



Reducing Class Size In School: How Effective Are Smaller Classes And Other Policy Considerations

Special Report

University of Pittsburgh Office of Child Development

Serving Children and Families By Promoting

Interdisciplinary Education and Research • University-Community Programs • Dissemination

When educators and policymakers debate ways to improve student achievement in school, reducing class size is often at the top of their list. Is reducing class size effective? A growing body of research-based evidence suggests that it is, particularly during the critical early grades.

Not all questions regarding the effectiveness of reducing class size have been answered. There is, for example, the lack of a theoretical understanding of how class size affects student performance, and some studies report little or no meaningful change, particularly studies that involve smaller samples and rely on non-experimental design.

The most scientifically-rigorous studies, however, report that children benefit when class sizes are reduced. Benefits, in some cases, have been immediate and long lasting. Perhaps the most noteworthy example of such outcomes is Project STAR in Tennessee, one of the largest class size experiments in the nation and one of the most thoroughly investigated.

Nearly every state has at one time considered legislation to help schools reduce class size. More than 20 states have adopted such legislation. Federal legislation was passed in 1999 to help local schools hire 100,000 qualified teachers over seven years to reduce class size in grades 1-3 to a national average of 18 students per class. In Pennsylvania, three bills pending in the state House and Senate offer certain school districts incentives to reduce class size.

Effectiveness Of Reducing Class Size

Many different approaches have been taken to studying the impact of reducing the size of classes in schools. Most studies are of non-experimental design. Recently, however, a number of more carefully controlled experimental studies have looked at reducing class size and offer more reliable data on the effectiveness of such policies.

Analyses Of Existing Studies

Several analyses of smaller class sizes have been done using a variety of methods to draw conclusions through reviews of already existing research. Major analyses report a range of findings. For example:

- A 1978 *meta-analysis* combined the findings of 77 empirical studies on class size and achievement. A sec-

ond analysis looked at the relationship between class size and other outcomes. The analyses reported that small classes are associated with higher achievement at all grade levels, especially when students are in small classes for more than 100 hours, and when student assignment is carefully controlled. Major benefits were seen in classes with fewer than 20 students. The second study also found better student reactions, teacher morale, and quality of the instructional environment in smaller classes.¹

- A 1986 review of 100 class size studies reported that the clearest evidence that smaller classes benefit children is found in the primary grades. It also reported that smaller classes particularly benefit disadvantaged and minority students, and that benefits are influenced by whether or not teachers adjust teaching methods and classroom procedures to the smaller classes. The review grouped similar kinds of research studies, such as studies of the same grade level, subject area, or student characteristics.²

- Small gains among students were noted in a 1989 study that analyzed empirical studies that met three criteria: a study was included only if class size had been reduced for at least a year, classes of fewer than 20 students were compared to substantially larger classes, and students in the larger and smaller classes were comparable. The reported gains, however, did not last beyond the children's' small-class experience.³

- Smaller classes were not found to have an appreciable effect on student performance in a research analysis that examined trend data from the 1950s to 1986. No consistent relationship between class size and standardized test scores was reported. The review combined students from all grade levels and relied on student/teacher ratios to measure class size, rather than actual class sizes.⁴

Several limitations of the analytic approach to assessing the impact of class size are serious enough to warrant caution when considering the findings of the studies. These shortcomings include a reliance on student/teacher ratios as a measure for class size rather than actual class size; grouping the data for all grade levels together; and using data that represent student achievement at the school level or school district average scores, rather than the scores of individual

students placed in larger or smaller classes.⁵

Recent experimental studies of class size offer findings drawn from more rigorous approach in which attention is paid to the specific experiences and outcomes of children in smaller classes. The largest class size reduction experiment, Tennessee's *Project STAR* (Student-Teacher Achievement Ratio), and two associated data collections, have made important contributions to the quality of research evidence concerning the influence smaller classes has on children.

Project STAR

In Project STAR, students in the smaller classes were found to outperform students in larger classes, regardless of whether or not the teachers in larger classes had aides to help them. Later studies suggest these gains were long-lasting.

