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What the Research Tells Us: Class Size Reduction

At a Glance

This Information Capsule examines the background and history in addition to research findings pertaining to class size reduction (CSR). This Capsule concludes that although educational researchers have not definitively agreed upon the effectiveness of CSR, given its almost universal public appeal, there is little doubt it is here to stay in some form. That is not to say CSR does not benefit student achievement particularly in the primary grades, but rather the effects may be small and the optimism of educators regarding CSR should be tempered with the real world problems to which it is directly and indirectly associated. If large-scale CSR programs lead to lower teacher quality which in turn leads to negative impact on student achievement, this may offset any positive gains of smaller classes and therefore greatly reduce the effectiveness of CSR. The most prominent among its drawbacks appears to be high cost and the lack of cost effectiveness. These issues of course take on additional significance given the current economic climate. Some experts claim improvements in teacher quality and restructuring teacher preparation programs are more cost effective alternatives. These topics will be addressed in a future Information Capsule prepared by Research Services.

Class size is one of the most frequently debated and researched areas in contemporary education. As of 2005, approximately 24 states either mandated or provided incentives to reduce class size in public schools (Chingos, 2010). As a result of its appeal to common sense, Class Size Reduction (CSR) enjoys almost universal public approval. Teachers like it since they perceive it produces immediate improvements in achievement and it allows them to focus more on the individual student. Parents like it because they want their children to have personal attention. However, educational researchers are more skeptical than either of these stakeholder groups concerning the efficacy of smaller classes.

In November 2002, Florida residents voted to amend the state constitution to establish maximum class sizes in elementary and secondary schools. Starting with 2010-2011, class sizes were to be capped at 18 students in prekindergarten through third grade, 22 students in fourth through eighth grade, and a maximum of 25 students in ninth through twelfth grade. The cost of the class size amendment has been estimated at approximately \$20 billion over eight years.

With an upcoming vote on a revised class size amendment due in November 2010, the efficacy of the reform takes on added significance. The proposed amendment would cap class size at the school level and prohibit more than three students above the mandated maximum in kindergarten through grade three and no more than five students above the present limit in other grades. Approval of this amendment would save the state a considerable amount of money.

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CSR Benefits. In addition to improving student academic achievement, particularly in mathematics and among low-achieving students, as well as those taught by less qualified teachers, a number of other types of benefits have been proposed from the research.

- Higher morale and less teacher stress
- Reduced teacher workloads
- More individualized attention for students
- Increased student and teacher interaction/communication
- Higher levels of student participation
- More time on task or greater opportunity to learn
- Lower retention rates
- Increased parent and teacher interaction/communication

Historical Background. There are three important studies or programs in CSR that either have been completed or are still operating. The first two have historical significance because much of what is believed about CSR originated with them. As described by Witte (2000), the STAR study in Tennessee and the SAGE program in Wisconsin will be examined briefly in this capsule. In addition, the California CSR program will also be discussed since it provides many lessons from which proponents of current and future CSR programs should be made aware.

STAR. The most frequently cited study in the field is the STAR (Student Teacher Achievement Ratio) experiment from the 1980s. The project ran from 1985 to 1989 and involved 79 elementary schools. This study randomly assigned students to kindergarten classes so that some were enrolled in regular classes composed of 22-24 students and others went into small classes of 14-16 students. Students remained in these class configurations through third grade. When followed up in grade 3, students in small classes scored significantly higher in reading and mathematics when compared to children in regular classes. These benefits were said to extend into the upper elementary grades. The advantage of CSR appeared greater (nearly double) for minority as opposed to non-minority students. Classroom behavior was judged better for students enrolled in small classes, and they were more likely to take college entrance exams during high school.

SAGE. The SAGE (Student Achievement Guarantee in Education) program from Wisconsin started in 1996. This study did not use randomization of students into regular and small classes but rather matched control and experimental schools. Variables used to match schools included family income, reading achievement, size, and racial composition. The CSR intervention started in first grade and continued as students advanced to grades 2 and 3. The program continued for five years through 2001-02. Students were tested in May and again in October each year using the Terra Nova Comprehensive Test of Basic Skills. Results indicated that students in classes with approximately 15 students out performed those in classes composed of approximately 30 students in mathematics and language arts each year the program was in existence.

CSR in California. California's Class Size Reduction (CSR) was the first large-scale state operated program and it was initiated during a time of plentiful state funding (Rand, 2002). It is actually not an experiment but rather a program contained within which provisions were made for evaluation. CSR began in kindergarten through third grades during the fall of 1996 and it limited participating classrooms to 20 students. Initially from \$650 to \$850 per student and facility grants from \$25,000 to \$40,000 per school were awarded to districts able to reach the reduced class size. During 1997-98 or second year of operation, 1.6 million students were enrolled in small classes at an annual cost of \$1.5 billion (Witte, 2000). Over the lifetime of the reform, the state has spent an estimated \$22 billion in direct subsidies to districts participating in the program. This funding is in addition to billions of dollars individual school districts had to spend in order to cover the costs of the reform (Freedberg and Cabrera, 2009).

