

Class Size and Student Learning - Class-Size Research (1978–2002), Translating Class-Size Research to Practice

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The class unit is the basic unit of organization for instruction; therefore class-size information should be foundational knowledge for educators. Yet between the first edition of the *Encyclopedia of Education* in 1971 (see John Reiser's entry on class size, pp. 157–160) and its second edition in 2002, understanding of class size and its actual use have arguably seen both the greatest and the least change among the fundamentals of education.

Class size and pupil-teacher ratio (PTR) are defined, computed, conceptualized, and used differently. Class size, the number of students in a class for whom the teacher is responsible and accountable, is determined by addition. A PTR is derived by dividing the number of students at a site, such as a school, by some representation of educators (e.g., teachers, administrators, specialists) serving that site. In a classroom with 30 students and one teacher, the class size is 30 and the PTR is 30:1. If two teachers serve those 30 students, the class size is 30, but the PTR is 15:1. Class size and PTR have changed much in thirty years but the terms are still used imprecisely as synonyms in research, critiques, policy, and in practice. Yet the distinctly different concepts provide far different outcomes.

Changes in the delivery of education initiated by the 1965 Elementary and Secondary Education Act (ESEA, or Pub. L. 89-10) influenced PTR greatly and class size only minimally. Among other things, ESEA targeted categorical funds to special audiences, such as students at risk of school failure. Title I teachers and aides (named after ESEA's major initiative) provided special services such as reading remediation in pull-out programs where students left regular classrooms for small-group instruction. Later legislation (e.g., the Education of the Handicapped Act, Pub. L. 94-142 [1975] and its extensions [the Individuals with Disabilities Education Act or IDEA] in 1990 and 1997) followed similar formats. According to the U.S. Department of Education's statistics for 1999, the spate of special teachers changed the overall kindergarten to grade 12 (K-12) PTR from 24.7 (1965) to 16.8 (1999). This change is readily seen in elementary grades (the area of most class-size research), where the average PTR decreased from 27.6 in 1965 to 18.6 in 1999.

Class-Size Research (1978–2002)

Interest in class size blossomed in the late 1970s. Gene Glass and Mary Lee Smith consolidated prior years of class-size research using meta-analysis to calculate the effects of many studies and pool the results. Indiana's statewide Prime Time project (1981) initially reduced class size in grades 1 and 2, and later expanded to include reductions in kindergarten and grade 3 reductions that could involve teacher aides, a PTR intervention. Texas passed House Bill (H.B.) 72 in 1984 to limit class size in grades K-2 to 22 and added grades 3 and 4 and a 20 student limit in 1986. The reasons for reducing class sizes include providing better instruction, more individual attention to students, and accommodating the growing diversity in public schooling.

In Tennessee, Project STAR (Student Teacher Achievement Ratio) was a statewide, large-scale longitudinal (1985–1989) experiment of small-class effects on the achievement and development of pupils in grades K–3. STAR expanded into the Lasting Benefits Study, Project Challenge, the Enduring Effects Study, and STAR Follow-up Studies to track students through the grades. By 2001, analyses had been conducted on STAR students who graduated from high school in 1998, including college admissions test results analyzed by the size of the K–3 class that the students had attended.

STAR involved 11,600 students and 340 teachers in 79 schools. Students were assigned at random to small classes (13–17 students), regular classes (approximately 22–25 students), and regular classes with a full-time teacher aide. The in-school design whereby each participating school had at least one of all three class types ruled out school-level variables. Random

replacements for students who moved or were retained in grade maintained the cohorts in grades K–3. Grade-appropriate teachers were randomly assigned each year. Data were collected on pupil cognitive (e.g., test scores) and noncognitive (e.g., behavior, participation, attendance, self-concept) measures and teachers and aides were interviewed each year. Each year the small-class students exceeded the large-class students on all cognitive and most noncognitive measures. Gains were cumulative and were especially strong for students who had spent more years in small classes. Frederick Mosteller concluded: "The Tennessee class size project, a controlled experiment ... is one of the most important educational investigations ever carried out." (p. 113).

