

Effects of School Size on Student Outcomes: A Brief Overview of Research

Prepared for Albemarle County Schools

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Overview

The purpose of this brief is to present research findings related to school size and its impact on student achievement and associated student factors. Arguments for larger schools can include increased variety of classes, greater specialization of teachers, lower costs, a more diverse student body, and greater opportunities for students to develop social relationships (Kuziemko, 2006; Ready, Lee, & Welner, 2004). For small schools, benefits consist of ease in developing student to student relationships, staff familiarity with each other and the students, teachers accepting more responsibility for student learning, a stronger sense of community, and encouragement of better teaching; all of which indirectly impact student achievement and affect (Leithwood & Jantzi, 2009).

A few notes on this brief:

- Although achievement is the primary focus of research on the impacts of school size, there are several additional factors that emerged from several studies (i.e. teacher efficacy, attendance, bullying, etc.). These factors are included below.
- All research cited appeared in peer reviewed journals, or edited manuscripts and book chapters.
- High school research is included in a separate category and might help provide a more robust picture of the relationship between school size and student outcomes. High school findings, however, cannot be generalized to other school levels.

Summary of Research Findings

The following main points were derived from this research:

- There is not a consistent definition of a “small” school. Without this distinction it is hard to predict the impact of consolidation on student outcomes. For the research presented, the exact definition of “small” has been provided, when available, for added clarity.
- The research is mixed as to whether smaller schools are associated with higher levels of student achievement because different levels of “small” are found to be statistically significant throughout the research. For instance, one study finds that elementary schools of around 760 students are the ideal size for student achievement. Other numbers cited range from 400 in elementary schools up to 1000 students for high schools. There also are potential diminishing returns to school size on student achievement, as very small schools might have little to no impact on student success (as opposed to medium-sized schools, reflecting a curvilinear relationship between school size and student achievement).
- In addition to achievement, smaller schools appear to be associated with higher attendance, greater student engagement and more positive teacher attitudes. Conversely, there is also research to suggest that there are higher instances of bullying in smaller schools.
- Most of the research focuses on math and reading scores, with little attention given to other content areas (i.e. social studies, science, etc.).

Effects of School Size on Achievement

Elementary

1) The majority of research on the impact of elementary school size on student achievement finds an *inverse* or *non-linear* relationship.

- A 1984 study examined the impact of school size on individual student achievement in math and found an inverse relationship (Eberts, Kehoe, & Stone, 1984). Results indicate that the greatest negative impact on student performance occurred when moving from medium (400-600 students) to larger (over 800 students) elementary schools. There was little impact on performance when moving between small (under 200) and medium (400-600) elementary schools.
- Another study used least squares estimates to approximate that the optimal size for student achievement in elementary schools is 760 students (Borland & Howsen). Said differently, the authors find that school size has a nonlinear relationship with respect to student success on a mean total battery score of reading, language, and mathematics assessments. Up to 760 students they saw increases in student achievement, which then decreased after this threshold.
- A second study of Nevada public schools examined school size as one of several factors that might affect student achievement (Archibald, 2006). School size was shown to have a significant, negative relationship with student achievement, defined as scores on the Terra Nova Nevada state test. Statistical significance exists for both reading ($p < .05$) and mathematics ($p < .07$) in grades three through six. This study does not quantify “small” school, only indicating that that size is negatively associated with student achievement.
- Kuziemko (2006) used a two-stage-least-squares estimation to determine the relationship between school size and achievement, as well as attendance. Results from this study corroborate the negative relationship between school size, and math scores and attendance rates. Larger schools were shown to be associated with lower student achievement and lower levels of pupil attendance. Although no specific quantity of “small” or “large” is provided, the author suggests that, within reason, smaller schools will produce higher achievement and attendance. The author also acknowledges that “unreasonably low” school sizes are not financially realistic.
- Bickel and Howley (2000) use data from the 8th grade Iowa Test of Basic Skills to suggest that Georgia school districts should limit grade-level sizes to an upper limit of 250 students per grade for high schools, and 100 students per grade for elementary schools.
- Lee and Loeb (2000) examined test and survey data from teachers and sixth and eighth-grade students in 264 K-8 Chicago schools. Hierarchical linear modeling revealed that small schools (less than 400 students) had higher math achievement scores compared to medium or larger schools. In addition, teachers in smaller schools reported more positive attitudes toward teaching.
- Based on 6th and 11th grade data from the Office of Public Instruction in the state of Montana, a 1985 study found general trends (although not universal to all variables tested) that smaller elementary and high schools were more likely to be

stronger in areas of communication skills, consumer mathematics, critical thinking, lifelong learning, and consumer knowledge and attitudes (Edington & Gardener, 1985). In this particular study, “smaller” was not quantified, but the authors note that the state of Montana generally has smaller elementary and high schools relative to most other states.

