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ABSTRACT

This report summarizes research on the effects of class size reduction, outlines lessons learned from large-scale class size reduction initiatives in California and Wisconsin, and draws out implications of the research and lessons for class size reduction in North Carolina. The evidence that smaller classes promote increased learning is strongest in grades K-3. The longer students are in small classes, the more they benefit. Small classes help minority and low-income students the most. Teachers in smaller classes give students more individual attention and have fewer discipline problems. Though research in California and Wisconsin has found positive results of small class size, the states faced several barriers to reducing class size, including a shortage of high quality teachers; lack of adequate facilities, equipment, and materials; and lack of sufficient funding. Though North Carolina faces similar problems, it has undertaken such steps as scholarships for prospective teachers, alternative teacher certification, funding for additional teachers, an aggressive reduction program for the lowest-performing and highest poverty schools, and an outside evaluation of the effectiveness of class size reduction initiatives. (Contains 25 references.) (SM)

The Lessons of Class Size Reduction. First in America Special Report.

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First in America Special Report: The Lessons of Class Size Reduction

by Charles L. Thompson and Elizabeth K. Cunningham

NC Education Research Council

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Research confirms that reducing the size of classes in the early grades can produce large and lasting gains in student learning. Smaller classes afford students more contact with teachers, a more orderly learning environment, and more individual instruction. For these reasons, several states have launched initiatives to reduce class size. As part of their drive to make North Carolina's schools *First in America*, the Education Cabinet set a target of becoming one of the top ten states in class size reduction. Governor Easley has begun a major effort to reduce class size across the state. And legislation that combines smaller classes with other interventions in low-performing schools was recently enacted by the General Assembly.

Designed to support these efforts, this *First in America Special Report* summarizes research on the effects of class size reduction, outlines the lessons learned from large-scale class size reduction initiatives in California and Wisconsin, and draws out some of the implications of the research and lessons for class size reduction in North Carolina.

LESSONS FROM THE RESEARCH ON CLASS SIZE REDUCTION

The main findings from research on class size reduction may be summarized as follows:

- The evidence that smaller classes promote increased learning is strongest in grades kindergarten through third. The evidence favoring smaller classes is weaker at other grade levels (Glass & Smith, 1998).
- Only when classes drop below a certain threshold (no more than 20 and probably as few as 17) do large benefits appear and last into subsequent grades (Word et al., 1990; Finn, 1998; Finn, Gerber, Achilles, & Boyd-Zaharias, 2000a). Existing research does not pinpoint an optimal or "best" class size. In fact the size of the reduction — the difference between the size of classes before and after reduction — may matter as much as the actual number of students in the class (Stecher, 2001).
- The longer students are in small classes, the more they benefit. For students to make enduring gains, they need to be in smaller classes for at least two years (Finn et al., 2000a). With at least two years of smaller classes in grades K-3, students continue to learn more even after they move into larger classes at grades four and above (Finn et al., 2000a).
  - Preliminary results from one major study showed that students who had been in small K-3 classes for at least two years were less likely to drop out of school and were more likely to graduate from high school with honors (Boyd-Zaharias & Pate-Bain, 2000).
  - The study also showed that the percentage gap between scores of black and white students taking college entrance exams was significantly smaller for black students who had been in smaller classes compared to black students in regular classes or classes with a teacher aide (Boyd-Zaharias & Pate-Bain, 2000).
- Small classes improve achievement by all students, but help minority and low-income students the most (Word et al., 1990; Finn & Achilles, 1990; Molnar et al., 1999).
- Though teachers in smaller classes do not dramatically alter their teaching strategies or the amount of content they cover, they do give students more individual attention through one-on-one tutoring and brief on-the-fly help (Molnar et al., 1999; Molnar, Smith, & Zahorik, 1999). Teachers with small classes also spend more time communicating with parents (Stecher, 2001).
- In a number of studies, including one in Burke County, North Carolina, teachers with smaller classes had fewer discipline problems than in larger classes (Achilles, 1994; Egelson, Harman, & Achilles, 1996; Molnar et al., 1999).
- Student achievement is not significantly improved in regular sized classes with a full-time teacher aide (Finn, 1998; Finn et al., 2000b). Yet there is some evidence that if aides are carefully selected for their verbal skills, trained, and assigned to tutor students one-on-one they can make a measurable contribution to improved learning (Farkas, 1998a; Farkas, 1998b).
- Though the cost-effectiveness of class size reduction is still debated, a recent RAND study found it among the three most efficient forms of expenditure to improve student achievement, along with expanding pre-kindergarten programs and providing teachers more resources for teaching (Grissmer, Flanagan, Kawata, & Williamson, 2000).

