch program, which uses income eligibility criteria. Diaz (2008) did not report a statistically significant relationship between student achievement and school size whereas a statistically significant correlation was yielded between student achievement and socioeconomic status. Diaz concluded that there was "strong evidence that the socioeconomic status of the district was the predominant predictor of student performance" (2008, p. 37).

Caldas (1993) also suggested that school size did not have a meaningful effect on elementary or high school student outcomes. Further, Caldas (1993) reported urban communities might benefit from larger school size more so than other geographic community types such as rural areas. Carpenter (2006) studied elementary schools in South Carolina for the school year 2004–2005 to determine if a relationship was present between student achievement and school size. Through multiple regression analyses, he indicated

that socioeconomic status had a statistically significant relationship to student achievement whereas school size was not statistically significantly related with student socioeconomic status.

Some researchers (e.g., Carpenter, 2006; McCathern, 2004; Stevenson, 2001) have indicated that no evidence is present that suggests a relationship between school size and student achievement in elementary schools. For example, McCathern (2004) discovered that when socioeconomic status was controlled, a relationship was not present between school size and student achievement. Similar to other researchers (e.g., Sirin, 2005), McCathern confirmed a relationship between the socioeconomic status of students and student achievement. Socioeconomic status was reported to be the most significant predictor of student achievement among all of the factors that were analyzed.

12 Optimal Size

The ideal size of elementary schools has been an area of debate. Some researchers have tried to identify ideal sizes. For example, Eberts, Kehoe, and Stone (1984) studied 287 elementary schools' achievement scores and school climate indicators. School size had a negative significant effect on student achievement for schools with more than 800 elementary students. Lee and Loeb (2000) analyzed 264 elementary schools in Chicago and discovered that school size influenced student academic performance. They reported that teachers in smaller schools with less than 400 students were more likely to know individual students and develop a professional relationship with students to ensure each student performs at high levels.

A few researchers have offered specific numbers as ideal school sizes for elementary schools and these numbers are summarized in Table 2. Goodlad (1984) recommended that elementary schools enroll no more than 300 students and Sergiovanni (1993) asserted that school size should not exceed 300 students so that true relationships and a sense of community can be developed within the school environment. Raywid (1999) reviewed research related to school size and developed a definition of the maximum size for schools. She asserted that elementary schools should not exceed 350 students. Similarly, Fine and Somerville (1998) recommended a maximum of 350 elementary students.

Leithwood and Jantzi (2009) concluded in an analysis of 57 school size and student achievement studies that elementary schools serving a culturally diverse or majority disadvantaged student population should not enroll more than 300 students. The researchers also stated that elementary schools that serve a more balanced mix of students from advantaged and disadvantaged backgrounds should not have more than 500 students in attendance for the optimal school size. Goodlad (1984) concluded that the struggles of meeting the needs of a large student population will continue as schools get larger. "It is not impossible to have a good large school, it is simply more difficult" (Goodlad, 1984, p. 309).

13 The Question of School Size

Researchers have cautioned administrators, school boards, and policy makers against examining school size research and determining that all schools need to made smaller so that more students can experience academic achievement (Abbott et al., 2002; Howley et al., 2000). Slate and Jones (2005), after reviewing the available research literature, asserted that large-scale studies with randomization of students were not available. As such, educational stakeholders should interpret the findings with caution and with the understanding that findings might be confounded by other variables, which might not be easily measured in a causal investigation.

Although we have summarized the optimal elementary school sizes in Table 2, we would like to propose to readers that perhaps the question of, "What is the optimum school size?" is not the right question that should be asked. Rather, we contend that the question of school size should be considered within the content of student demographic characteristics and desired student outcomes. That is, "What is the optimum school size range for Hispanic students enrolled in elementary schools to perform well academically?" would be an example of a better question to address. Given the emphasis placed by the No Child Left Behind Act on holding schools accountable for subgroup performance, we believe that such analysis at subgroup levels for the issue of school size is warranted. It seems likely that optimal school size at the elementary level varies

by student demographic characteristic and y desired student outcomes. To date, however, researchers have not investigated the issue of school size through the lenses we have proposed.

After reviewing the existing studies, it appears that more studies are needed in which differences are examined between rural and urban communities and in which socioeconomic differences are controlled. Further, variables such as school climate, safety, and student discipline need more coverage. Finally, with the addition of schools-within-schools, more studies are needed at the elementary level to examine the extent to which the school connectedness theory applies to these settings.