Project STAR began in 1985 as a four-year longitudinal study of kindergarten, first-, second-, and third-grade classrooms in Tennessee. Classes of 13-17 students were compared with classes of 22-26 students, both with and without an additional instructional aide in the larger classes. Teachers did not receive any training related to teaching in smaller classes.

The study's findings are considered particularly important because unlike most class size studies, Project STAR embraced the essential features of a controlled research experiment designed to produce reliable evidence about the effects of intervention.

For example, the study was large in terms of schools studied: 79 schools, more than 300 classrooms, and 7,000 students. Students were studied through four years. Teachers and students were randomly assigned to the three different kinds of classes. Steps were taken to eliminate possible influences from variations in the quality of the participating schools that might affect the quality of the classroom activity.

Several gains among students who attended the smaller classes in their early grades were reported.⁶

- Smaller class students substantially outperformed larger class students on Stanford Achievement Tests and the curriculum-based Basic Skills First test – regardless of their race or whether they were from urban, suburban, or rural schools.

- The positive achievement effect of smaller classes on minority students was double that for majority students initially, and later was about the same.

- A smaller proportion of students in the smaller classes was retained in-grade, and there was more early identification of students' special educational needs.

- There were no significant differences in academic

achievement for students in the larger classes with or without an additional instructional aide.

Children in smaller classes during the early grades continued to do well after they returned to normal-sized classes, according to the follow-up study, *Lasting Benefits*. In fourth grade, for example, students from the smaller classes still outperformed the students from the larger classes in all academic subjects. They were better behaved and, at least through eighth grade, performed at a higher academic level.⁷

Smaller classes in the early grades are also associated with increased likelihood that children will aspire to enroll in a college or university after high school. A follow-up analysis of Project STAR students reported that for high school seniors, nearly 44% of those who had been assigned smaller classes in the early grades took either the SAT or ACT exam, compared to 40% of those who had been assigned a regular class. Among African-American students, the likelihood of them taking the test increased 25%, from 31.7% to 40.2%. The gap between white and African-American students who take the exams was 54% smaller among students assigned to smaller classes.⁸

In 1990, Tennessee began Project Challenge, which offered smaller classes to kindergarten through third grade students in 16 school districts with the lowest family income levels and highest numbers of children who qualified for the federal free and reduced price lunch program. Three years later, the schools moved up in rankings based on statewide achievement test scores. In reading, for Project Challenge districts improved from 99th out of the state's 138 districts to 78th in the state. In math, Project Challenge districts improved from 85th in the state to 57th.⁹

Wisconsin's SAGE Program

Other large class size experiments report similar outcomes.

In Wisconsin, the goal of Student Achievement Guarantee in Education (SAGE) program is to have student/teacher ratios no greater than 15 to 1 in kindergarten, first grade, and second grade classes. The state began phasing in the smaller classes in 1996-1997 school year and studied the outcomes, comparing students in the smaller classes to similar students in existing classrooms. A second-year evaluation reported several gains among children in the smaller classes.¹⁰

- First-grade students in the smaller classes performed consistently better than comparison students in mathematics, reading, language arts, and total scores for the Comprehensive Test of Basic Skills.

- The achievement gap narrowed between white and African-American first-grade students who were in the

smaller classes. The gap widened among white and African-American first-grade students who were in the larger classes.

In second grade, academic achievement among students in smaller classes remained higher than that of students in larger classes. However, the difference did not increase substantially.

Although several of the findings are consistent with those seen in Project STAR, at least one important difference separates the two programs. Unlike Project STAR, class size reductions in SAGE were implemented with other changes, including use of a rigorous academic curriculum, before- and after-school activities for students, and professional development for teachers. The second-year evaluation, however, suggests such components have not had an impact on student achievement.