A study of the program during 1998-99 included 432 California schools and found in general no difference on Stanford Achievement Test scores between groups of students who had participated in smaller classes and those enrolled in regular sized classes. Although the program has been very popular among teachers, parents, and students it has resulted in relatively small positive achievement gains among K-3 grade students.

The California program began before the current economic downturn. Although it has been reportedly spared from the recent massive budget cuts, most California schools are increasing class sizes in kindergarten through grade 3 (Freedberg and Cabrera, 2009). California Watch surveyed schools in 30 California districts and found that a considerable number of them were increasing class size to 24 and others were going up to 30 students per kindergarten to third grade classroom. A number of state policymakers contend that CSR is no longer sustainable in the present economic climate. As a result, for the next three years California school districts will be allowed to raise K-3 classes to a high of 31 students. Schools that raise class size above 25 can still receive 70 percent of the subsidies previously provided by the program

Methodological Issues

Methodological concerns can be found in even the best social science experiment and the above referenced research efforts are no exception. Chief among these methodological problems are the following. Although the STAR findings were impressive, researchers failed to double check that the achievement level of students was in fact similar in both experimental and control groups when the study began. Therefore, pre-study skill levels could have been partly responsible for the achievement gains yielded by the study.

STAR students entering and leaving their respective classes throughout the four year study was not controlled and therefore could have led to an additional source of bias. In fact, the overall attrition from the experiment was approximately 50 percent. It was also determined that this attrition was not random but rather students who dropped out were not performing as well as those who stayed in the program (Hanushek, 1997). Additionally, 10 percent of the students crossed over from one treatment group to another, and 10 to 12 percent of the students were not tested during the first two years of the project. Hanushek concluded that the positive impact of smaller classes did in fact occur in kindergarten and possibly in grade 2 but that in his opinion the data did not support gains in subsequent grades.

The other two projects, SAGE and California CSR, also have methodological issues. There was no random assignment of SAGE students into treatment and control classes and only 17 comparison schools versus 30 treatment schools participated. Two comparison schools dropped out of the study during the second year. In addition, due to limited funding in the second year, many treatment schools did not reduce their class size until the second semester. The study comparisons were between schools and classrooms and not between individual students. Such school level analysis can mask findings if differences between classrooms cancel out legitimate differences that could be detected among individual students. Only a student-level analysis could provide evidence of the latter.

The California CSR project presented even more methodological issues to analysts. There was no random assignment of any kind and in fact schools volunteered to participate. To the extent that differences may be inherent in schools that volunteer for special programs compared to those that do not, this could lead to a source of potential bias. In addition to the methodological problems in California, the listing below includes programmatic and inadvertent dilemmas posed by such large scale CSR projects in general. These areas can serve as lessons and potential pitfalls to be avoided by states either contemplating or embarking on CSR.

- Space problems were the number one problem listed by principals (CSR, 1999). To reduce class size to an average of 15 students requires more than five times more classes than to reduce them to 20 students (Witte, 2000)
- It is more likely that less qualified teachers will be hired as a result of CSR. In the first two years of the program a total of 23,000 new K-3 teachers were hired in California. The number of uncertified K-3 teachers increased from 1 percent before CSR to 12 percent two years later. Additionally, the proportion of teachers with less than three years of experience doubled.
- The number of uncertified teachers varied across schools based on the income of students. In schools with the lowest income, more than 20 percent of the teachers were uncertified compared to only 5 percent in the highest income schools. The unfortunate truth is that a CSR policy requiring a particular class size without sufficient funding leads inevitably to a reduction in teacher quality (Imazeki, 2004).
- The small gains resulting from reduced class size in California may have been due in part to a decrease in teacher quality. Students taught by less qualified teachers tended to offset the benefits of smaller classes (Jepson and Rivkin, 2002). As a result, a number of California districts have judged the CSR program not worth the expense and opted out of the voluntary program.
- Research has shown that teaching strategies and methods do not change significantly by virtue of CSR (Witte, 2000). Teachers tend to do the same thing but they appear to do it better. Contributing factors to account for this are the improved student classroom behavior and the enhanced individualization which occurs in smaller classes. Therefore, time on task increases as less time is spent disciplining students.
- The overall effect of CSR can be to help some students at the expense of others. Harris and Plank (2000) reported that wealthier districts in California attracted the best teachers from low-income districts while the low-income districts were forced to hire less qualified teachers.
- Research has shown that CSR is one of the most expensive reforms and among the least cost effective (Levin, 1988; Grissmer, 2002). This realization has led a number of decision makers to suggest improving teacher quality and teacher preparation programs as more cost effective reform efforts. Therefore, a subsequent capsule prepared by Research Services will address these reforms.