LESSONS FROM THE LARGE-SCALE IMPLEMENTATION OF CLASS SIZE REPRODUCTION

Much of the research summarized above grew out of the Tennessee Student/Teacher Achievement Ratio program (STAR), a large, carefully-designed experiment. Spurred in part by STAR findings, other states have now initiated more expansive operating programs. These carry with them the challenges of larger scale and routine operation. Yet with minor exceptions, evaluations of the full-scale programs are consistent with earlier research:

- Evaluations in California and Wisconsin revealed that students who were enrolled in smaller classes performed better than those who were not. California's evaluation also produced evidence that the benefits of being in a smaller third grade class persisted after students returned to a larger class in the fourth grade, though students who had been in a smaller class only in the second grade did no better in the fourth grade (Stecher & Bohrnstedt, 2000).

- Parents whose children participated in California's class size reduction program were more satisfied with several aspects of their child's school. They gave high ratings to the overall quality of their child's education, their teachers' qualifications, and the individual attention given to their child. Parents also reported slightly more frequent contact with their child's teachers (Stecher, 2001).

- Teachers in smaller classes in California and Wisconsin gave more individual help to students during mathematics and language arts lessons than did teachers in larger classes (Stecher & Bohrnstedt, 2000; Molnar, Smith, & Zahorik, 2000). In California, the extra help included more frequent, sustained work with individual students who had reading problems (Stecher & Bohrnstedt, 2000).

- A significant percentage of California and Wisconsin teachers with smaller classes reported improved student behavior and less need to take disciplinary action in the classroom (Stecher & Bohrnstedt, 2000; Molnar, Smith, & Zahorik, 2000). California's teachers offered several explanations for the improvement in student behavior, including having fewer disruptive students in their class, being able to address discipline problems before they could escalate, and having more time to provide students with individual attention (Stecher & Bohrnstedt, 2000).

Despite the promise, other states' experiences also point to important obstacles and worrisome side effects of large scale initiatives to reduce class size. The success of class size reduction initiatives has been frustrated by a shortage of high quality teachers, a lack of adequate facilities, equipment, and materials, and a lack of sufficient funding.

A Shortage of High Quality Teachers

Since reducing its kindergarten through third grade classes to 20 students to one teacher, California has experienced a worsening teacher shortage and a dramatic rise in the percentage of teachers who are teaching without a full license. In addition, the percentage of teachers who have college training beyond a bachelor's degree and who have more than three years of teaching experience has decreased significantly (Stecher & Bohrnstedt, 2000; Stecher, Bohrnstedt, Kirst, McRobbie, & Williams, 2001). Yet teacher quality is among the most important determinants of student learning.

The increased demand for qualified teachers resulting from California's reduction program worsened teacher shortages throughout the elementary school. Many ESL, special education, and 4th and 5th grade teachers switched to teaching students in reduced size kindergarten through third grade classes (Stecher & Bohrnstedt, 2000). While many ESL and special education students benefited from the reductions in class size, some of the benefits were undercut by the resulting shortage of qualified ESL and special education teachers.

As noted above, teachers with smaller classes provide students more indiividual attention but typically make no major changes in the way they teach. Some have argued that to take full advantage of smaller classes, teachers need training in the new approaches that smaller classes permit (Brophy, 1988). California and Wisconsin have required such professional development, but it is not yet clear whether the training has made a contribution that goes beyond the effects of simply reducing class size (Stecher & Bohrnstedt, 2000).

A Lack of Adequate Facilities, Equipment, and Materials

Except in schools that have extra or underutilized classrooms, smaller classes require additional classroom space. More equipment and materials are also required. Partly because California had poor information on facility needs, the state's plans did not adequately address the need for additional facilities, equipment, and materials. The lack of adequate facilities funding forced many schools to take space from existing programs. More than 40 percent of California's schools reported eliminating designated spaces for special education classes. A significant number of schools also reported eliminating child care facilities, music and art rooms, computer labs, and libraries to accommodate the additional K-3 classes (Stecher, 2001).

In Wisconsin, one response to the facilities squeeze has been to assign two teachers to team up to teach a class of 30 students rather than to assign each to a separate class of fifteen (Molnar, Smith, & Zahorik, 2000). It is not clear whether such teaming arrangements offer a real learning advantage over larger classes, but it is clear that they do not match the gains produced by true class size reduction. An evaluation of the Wisconsin initiative showed that second graders in genuinely smaller classes (15:1) outperformed second graders in team-taught classes of 30 (Molnar, Smith, & Zahorik, 2000).