Wisconsin began SAGE (Student Achievement Guarantee in Education) primarily in urban areas in 1996. SAGE later expanded to any district that met eligibility criteria. As in the early Glass and Smith works, Prime Time, and STAR results, SAGE evaluators found both cognitive and noncognitive gains. Like STAR, SAGE began in kindergarten and proceeded one grade per year, phasing in small classes, and results were similar. Compared to students in larger classes, small-class students achieved higher test scores and better behavior and discipline, and teachers felt that they were more effective and able to provide more individual attention. Minority and difficult-to-teach youngsters received greater benefits than did other students, echoing reviews of classsize research such as Harold Wenglinsky's 1997 findings that "fourth graders in smaller-than-average classes are about half a year ahead of fourth graders in larger-than average classes.... The largest effects seem to be for poor students in high-cost areas" (pp. 24–25).

In 1996 California began a massive voluntary class-size reduction (CSR) in grades 1 through 3 that included incentives to participate. Brian Stecher et al. (2001) found unanticipated consequences, including large-scale movement from poor and urban districts of certified teachers who were replaced by new, uncertified, or emergency-credentialed teachers. Modest student gains did not include the differential benefits for minority students found in other class-size studies. It remains to be seen if teacher mobility influenced this.

TABLE 1

Translating Class-Size Research to Practice

Many class-size studies collectively told educators much about schooling and identified that there were right ways to use small classes. On tests given in grades 3 and higher, studies showed that one year (grade 3) in a small class, and even two years (grades 2 and 3) yielded negligible test-score gains. For short-term and long-term results, students had to start small classes when they entered school (kindergarten or grade one). The treatment had to be intense (all day, every day) and for sufficient duration (at least three and preferably four years). Small classes are more preventive than remedial, as they help teach young students what is expected in schooling. By 2001 researchers had identified some two dozen research-and theory-based reasons why small classes provide superior student opportunities and outcomes (see Table 1).

The longer a student has small classes the better the outcomes, not just while in small classes, but through high school and beyond. Small-class K–3 students gained about a year's growth in all subjects tested over randomly assigned peers in larger classes. Small-class students had significantly higher graduation rates, lower retention in grade, and higher percentage of honors diplomas. Early small-class attendance reduced the college admissions test-taking gap between white and minority students significantly. In contrast classes with teacher aides (which reduced PTR but not class size) were particularly ineffective for minority male students, a finding that helps explain the mixed outcomes in Prime Time after aides were allowed as a small-class alternative.

Consideration of Critical Comments about Class Size

Small-class critics typically build on the comments of Eric Hanushek, whose work is typical of production function studies that use large, nonspecific databases not established for or from class-size research. Hanushek made two points: First, "pupil teacher ratios are not the same as class sizes," and second "the only data ... available over long periods refer to teacher-pupil ratios" (p. 145). Thus, Hanushek's criticisms rely on PTR estimates and not on class-size work. His comments that small

classes do not yield better student outcomes simply ignore class-size research findings such as early intervention, intensity, and duration. He also excluded Project STAR's results. Scholars criticized Hanushek's vote-counting methods and actually reanalyzed his data, obtaining different results. For example Rob Greenwald, Richard Lane, and Larry Hedges (1996) and Alan Krueger (2000) found that careful treatment of Hanushek's data and excluding "double counting" actually showed that small classes were associated with increased student outcomes.

Educators who use small classes for young students must balance costs against benefits and implement small classes in accordance with the research. The difference between class size and PTR in the United States in 1998 was about ten pupils. If a school had a PTR of 17:1, a teacher faced about twenty-seven students in elementary grades. Redeployment of personnel based on small-class benefits is one way to find personnel and space for the small classes sizes that support improved student achievement, behavior, and school participation.

John Reiser's 1971 plea to understand and use differences between class size and PTR remains. However, by 2001 there was experimental and anecdotal evidence that class sizes of about 14 to 16 in grades K–3 improve education outcomes of students, and the gains grow throughout the grades. There is no evidence that small classes in later grades are harmful. Much of the discussion is ideological and not research-based. Glass (1992) said that "the controversy over class size has not subsided ... educational research may ... replace ordinary language with numbers ... but it is not likely to reduce or eliminate the conflicts of interest and political positions that are played out in the school system" (p. 165).

See also: [ELEMENTARY EDUCATION](#); [SECONDARY EDUCATION](#), [subentries on CURRENT TRENDS](#), [HISTORY OF](#).

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