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Jeremy D. Finn

State University of New York at Buffalo

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Keynote Address

***Small Classes in American Schools:
Research, Practice, and Politics***

Jeremy D. Finn
State University of New York at Buffalo

Today I'd like to talk about an unusual combination of events—a case in which school practice has informed research which has informed practice. In particular, I'll talk about:

- (1) The current status of class-size reduction programs in the U. S.; that will be short because it is changing even as we speak.*
- (2) The research base that provided the motivation for districtwide and statewide class-size initiatives.*
- (3) Some misapplication of the research.*
- (4) Questions about reduced classes that remain unanswered, and current work to explain why small classes are effective.*

Introduction

Why is it that, after years of research and debate, class sizes are now being reduced in the elementary grades across the U. S? I presented a list of reasons to a group of legislators on April 2. They included the following:

- Everybody likes the idea of small classes. Teachers, parents, policy makers, legislators, and even the courts understand the importance of small classes for teaching and learning;
- High-quality research has demonstrated the benefits of small classes in the early grades—especially for students at risk;

And, as of April 2,

- Education had risen to the top of state and national agendas;
- The economy was healthy, so we had ample resources to direct toward school improvement.

These factors created the situation we have today. Over half the states, countless districts, and the federal government have sponsored class-size reduction (CSR) programs. In California alone, 28,000 new teachers were hired in the first three years of the statewide class-size initiative; in the first year of the federal CSR program, 29,000 new teachers were hired, mainly in poor, urban school districts. It is impossible to count the classes reduced in schools across the nation, but it is certainly a large number.

But much has changed, making the future of reduced classes in the elementary grades is less clear. The President's education plan, "No Child Left Behind," earmarks the federal reduced-class initiative as one of two programs to be eliminated. The recent decline in the economy may leave states and districts less able to hire additional teachers.¹ And

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the events of September 11 have refocused our agendas in a way that may well give lower priority to education. It remains to be seen if small class sizes have become sufficiently institutionalized that we will continue to include them in our basic educational plans.

The Research Base

Before overviews past and current research on class size, I'd like to tell you how I got involved in this field. I began as a skeptic. I was asked to serve as consultant to Tennessee's Project STAR in 1985. I told the STAR Consortium that I didn't think they would be able to complete a four-year study as ambitious as the one they had planned, and that, even if they did, they were unlikely to find positive effects. They (we) proved me wrong on both counts. Well, I analyzed the STAR data myself each year, and am now convinced that the benefits are real and replicable. Nevertheless I'm not a 'blind advocate' of small classes. I don't consider them to be a solution to our educational problems or a "silver bullet;" I view them as an essential **opportunity** for instruction to be effective and for students to become maximally involved in the learning process.

The current research base on small classes in the elementary grades includes:

- Dozens of research studies conducted prior to the mid-1980s;
- Project STAR, a large-scale randomized experiment, and short- and long-term follow-up studies of STAR participants;
- Analyses of the STAR results by different research teams using a variety of statistical approaches, and replication of the basic STAR findings through non-experimental interventions at other sites;
- Ongoing research into the classroom processes that distinguish small and large classes.

I will talk briefly about each of these.

Early research on class size

Prior to the 1980s, dozens of studies were conducted on the relationship between class size and pupil performance. Many suffered from small samples, poor research designs, and inadequate treatment of the data. To my knowledge, not one was truly a randomized experiment. Reviews of this research supported some tentative conclusions, however; among them:

- Reduced class size (below 20 pupils) can be expected to produce a modest increase in academic achievement (Glass and Smith, 1978; Slavin, 1989);
- Small classes are most beneficial in the early primary grades (Robinson, 1990);
- Students who are economically disadvantaged are most likely to benefit from small classes (Robinson, 1990).

Project STAR (Student/Teacher Achievement Ratio)

Beginning in 1985, the State of Tennessee undertook an experiment to test these propositions. Project STAR (Student/Teacher Achievement Ratio) was a large-scale **randomized within-school experiment**. Pupils entering kindergarten in each participating school were assigned at random to a small class (13-17 students), a full-size class (22-26), or a full-size class with a full-time teacher aide. Teachers were also assigned at random to the classrooms. Pupils were kept in the same condition—small, regular, or teacher aide—for up to four years (Grade 3), with a new teacher assigned at random each year.

STAR had other special features:

- The study was extensive. More than 6,000 students in 329 classrooms in 79 schools participated in the first year, and almost 12,000 students participated at some point in the four-year study;
- The class arrangement was maintained all day, all year long. There was no other intervention, for example, no special training for teachers and no special curricula;
- Both norm-referenced and criterion-referenced achievement tests were administered to each pupil each year. Other data were collected systematically on the students and on their teachers;
- STAR pupils were followed **after they all returned to full-size classes in Grade 4**. Measures of academic performance and other outcome data were collected through high school, and we are currently collecting information on postsecondary schooling and employment.