In addition, we offer a few implications for practicing school administrators and school board members. Decisions about school size appear to be complex and involve a variety of factors such as costs, community support, and students with special educational needs. Because few researchers examined subgroups and contextual factors of schools and districts, we recommend caution with using the optimal school sizes shown in Table 2. Moreover, many school districts do not have the economic resources to achieve these optimal sizes for elementary students. Still, because the school connectedness theory appears to have empirical support, measures can be taken to replicate the benefits of smaller schools in larger school settings by creating smaller units within large schools.

14 Summary

For years, researchers have examined the issue of school size as it relates to student performance in terms of academic performance and/or social performance and to school finance issues in terms of economic efficiencies. The varied results of the studies reviewed in this article highlight the need to study school size and student achievement in schools, particularly in elementary schools where students begin the educational process. Because school enrollments will continue to increase in many communities in the next decade (e.g., Texas is projected to increase at more than twice the national rate), information is needed to plan for optimal learning environments (Office of Policy Planning and Research, 1999). "Consequently, education administrators and taxpayers will continue to be confronted with difficult decisions related to school resources" (Office of Policy Planning and Research, 1999, pp. 24-25). Therefore, urgency exists to conduct additional research concerning the sizes of schools.

15 References

Abbott, M. L., Joireman, J., & Stroh, H. R. (2002). *The influence of district size, school size and socioeconomic status on student achievement in Washington: A replication study using hierarchical linear modeling. Technical Report.* Lynnwood, WA: Seattle Pacific University. (ERIC Document Reproduction Service No. ED 470668)

Allen, R. (2002). Big schools: The way we are. *Educational Leadership, 59*(5), 36-41.

Alspaugh, J. W., & Gao, R. (2003). *School size as a factor in elementary school achievement.* Columbia, MO: University of Missouri. (ERIC Document Reproduction Service No. ED 475062)

Arnold, M. L. (2000). *Rural schools: Diverse needs call for flexible policies.* Aurora, CO: Mid-continent Research for Education and Learning. Retrieved from http://www.mcrel.org/PDF/PolicyBriefs/5993PI_PBRuralSchoo

Bard, J., Gardener, C., & Wieland, R. (2005). *Rural school consolidation report.* Prepared for the National Rural Education Association Executive Board. Norman, OK: University of Oklahoma. Retrieved from http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/29/90/32.pdf

Barker, R., & Gump, P. (1964). *Big school-small school: High school size and student behavior.* Palo Alto, CA: Stanford University Press.

Beeson, E., & Strange, M. (2000). *Why rural matters: The need for every state to take action on rural education.* Randolph, VT: Rural and Community Trust. (ERIC Document Reproduction Service No. ED 445847)

Berry, C. (2004). *School size and returns to education: Evidence from the consolidation movement, 1930-1970.* Palo Alto, CA: Hoover Institute Stanford University.