2) Three additional studies discovered no effects on achievement as student population was increased.

- One study by Sadoski and Willson (2006) showed that gains on Colorado state reading assessments (CSAP) could not be attributed to elementary or middle school size. It should be noted, however, that the purpose of this article was to test the impact of a particular reading intervention and not specifically to examine the issue of school size on achievement. This study also excluded data from schools with less than 15 students per grade, which might have impacted the results.
- Caldas (1993) examined Louisiana testing data from grades 3, 5, 7, 10, and 11 in language arts, mathematics, written composition, science, and social studies. He found no meaningful relationship between school size and student achievement. However, in urban areas there was a stronger, negative relationship between school size, attendance rates and student achievement compared to non-urban areas.
- Self (2001) studied an Ohio school district and found that students in high school benefit more from consolidation than elementary or middle school students. Major benefits for secondary students are additional course offerings as well as added extra curricular activities.

3) Other Findings on Achievement

- Schreiber (2002) examined the Third International Mathematics and Science Study and discovered that school size and school resources were significantly, positively associated with school-level achievement in advanced mathematics. The focus of this study was on high achieving U.S. students in advanced math classes.

Secondary

1) In general, studies of secondary schools and students corroborated findings from elementary studies. Most of this research also reveals an *inverse* or *non-linear* relationship between school size and student achievement.

- A study by Lee and Smith (1997) used National Educational Longitudinal Study (NELS) reading and mathematics data from 1988 to answer three questions: (1) which size high school is most effective for students' learning; (2) which size is most equitable; and (3) whether the effects of school size are consistent across high schools defined by their social compositions. Results indicate that the ideal high school size for student achievement is between 600-900 students. In particular, large schools over 2,100 students have considerably lower levels of achievement than much smaller schools. In addition, the authors found that students from smaller schools were more engaged with school than pupils in

larger schools. One last important finding is that enrollment size has a stronger effect on achievement in schools with higher percentages of lower-SES and minority students. This echoes similar findings from a study by the same authors two years earlier (Lee and Smith, 1995). Results from the 1995 study indicated that gains in achievement, as well as greater and more socially equitable engagement, were associated with smaller high schools.

- Another secondary study used Educational Longitudinal Study (ELS) data to determine the effects of school size on math achievement and dropout rates. Data from this study once again favors smaller schools. There is a positive relationship between drop-out rates and school size. There is, however, a curvilinear relationship with respect to math scores. Those students attending very small (< 674) or very large (> 2592) schools show the largest gains compared to the students in between who showed smaller gains (Werblow & Duesbery, 2009).
- A 2000 study used hierarchical linear modeling and NELS data for both reading and mathematics to investigate the relationship between school size and achievement (Lee, 2000). For all students, the author found that the optimal high school size for learning in math and reading is between 600-900 students. In addition, results show that high school size is more important for students from lower socio-economic backgrounds than their more affluent counterparts.

Effects of School Size on Bullying and Social Interactions

- In reference to bullying, one study in particular discovered that smaller schools are often positively associated with bullies (Ma, 2001). The author notes that this finding could be a result of bullying being done in private and not in front of a crowd of people. Because there are more opportunities for privacy in smaller schools, this could lead to higher instances of bullying than in larger schools.
- There is research to suggest that social interactions are generally more positive in smaller high schools (Lee, Bryk, & Smith, 1993).

Effects of School Size on Dropout Rates

- Asplough (1998) examined K-12 enrollment in 447 Missouri school districts and discovered that school size is a significant, positive factor in school dropout rates.
- Another study used NELS data from 1988 to examine the impact of high school size on urban and suburban dropout rates (Lee & Burkam, 2003). The researchers discovered that students enrolled in high schools of fewer than 1,500 students more often stay in school than those in larger schools.

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