The findings of Project STAR are important building blocks in today's knowledge base about small classes. From a scientific perspective, it is also important that the STAR data have been reanalyzed by a number of researchers, using a variety of statistical procedures. With minor exceptions, all of their analyses concur with the original findings.

The Findings. The findings of STAR have been summarized in a number of publications including Word, et al., (1990), Finn (1998), Finn and Achilles (1999), and Finn,

Gerber, Achilles, and Boyd-Zaharias (2001). The recent report in *Teachers College Record* is the most intensive look at short- and long-term academic outcomes to date. In that paper, we also presented two kinds of effect sizes, the usual "standard deviation" metric and "months of schooling." Here are a few highlights, drawn from those reports.

During the experimental years (K-3):

- Small classes had statistically significant academic benefits in every grade in *all academic subjects*. {Effect sizes for the difference between small classes and full-size classes were in the range 0.2σ to 0.3σ in each school subject.²}
- The effects were greater for students who spent more years in a small class. {For example, Grade-1 students who entered small classes for the first time were about 1/2 month ahead of their schoolmates in reading and about 2 months ahead in mathematics. Grade-1 students who were in small classes for the second year (since kindergarten) were about 2 months ahead of their schoolmates in reading and about 3-1/2 months ahead in mathematics.}
- In every grade, the benefits of small classes were greater for minority students or students attending inner-city schools than for White students in non-urban schools. The effect sizes were often as much as two to three times as great, thus reducing the White-minority achievement gap.

Economist Alan Krueger reanalyzed the STAR data and concluded that, by third grade, the Black-White gap in school performance would be reduced by 38% if all students had attended small classes (Krueger and Whitmore, 2001).

All students returned to full-size classes in Grade 4, but continued to be followed:

- The benefits of small classes continued to be statistically significant through all subsequent grades *in all subject areas*.³
- Both **starting early** in small classes and **continuing in small classes for multiple years** were related to the duration and strength of carry-over effects. In each grade (4-8), both sets of effect sizes were larger for students who had spent more years in small classes in K-3. {For example, at the end of Grade 6, students who had attended small classes for one year had a 1.2-month advantage in reading over students who had attended full-size classes. Students who had attended small classes for 2 years had a 2.8-month advantage. Three years in a small class produced a 4.4-month advantage. And so on, in each school subject.}

Confirmation of the Findings. A number of (non-experimental) CSR initiatives have been undertaken following STAR, but most do not have systematic evaluations. Those that do replicate the basic results of STAR. Among them are Wisconsin's Project SAGE (Molnar, et al., 2000) and the well-researched effort in Burke County, NC (Egelson, Harman, and Achilles, 1996; Egelson and Harman, 2000). Both are targeted to schools serving low-income students. California's statewide CSR initiative has only been thoroughly evaluated for grade 3; because most classes in K-2

were reduced at one point in time, no comparison groups were available. The effect sizes are close to those obtained in STAR for students who entered small classes in Grade 3 (see CSR Research Consortium, 2000).

“The other shoe”—Teacher Aides. Project STAR’s results for teacher aides have often been overlooked because of the findings for small classes, but they have significant policy implications. When STAR was designed, Tennessee policy makers hoped that teacher aides could provide the same benefits as small classes but at a substantially lower cost.

The STAR analyses continually reported “no significant difference” between teacher-aide classes and full-size classes without aides. Those results were summarized and extended in several recent reports, including two by myself and Susan Gerber (Boyd-Zaharias and Pate-Bain, 1998; Finn, Gerber, Farber, and Achilles, 2000; Gerber, Finn, Achilles, and Boyd-Zaharias, in press).

In the Gerber papers, it was estimated that there were over 600,000 teacher aides in American classrooms (in 1998), costing about \$9 billion annually. Unfortunately, virtually all research on the topic, including STAR, finds that, in general, teacher aides benefit neither teachers nor students.

For example, in Gerber’s research, the academic performance of students in teacher-aide classes was compared with both other class types (small and full-size classes without aides), systematic ratings of student behavior were compared among the class types, and teachers in the three class types reported the severity of problems they encountered in their classrooms managing time, managing and controlling the class, and engaging students in learning activities.