Bickel, R., Howley, C., Williams, T., & Glascock, C. (2001). High school size, achievement equity, and cost: Robust interaction effects and tentative results. *Education Policy Analysis Archives, 9*(40), 1-31.
Blum, R. (2005. *School connectedness: Improving the lives of students.* Baltimore, MD: Johns Hopkins Bloomberg School of Public Health.
Brown, S., Johnson, P., Doughty, D., Cecil, D., & Keck, L. (2005). *An analysis of construction of small schools vs. larger schools.* Augusta, ME: State Board of Education. Retrieved from http://www.state.me.us/education/
Caldas, S. J. (1993). Reexamination of input and process factor effects on public school achievement. *Journal of Educational Research, 86*, 206-214.
Carpenter, C. A. (2006). The relationship of public elementary school size, student achievement, and per pupil expenditures in South Carolina. (Doctoral dissertation, University of South Carolina, 2006).
Chakraborty, K., Basudeb, B., & Lewis, W. C. (2000). Economies of scale in public education: An econometric analysis. *Contemporary Economic Policy, 18*, 238-247.
Chavez, J. J. (2002). School size and academic performance of Texas secondary public school students. (Doctoral dissertation, University of Texas at El Paso, 2002). *Dissertation Abstracts International, 63*(04), 1196A.
Clark, M., Hager, G., & Nikolova, N. (2006). *Schools size and student outcomes in Kentucky's public schools.* Frankfort, KY: Kentucky Legislative Research Commission. Retrieved from http://www.lrc.ky.go/lrcpubs/RR3
Conant, J. B. (1959). *The American high school: A first report to interested citizens.* New York, NY: McGraw-Hill.
Cotton, K. (1996). *School size, school climate, and student performance.* School Improvement Research Series. Portland, OR: Northwest Regional Educational Laboratory. Retrieved from http://www.nwrel.org/scpd/sirs/10/
Cotton, K. (2001). *New small learning communities: Findings from recent literature.* Portland, OR: Northwest Regional Educational Laboratory. Retrieved from http://www3.scasd.org/small_schools/nlsc.pdf
DeJong, W. S., & Locker, F. (2006). When large is small. *American School Board Journal, 193*(10), 39-41.
Diaz, V. (2008). Relationships between district size, socioeconomics, expenditures, and student achievement in Washington. *The Rural Educator, 29*(3), 30-39.
Dodson, M. E., & Garrett, T. A. (2004). Inefficient education spending in public school districts: A case for consolidation. *Contemporary Economic Policy, 22*, 270-280.
Duke, D. L., & Trautvetter, S. (2001). Reducing the negative effects of large schools. *National Clearinghouse for Educational Facilities.* Retrieved from http://www.edfacilities.org/pubs/size.pdf
Eberts, R., Kehoe, E., & Stone, J. (1984). *The effects of school size on student outcomes.* Eugene, OR: Oregon University. (ERIC Document Reproduction Service No. ED 245382)
Ferris, J. S., & West, E. G. (2004). Economies of scale, school violence and the optimal size of schools. *Applied Economics, 36*, 1677-1684.
Fine, M., & Somerville, J. I. (1998). *Small schools. Big imaginations: A creative look at urban public schools.* Chicago, IL: Cross City Campaign for Urban School Reform.
Fox, W. F. (1981). Reviewing economies of size is education. *Journal of Education Finance, 6*, 273-296.
Friedkin, N. E., & Necochea, J. (1988). School system size and performance: A contingency perspective. *Educational Evaluation and Policy Analysis*, *10*, 237-249.
Gates Foundation. (2003). *Responding to the needs of others: Bill and Melinda Gates foundation.* Retrieved from http://www.gatesfoundation.org/nr/public/media/annualreports/annualreport03/HTML/education.html
Gates Foundation. (2005). *Management discussion and annual reports: Bill and Melinda Gates Foundation.* Retrieved from http://www.gatesfoundation.org/nr/public/media/annualreports/annualreport05/financials_m
Gilmore, K. L. (2007). The relationship between school size and student achievement in Texas middle schools. (Doctoral dissertation, Texas A& M University-Commerce, 2007).
Goodlad, J. (1984). *A place called school: Prospects for the future.* New York, NY: McGraw Hill.
Hampel, R. (2002). Historical perspectives on small schools. *Phi Delta Kappan*, *85*, 357-363.
Howley, C. (1996a). Compounding disadvantage: Consolidation and the effect of school and district size on student achievement in West Virginia. *Journal of Research in Rural Education*, *12*(1), 25-32.
Howley, C. (1996b). *Ongoing dilemmas of schools size: A short story.* ERIC Digest Charleston, WV:

Clearinghouse on Rural Education and Small Schools. (ERIC Document Reproduction Service No. 401089)
Howley, C. (2005, October). *Don't supersize me: The relationship of construction costs to school enrollment in the U.S.* Paper presented at the annual meeting of the International Society for Education Planning, Bologna, Italy. Retrieved from http://howleycb.googlepages.com/Asyetunpublishedmanuscripts
Howley, C., & Bickel, R. (1999*). The Matthew Project: National report.* ERIC Digest Randolph, VT: Rural Challenge Policy Program. (ERIC Document Reproduction Service No. 433174)
Howley, C., & Bickel, R. (2000). *When it comes to schooling . . . small works: School size, poverty, and student achievement.* Randolph, VT: Rural School and Community Trust. Retrieved from http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED447973
Howley, C., Strange, M., & Bickel, R. (2000). *Research about school size and school performance in impoverished communities.* Charleston, WV: The Education Resource Services. (ERIC Document Reproduction Service No. ED448968)
Imazeki, J. (2006). *Assessing the costs of K-12 education in California public schools.* San Diego, CA: San Diego State University Department of Economics. Retrieved from http://irepp.stanford.edu/documents/GDF/STU Imazeki/18-Imazeki(3-07).pdf
Johnson, J. D. (2006, March). *More doesn't mean better: Larger high schools and more courses do not boost student achievement in Iowa high schools.* Arlington, VA: Rural School and Community Trust. (ERIC Document Reproduction Service No. ED497981)
Johnson, J. D., Howley, C. B., & Howley, A. A. (2002). *Small works in Arkansas: How poverty and the size of schools and schools districts affect student achievement in Arkansas.* Washington, DC: Rural School and Community Trust.
Kannapel, P. J., & Clements, S. K. (2005). *Inside the black box of high-performing high-need schools.* Lexington, KY: The Prichard Committee for Academic Excellence. Retrieved from http://www.centerforcsri.org/index.p
Kennedy, J. (1914). *Rural life and the rural school.* New York, NY: American Book Company. (ERIC Document Reproduction Service No. ED392561)
Kiesling, H. J. (1967). Measuring a local government service: A study of school districts in New York state. *Review of Economics and Statistics*, *49*, 356-367.
Lamdin, D. J. (1995). Testing for the effect of school size on student achievement within a school district. *Education Economics, 3*(1), 139-155.
Lashway, L. (1999). *School size: Is small better?* Alexandria, VA: National Principals Resource Center. (ERIC Document Reproduction Service No. ED428434)
Lee, V. E., & Loeb, S. (2000). School size in Chicago elementary schools: Effects on teachers' attitudes and students' achievement. *American Educational Research Journal*, *37*, 3-31.
Lee, V. E., & Smith, J. B. (1993). *Effects of high school restructuring and size on gains in achievement and engagement for early secondary school students.* Madison, WI: Wisconsin Center for Education Research.
Lee, V. E., & Smith, J. B. (1997). High school size: Which works best, and for whom? *Educational Policy Analysis Archives, 19*, 205-227.
Leithwood, K., & Jantzi, D. (2009). A review of empirical evidence about school size effects: A policy perspective. *American Educational Research Journal*, *79*, 464-490.
Lindsay, P. (1982). The effect of high school size on student participation, satisfaction and attendance. *Educational Evaluation and Policy Analysis*, *4*(1), 57-65.
Martin, E. P., & Slate, J. R. (1998). Secondary school size and achievement in Georgia public schools. *Research in the Schools*, *5*(1), 18-26.
McCathern, D. (2004). The relationship between preK-5 and K-5 elementary school size and student achievement in grade 5 students on the MAT7 in South Carolina for the school years 1996-1997 and 1997-1998. (Doctoral dissertation, University of South Carolina, 2004). *Doctoral Abstracts International, 65*(04), 1257A.
Mitchell, S. (2000). Jack and the giant school. *The Journal of the New Rules Project, 2*(1), 12-18.
Monk, D. H., & Haller, E. (1993). Predictors of high school academic course offerings: The role of