A Lack of Sufficient Funding

California's class size reduction program was voluntary and funded only a part of the additional costs of the reduction. Schools and dis-

tricts with the least ability to make up the difference often found themselves unable to take advantage of the program. Yet many of these districts had the neediest students and the largest classes (Stecher & Bohrnstedt, 2000).

While California is nearing full implementation of its class size reduction program, the remaining larger classes are concentrated in schools serving high percentages of low-income, Hispanic students. In 1999, schools with few Hispanic students (less than 15%) had 95 percent of their third graders in smaller classes, whereas schools with larger concentrations of Hispanic students (45% or more) had only 80 percent of their third graders in the smaller classes (Stecher & Bohrnstedt, 2000). These largely poor, largely minority schools are unable to compete for the experienced administrators and qualified teachers and provide the improved facilities that would allow them to enjoy all of the benefits of California's class size reduction initiative.

LESSONS FOR NORTH CAROLINA

As North Carolina undertakes initiatives to reduce class size, it is instructive to examine the lessons learned from the research on class size reduction and the practical experiences of several states in implementing these initiatives. Without a thoughtful policy and deliberate action, North Carolina could find itself confronted with the shortage of high quality teachers, lack of adequate facilities, equipment, and materials, and lack of sufficient funding that has thwarted the efforts of other states.

A Shortage of High Quality Teachers

North Carolina faces a severe and worsening teacher shortage:

- The North Carolina Department of Public Instruction predicts that North Carolina will need a total of 10,000 new teachers between 1998 and 2008 to keep pace with the state's population growth (Public Schools of North Carolina, 1998).

- Each year approximately 13 percent of North Carolina's teaching force leaves the teaching profession or moves out of the state. It is estimated that this rapid turnover will require the state to hire 95,000 new teachers between 1998 and 2008 (Public Schools of North Carolina, 1998).

- Changes in education policy have and will continue to exacerbate teacher shortages. In 1997, the Department of Public Instruction predicted that the addition of charter schools, changes in graduation requirements, curriculum expansions, and existing class size reduction efforts would require an additional 5,000 teachers in the coming decade (Public Schools of North Carolina, 1998).

  - These predictions did not contemplate efforts to reduce class sizes in all grades in low performing elementary and middle schools. Nor did they include the increased demand for teachers created by efforts to reduce class size in all kindergarten classes, and subsequently in all first, second, and third grade classes, to eighteen students, as proposed by Governor Easley. If fully implemented at current population levels, these programs could require more than 3,500 additional teachers.

  - The establishment of a public pre-kindergarten program will also increase the demand for certified elementary teachers. When fully implemented, the Governor's More at Four program is designed to serve more than 40,000 four-year olds in the state. Because each classroom of eighteen students will be lead by at least one fully certified teacher, the More at Four Program could require as many as 2,000 certified teachers (Russell, et al., 2001).

While North Carolina's teacher shortage is a problem throughout the state, the challenge is even greater in low wealth counties, counties that pay lower local teacher salary supplements, and in certain grades and subject matters..

- As of October 2000, the fifteen North Carolina school districts that reported vacancies of more than 2 percent of their total staff were concentrated in the eastern part of the state and offered an average local teacher salary supplement of $677 — $234 below the statewide average (NC Department of Public Instruction, Human Resource Management, School Personnel Support, 2000).

- In these counties, and across the state, more than 20 percent of the reported vacancies were in grades kindergarten through six. Another 15 percent of the vacancies were for teachers of exceptional children (NC Department of Public Instruction, Human Resource Mangement, School Support Personnel, 2000).

North Carolina will need to act swiftly if it is to prevent the sharp decline in average education level, experience, and credentials of teachers that occurred throughout California, and particularly in its poor and hard-to-staff schools (Stecher et al., 2001). Research has shown that teacher quality may be even more important to student achievement than class size (Wright, Horn, & Sanders, 1997). For this reason, Stecher et al. (2001) suggest that states take several steps to ensure an ample, high quality teaching force, including:

- implementing scholarship programs to attract students to teacher training institutions,

- increasing the capacity of teacher training institutions to prepare new teachers,

- reforming certification requirements to create alternate paths to certification,

- implementing incentive programs and improving working conditions to help recruit and retain effective teachers in hard-to-staff schools, and

- developing mentoring and support programs that provide "immediate, problem-specific, and personal support on a continuing basis" to new and inexperienced teachers.