There are other research studies regarding the efficacy of reducing class size besides those examining STAR, SAGE, and the California CSR program. One frequently cited meta-analysis study conducted by Hanushek (2003) examined 376 studies and the effect of nine different reform strategies. Reducing class size was defined as "pupil teacher ratio" (PTR), although not the best indicator of class size, PTR represented the least effective strategy studied. Out of a total of 276 PTR estimates studied only 14 or 5.1 percent found a statistically significant positive effect on academic achievement. In contrast, the indicator with the highest proportion of significant results turned out to be teacher test scores. Out of 41 estimates 37 or 79 percent resulted in a positive effect on academic achievement. Therefore, the higher the teacher scores on assessments used within the field of education, the greater the positive effect on student academic achievement.

An early comprehensive meta-analysis conducted by Glass and Smith (1979) analyzed 725 studies and concluded that CSR used in elementary grades (1-6) would result on the average of moving a student from the 50th percentile to the 52nd percentile. This amounted to an increase of about two

percentile points which can be considered a relatively small gain. However, this particular study has been frequently criticized on methodological grounds by CSR advocates.

Research on Class Size Reduction in Florida

It has been very difficult to determine the effects attributable to CSR in Florida since there have been several reforms implemented in the state at roughly the same time. These reforms have included A-Plus Accountability, School Choice Program, Opportunity Scholarships, McKay Scholarships, Corporate Tax Credit Scholarships, and "Just Read, Florida." The most recent study of Florida CSR has been conducted by Harvard University faculty member Mathew Chingos (2010).

Chingos performed two analyses using FCAT reading and mathematics scores and non-academic variables (i.e., attendance, retention, etc.). A district-level analysis was conducted using 2004 to 2006 data and a school-level analysis used data from the 2007 school year. Both types of comparisons included grades 4 through 8 among districts and/or schools that already had established class sizes at or less than the state mandate compared to schools that had to reduce class sizes to achieve the mandate. Statistical analysis indicated that both groups were similar in composition concerning demographic and skill level variables.

Results from the study led Chingos to conclude that, "...both district-and school-level analyses indicate that the effects of mandated CSR in Florida on cognitive and non-cognitive outcomes were small at best and most likely close to zero." He continued, "... results of this study do strongly suggest that large-scale, untargeted CSR mandates are not a particularly productive use of limited educational resources."

Similar to other research efforts on CSR, this Florida study has also been criticized on methodological grounds. Finn (2010) reviewed the study for the Education and Public Interest Center and Education Policy Research Unit at Arizona State University. A number of criticisms were levied with the most damaging being that the data were derived from grade 4 through grade 8 where the potential for finding positive results has been minimal.

Options Proposed to Improve CSR and Alternative Reforms

The CSR Research Consortium (2002) was given the responsibility of evaluating the California CSR program and reported that it was difficult to attribute the improvement in academic achievement for California students to smaller classes. However, this group and other respected authors have provided a number of supplemental policies that could enhance the effectiveness of maintaining smaller classes. These recommendations are listed below.

- Focus CSR on low achieving schools if funding is a problem
- Allow class size flexibility to accommodate the different needs of each school district so that class size is lower for low income students and higher for more affluent students
- Allow smaller classes for beginning teachers and larger classes for experienced teachers
- Establish smaller classes in kindergarten and first grade classes but slightly larger classes in third grade and above
- Develop qualified teachers and adequate facilities before implementing CSR
- Pilot test CSR programs before instituting statewide programs
- Pilot test CSR programs with even fewer than 15-20 students per class
- Establish formal evaluations/research on all CSR reform efforts
- Include better coordination and integration with other statewide education reform efforts

Types of education reforms other than CSR have appeared in the literature and include the following.

- Allow some students to arrive an hour early and others to remain an hour later to enable small group instruction
- One-to-one or small group tutoring on a "pull out" basis
- Early childhood programs involving developmental child care and established preschool models
- Whole school reform programs such as Success for All and Accelerated Schools
- Improve teacher quality
- Restructure teacher preparation programs

In conclusion, although educational researchers have not definitively agreed upon the effectiveness of CSR, given its almost universal public appeal, there is little doubt it is here to stay in some form. That is not to say CSR does not benefit student achievement particularly in the primary grades, but rather the effects may be small and the optimism of educators regarding CSR should be tempered with the real world problems to which it is directly and indirectly associated. If large-scale CSR programs lead to lower teacher quality which in turn leads to negative impact on student achievement, this may offset any positive gains of smaller classes and therefore greatly reduce the effectiveness of CSR. The most prominent among its drawbacks appears to be high cost and the lack of cost effectiveness. These issues of course take on additional significance given the current economic climate. Some experts claim improvements in teacher quality and restructuring teacher preparation programs are more cost effective alternatives. These topics will be addressed in a future Information Capsule prepared by Research Services.

All reports distributed by Research Services can be accessed at <http://drs.dadeschools.net>.

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