school size. *American Educational Research Journal*, *30*, 3-21.
National Center for Education Statistics. (2006). *Indicators of school crime and safety: 2006: December.* Retrieved from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2007003
New York City Department of Education. (2007). *Chancellor Klein announces that preliminary June graduation rate of new small schools tops 70% for second consecutive year, even as many more new small schools graduated senior classes. Retrieved from http://schools.nyc.gov/Offices/mediarelations/NewsandSpeeches/2006-2007/20070629_small_school_grad.htm*
Office of Policy Planning and Research. (1999). *School size and class size in Texas public schools.* Austin, TX: Texas Education Agency Research and Evaluation Division. Retrieved from http://www.tea.state.tx.us/rese
Overbay, A. (2003). *School size: A review of the literature. Research watch.* Charleston, WV: The Education Resource Services. (ERIC Document Reproduction Service No. ED477129)
Plecki, M. (1991, April). *The relationship between elementary school size and student achievement.* Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL. (ERIC Document Reproduction Service No. ED396861)
Porter, M. E. (2008). The five competitive forces that shape strategy. *Harvard Business Review*, *86*, 79-93.
Raywid, M. A. (1999). *Current literature on small schools.* Charleston, WV: The Education Resource Services. (ERIC Document Reproduction Service No. ED425049)
Roeder, P. W. (2002). *Resisting the urge to merge: Does school size matter?* Lexington, KY: University of Kentucky. (ERIC Document Reproduction Service No. ED464793)
School Renaissance Institute. (2000). *Small schools yield big educational benefits.* Report. Madison, WI: The School Renaissance Institute. (ERIC Document Reproduction Service No. ED449467)
Sergiovanni, T. J. (1993, April). *Organizations or communities? Changing the metaphor changes the theory.* Paper presented at the annual meeting of the American Educational Research Association, Atlanta, GA.
Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of Educational Research, 75*, 417-453.
Slate, J. R., & Jones, C. H. (2005). Effects of school size: A review of the literature with recommendations. *Essays in Education, 13.* Retrieved from http://www.usca.edu/essays/vol132005/slate.pdf
Slate, J. R., & Jones, C. H. (2007a). Secondary school size and gender differences in the state of Texas. *Essays in Education, 23.* Retrieved from http://www.usca.edu/essays/vol232008/slate%20revised.pdf
Slate, J. R., & Jones, C. H. (2007b). Secondary school size and Hispanic student performance in Texas. *Essays in Education, 23.* Retrieved from http://www.usca.edu/essays/vol232008/slate2.pdf
Steifel, L., Berne, R., Iatarola, O., & Frucher, N. (2000). High school size: Effects on budgets and performance in New York City. *Educational Evaluation and Policy Analysis*, *22*(1), 27-39.
Stevenson, K. R. (2001). *The relationship of school facilities conditions to selected student academic outcomes: A study of South Carolina public schools.* Prepared for the South Carolina Education Oversight Committee. Retrieved from http://www.edfacilities.org/pubs/size_outcomes.pdf
Stevenson, K. R. (2006, April). *School size and its relationship to student outcomes and school climate: A review and analysis of eight South Carolina statewide studies.* Washington, DC: National Clearinghouse for Educational Facilities. Retrieved from http://www.edfacilities.org/pubs/size_outcomes.pdf
Streifel, J. S., Foldesy, G., & Holman, D. M. (1991). The financial effects of consolidation. *Journal of Research in Rural Education, 7*(2), 13-20.
United States Census Bureau. (2005). *Small area income and poverty estimates.* Retrieved from http://www.census.gov//did/www/saipe/county.html
Wendling, W., & Cohen, J. (1981). Education resources and student achievement: Good news for schools. *Journal of Education Finance*, *7*, 44-63.
Young, E., & Green, H. A. (2005). *School system consolidation.* Nashville, TN: Tennessee Department of Education. Retrieved from http://www.state.tn.us/tacir/PDF_FILES/Education/school%20consolidation

Table 1

Elementary School Size and Student Achievement Studies

Author	Location	Number of Schools	Dependent Variable	Student Achievement	Groups
Abbott, Joireman, & Stroh, 2002	Washington	1,035	Washington Assessment of Student Learning Math and Reading	Favors small schools	Along a continuum
Alspaugh & Gao, 2003	Large urban district, Missouri	39	Stanford 9 NCE Reading, Math, Language, Science, and Social Science	Favors small schools	Less than 200 200–299 300–399 400–499 500 or more
Johnson, Howley, & Howley, 2002	Arkansas	Not specified	Average Stanford 9 Scores and Average Benchmark Scores for Literacy and Math	Favors small schools	Along a continuum
Howley, 1996a	West Virginia	628	Comprehensive Test of Basic Skills	Not statistically significant	Along a continuum

Table 1 (cont.)

Author	Location	Number of Schools	Dependent Variable	Student Achievement	Groups
Lamdin, 1995	Baltimore, Maryland	97	California Test of Achievement Reading and Math	Not statistically significant	Along a continuum
Office of Policy Planning and Research, 1999	Texas	1,529	Texas Assessment of Academic Skills Reading, Math, Writing	Favors small schools	Under 300 300–599 600–899 900–1,999 2,000 and more
Plecki, 1991	California	4,337	California Assessment Program	Favors small schools	1–200 201–400 401–600 601–800 801 and more
Roeder, 2002	Two largest school districts in Kentucky	32	Accountability Index, CTBS/5, and Attendance Rate	Favors large schools	Along a continuum

Table 2

Optimal School Sizes for Elementary Schools

Optimal Size	Researchers
300 students (or less)	Goodland (1984)
	Sergiovanni (1993)
	Leithwood and Jantzi (2009), differentiated schools with high at risk populations
350 students (or less)	Fine and Somerville (1998)
	Raywid (1999)
500 students (or less)	Leithwood and Jantzi (2009), differentiated schools with few at risk populations