Policy Implications

In 1999, federal legislation provided U.S. public schools with more than \$1.2 billion a year for programs that reduced class size in certain schools. After the first year, the Department of Education reported some 1.7 million children in the early grades receive instruction in smaller, more personalized classes; 90,000 teachers were teaching more manageably-sized classes; 23,000 schools – about one-third of the nation's elementary schools – had hired one or more new teachers; and 15,000 school districts had improved their recruiting and hiring of teachers, or had provided professional development to help teachers maximize the benefits of smaller classes.¹¹

Nearly two decades of classroom experience and a growing body of research offer educators and policymakers some guidance when considering programs that seek to reduce class size as a way to improve the performance of students.

Which Grade To Target?

Most studies that report benefits from reducing class size suggest that small classes in the critical early grades, particularly kindergarten through third grade, lead to higher student achievement. In fact, many experiments, including Tennessee's Project STAR, focus on those early grades and have shown immediate improvement in student outcomes in addition to long-last benefits.

Researchers are more cautious about whether significant positive reducing class size in later grades yield significant improvements in student performance.

How Small Is Small Enough?

Studies suggest that the most successful experiments are those that drop class size below a certain threshold. No "magic number" is prescribed. However, research indicates that class size must at least be lowered to fewer than 20 students if improvements are to be seen. Reducing class

size from 30 to 25, for example, will likely produce little or no improvement. In Project STAR, students in classes with fewer than 18 students did better than students in larger classes.

Lower students-to-teacher ratios do not always result in smaller classes. Some initiatives, for example, allow officials to include other education staff other than teachers when calculating the ratio, such as resource teachers in special education, music, and physical education. In such cases, class size may not actually be reduced. In Project STAR, for example, larger classes with instructional aides did *not* produce the same benefits as the smaller classes.

Reducing class size across the board may not be necessary to improve student achievement. It may, for example, be more important and less costly to reduce the size of reading classes and not physical education classes. Studies also suggest that certain student populations, such as minority and disadvantaged students, benefit most from smaller classes.

Cost Of Smaller Classes

The cost of reducing class size varies widely and is influenced by a number of factors. An analysis of a simulation of class size reduction in seven Florida school districts offers a "rule of thumb" estimate of the costs involved. At a classroom cost of \$53,000, the per student cost for reducing class size from 24 to 20 students is \$435. The cost doubles when the class enrollment is dropped to 17 and triples when the class size is reduced from 24 to 15 students.

Studies suggest some reimbursement strategies are less efficient than others. In California, for example, schools received a flat per student reimbursement, regardless of the effort and expense required to reduce class sizes. For some, it was a financial boon. For others, it was a financial strain. Districts that already had relatively small classes were reimbursed \$650 per student when their actual costs were minimal. Other districts with large class sizes and fewer resources to accommodate more classrooms received the same \$650 per student reimbursement, but spent closer to \$1,000 per student to reduce class sizes.¹²

Impact On Teacher Supply

The availability of teachers, particularly quality teachers, may be affected when class size is reduced. Some states already face serious shortages of teachers. Pennsylvania has no shortage of teachers overall, but is experiencing spot shortages – a need for teachers of certain subjects, such as the sciences and higher mathematics; some rural and urban school districts struggle to find qualified teachers for open positions; minority teachers are underrepresented in public school classrooms.¹³

How class size policies will affect teacher supply over

the long term is unclear. If the supply of teachers remains the same, class size policies could exacerbate existing shortages by requiring more classes and a demand for additional teachers. Such circumstances could result in the hiring of less qualified teachers to meet the demand. In California, the quick implementation of class reduction policies led to the rapid addition of more than 29,000 teachers in three years, and a decline in the overall experience, education, and credential level of teachers in grades K–3. Even with such difficulties, the California program resulted in small gains in student performance.

Over the longer term, however, smaller classes might not diminish the quality of teachers or further weaken supply. Many teachers who now leave the classroom after only a few years to pursue other professions may find teaching in smaller classes more personally rewarding and stay in the schools longer.

Demand For Student Improvement

The most rigorous studies show that reducing class size is an educational reform that can result in improved student performance and long-lasting benefits, although some of the gains are small. Low-income and minority students tend to benefit the most and smaller classes have had their greatest impact on student achievement when implemented in the early grades.