North Carolina has already undertaken or is considering many of these steps — including scholarships for prospective teachers and teacher assistants interested in gaining certification, an alternative certification program, and incentives to recruit teachers into hard-to-staff schools. Yet, the additional burden that the state's class size reduction plans will place on the supply of high quality teachers will require an intensification of efforts. "Unless great care is taken to design and implement class size reduction reforms thoughtfully this added demand can fall unevenly on poor districts, leading to greater inequities and undermining the reform's potential" (Stecher et al., 2001).

A Lack of Adequate Facilities, Equipment, and Materials

Despite a tight state budget and growing student enrollment, North Carolina policymakers have made a commitment to implementing the first stages of a class size reduction program. While funds were provided for additional teachers, no funds were provided for the additional facilities, equipment, and materials needed in their classrooms.

As documented in the *2000-01 Statewide School Facilities Needs Survey* recently issued by the Department of Public Instruction, North Carolina already faces a shortage of available classroom space. The survey finds that there are $6.2 billion in construction needs facing schools over the next five years. Sixty-three (63%) of this need is for new schools and additions to existing schools (NC Department of Public Instruction, Financial and Business Services, School Support, School Planning Section, 2001).

North Carolina's plan to begin reductions in kindergarten raises some additional issues regarding facilities, equipment, and materials. Kindergarten classrooms have additional square footage, restroom, and safety recommendations that make them more expensive to build than other classrooms. In addition, kindergartens use more supplies and materials and are more likely to break or wear out equipment than other classes. For these reasons, it costs an average of $175,000 to construct and equip a kindergarten classroom in North Carolina. Even the more cost efficient addition of mobile units costs an average of $50,000 (NC Department of Public Instruction, Financial and Personnel Services, Division of School Support, School Planning Section, 1998).

With little available money for new school facilities, North Carolina's districts will confront some tough choices — eliminate designated classroom spaces for special education, music, art, computers, libraries, etc.; allow team teaching arrangements where teachers share classroom space; rely on mobile units to meet facilities needs; or find additional local funds to support the acquisition or consruction of new facilities. Each of these choices has important obstacles or downsides that must be considered. And some could diminish the effectiveness of class size reduction efforts.

> Only 40 percent of North Carolina's teachers believe that they have the facilities, equipment, and materials they need to meet their instructional needs.

A Lack of Sufficient Funding

If California's experience has taught any lesson, it is that failing to provide schools with ample funds to cover the costs of class size reduction may exclude many disadvantaged schools from full participation. Does it appear that North Carolina will heed this lesson?

The current class size reduction plans in North Carolina take several positive steps.

- A separate, aggressive reduction program has been enacted for the lowest performing and highest poverty schools.
- North Carolina's class size reduction budget provides needed funds for college scholarships for prospective teachers and teacher assistants interested in gaining certification. The budget also provides for a study of the effectiveness and feasibility of incentives to attract certified teachers back into the classroom.
- The large-scale reduction program under consideration is designed to be phased in by grade, beginning in kindergarten. This should allow schools some time to prepare for the increased demand for teachers and facilities.
- Finally, the state has planned an outside evaluation of the effectiveness of its class size reduction initiatives. This information can be used to monitor the implementation of the program and to suggest possible solutions as problems arise.

But North Carolina's plans do not address several important concerns:

- Little additional assistance has been requested for schools and districts already facing shortages of teachers, space, and financial resources.
- The class size reduction budget does not include funds to recruit teachers into low performing and high poverty elementary schools.
- The current budget only funds reductions in kindergarten classes for the first two years. It appears that without additional allocations, students enrolled in reduced size kindergarten classes in 2001-02 will not continue in reduced size first grades classes the following year. Research demonstrates that students must be in smaller classes for at least two years in order to reap the long-term benefits of a reduction program (Finn et al., 2000a).
- Current allocations are likely to reduce average kindergarten class sizes by one to two students. Research suggests that while this is a step in the right direction, the size of the reduction may not be large enough to produce substantial results.

CONCLUSION

Class size reduction has a positive effect on student achievement and increases the amount of one-on-one instruction that students receive. For these reasons, it is a very popular and effective reform. Yet, the reform also places large demands on schools and districts for additional qualified teachers, extra facilities, equipment, and materials, and additional funds. As North Carolina moves toward its goal of becoming one of the top ten states in class size reduction, great care should be taken to ensure that all schools and districts have the capactiy to meet these demands.

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Other Special Reports on the Black-White Achievement Gap, Resource Reallocation in Education, and the Implementation of Pre-Kindergarten Programs will be available from the North Carolina Education Research Council.

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