Although the costs can be high, reducing class size is likely a policy that will continue to attract attention as school districts across the nation work to comply with the federal No Child Left Behind legislation, which requires districts to improve student performance in graduated steps. “School districts are going to be compelled to do some things they had not considered necessary to do in the past,” said Ronald R. Cowell, President of The Education Policy and Leadership Center in Harrisburg, PA. “If school officials are faced with a significant learning gap with low-income children being at the bottom of that gap, and the research says those children can make significant improvement in school achievement in smaller classes, particularly in the early grades, I think school officials will look at that very seriously. In some instances, they will be desperately searching for something that works.”

References

Pritchard, I. *Reducing Class Size: What Do We Know?* National Institute on Student Achievement, Curriculum and Assessment. U.S. Department of Education, Office of Educational Research and Improvement.

March 1999. Jessup, MD: U.S. Department of Education. Reichardt, R. (2000). *The Cost of Class Size Reduction: Advice for Policy Makers*, RGSD-156. Santa Monica, CA: RAND.

This Special Report, written by Jeffery Fraser, is largely based on the above-referenced publications. It is not intended to be an original work, but a summary for the convenience of our readers. References noted in the text follow:

¹Glass, G.V., Cahen, L.S., Smith, M.L., & Filby, N.N. (1982). *School class size: Research and policy*. Beverly Hills, CA: Sage.

²Robinson, G.E., & J. H. Wittebols. (1986). *Class size research: A related cluster analysis for decision-making*. Arlington, VA: Education Research Service.

³Finn, J.D. (1998). *Class size and students at risk: What is known? What is next?* Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement, National Institute on the Education of At-Risk Students.

⁴Achilles, C.M. (1996). Students achieve more in smaller classes. *Educational Leadership*, **53** (5): 76-77.

⁵Finn, op. cit.

⁶Achilles, C.M., Nye, Zaharias, J.B., Fulton, B.D., & Cain, C. (1996). Education's Equivalent of Medicine's Framingham Heart Study. Washington, DC: ERIC Clearinghouse. ED 402677. See also Mosteller, F. (1995). The Tennessee study of class size in the early school grades. *The Future of Children* **5** (2): 113-127.

⁷Nye, B. A., Fulton, B.D., Zaharias, J.B., & Cain, V.A. (1995). *The Lasting Benefits Study, Eighth Grade Technical Report*. Nashville, TN: Center of Excellence for Research in Basic Skills, Tennessee State University.

⁸Krueger, A.B., & Whitmore, D.M. (2001). The effect of attending a small class in the early grades on college-test taking and middle school test results: Evidence from Project STAR. *The Economic Journal*, **111** (January), 1-28. Royal Economic Society.

⁹Finn, op. cit.

¹⁰Molnar, A., Percy, S., Smith, P., & Zahorik, J. (1998). *1997-98 Results of the Student Achievement Guarantee in Education (SAGE) Program*. Milwaukee, WI: University of Wisconsin-Milwaukee.

¹¹Cohen, G., Miller, C., Stonehill, R., & Geddes, C. *The Class Size Reduction Program: Boosting Achievement in Schools Across The Nation. A First-Year Report. (September 2000)*. Jessup, MD: U.S. Department Education.

¹²Hill, E.G., Policy Brief, *Class Size Reduction*. (February 12, 1997). Sacramento, CA: California Legislative Analyst's Office, http://www.lao.ca.gov/class_size_297.html

¹³Head of the Class: A Quality Teacher In Every Pennsylvania Classroom, *The Education Policy and Leadership Center Teacher Quality and Supply Project*. Harrisburg, PA: The Education Policy and Leadership Center. 2003. (Available online at www.eplc.org/teacherquality.html).

University of Pittsburgh Office of Child Development, a program of the School of Education, 400 N. Lexington Ave., Pittsburgh, PA 15208 (412) 244-5421

Internet: www.pitt.edu/~ocdweb/