The study posed two questions, the first being: “Do students in teacher aide classes perform as well or behave as well as do students in small classes?” To quote from the report,

The answer is unequivocally “no.” In terms of academic achievement, students in small classes performed significantly better on every test administered in every grade. There were no exceptions. ... In terms of behavior...students who had attended small classes exhibited superior learning behaviors on two of three dimensions and on total engagement (in learning)... When teachers were interviewed about their preference, 71% said they would prefer teaching a small class to teaching a regular class with a full-time assistant. (p. 163)

The second question was “Do classes with teaching assistants have advantages over full-size classes without assistants?” The results lead to these conclusions:

Here, too, the answer is “no.” No overall differences in academic achievement were found between the performance of students in teacher aide classes and students in regular classes on any test in any grade. ... In several instances, students in aide classes performed **more poorly** than did students in non-aide classes ...In terms of learning behavior, again no significant differences were found ...

in Grade 4 or Grade 8. In several instances, behavior was marginally *poorer* among students in classes with aides. (pp. 163-164, bold added)

Finally, teachers with aides reported little or no relief from the responsibilities of teaching, even when teaching assistants were classified according to the types of duties they performed: administrative, noninstructional interactions with students, or instruction.

Some districts (e.g., Burke County, NC; San Diego, CA) have used teacher aide monies to hire additional teachers. Given the absence of positive impact for aides and even the possibility of negative effects, this seems to be sensible policy. The other option discussed in the reports – to “remedy the deficient preparation of paraprofessionals for the tasks they perform, the lack of clearly defined roles for aides in the classroom, and the absence of training for teachers in utilizing their assistants” (Finn, et al., 2000, p. 165)—also deserves serious consideration.

Other Findings about Small Classes

Project STAR did not undertake sufficient studies of classroom processes. However, from the limited process research undertaken in STAR and research on other CSR initiatives, several additional findings have emerged. Among them:

- Teacher morale is improved in small classes (Glass and Smith, 1978; Johnston, 1990);
- Teachers spend more time on direct instruction and less on classroom management when classes are smaller (Molnar, Smith, and Zahorik, 1999);
- There are fewer disruptions in small classes and fewer discipline problems (CSR Research Consortium, 2000; Achilles, Kiser-Kling, Aust, and Owen, 1995);
- Students’ engagement in learning is increased (Finn, Fulton, Zaharias, and Nye, 1989; Evertson and Folger, 1989);

Also:

- In-grade retentions are reduced (Harvey, 1993; Word, et al., 1990);
- Dropout rates may be reduced (Preliminary data in Bain, Fulton, and Boyd-Zaharias, 1999);
- Greater numbers of students who attend small classes in the early grades elect to take SAT or ACT tests in high school. That is, aspirations to attend college are increased, especially among African-American students (Krueger and Whitmore, 2001).

It is noteworthy that some of these outcomes produce cost savings.

A Comment About the Costs of Reduced Class Sizes

I don’t want to discuss the issue of costs in depth, but I’d like to comment on the approaches that have been taken in examining this question. Small classes have been described as an expensive intervention. There have been several analyses of costs including the one by Brewer, Krop, Gill, and

Reichardt (1999) who estimated the nationwide costs of CSR under different policy alternatives, and less thorough analyses by Witte (2000) and Harris and Plank (2000).

However, none of these analyses—performed by researchers who are usually insightful—has looked at possible resource trade-offs nor have they examined the factors on the benefit side of the equation. The issue of trade-offs is complex so I'm not surprised it hasn't been studied. For example, I mentioned several districts that used teacher-aide funds to hire additional teachers and reduce class sizes.

But I am surprised about the omission of **benefits** from these analyses. To my knowledge, the only analysis of benefits performed in recent years was that done by economist Alan Krueger. Using data from STAR, Krueger (1999) concluded that the benefits of reducing class sizes, in terms of students' future earnings, are very close to the per-pupil cost of reduced classes.⁴ In other words, the costs are recovered in the form of personal income to the students.⁵

However, the total benefits may be greater still. If small classes are an incentive for teachers to remain in urban settings, if students are more likely to attend college, and if grade retentions and dropout rates are decreased, then these represent cost savings as well and need to be included in any complete analysis of the costs and benefits of small classes.

How To Do Small Classes the Wrong Way

The implementation of reduced class sizes have produced some “tried and true” ways to negate their benefits. I will mention two in particular.

(1) In the rush to hire and place new teachers in classrooms, overlook the need for professional development and support

The California CSR initiative demonstrated the serious side effects of doing things too quickly. In its haste to reduce class sizes in K-3 in a matter of a few months, many individuals were placed in classrooms without completed teaching credentials not to mention adequate experience managing students. The effect was so large that the preparation level of the entire state's teaching force declined (Stecher, Bohmstedt, Kirst, McRobbie, and Williams, 2001). Stecher, et al., (2001) recommend that CSR initiatives be undertaken slowly and with careful planning. I would add the recommendation that we also make use of focused programs of professional support and development.

Project STAR demonstrated that the benefits of small classes are obtained **without** any special teacher preparation. However, several CSR programs have used professional development effectively in conjunction with reduced classes. This makes good sense because:

- Many teachers placed in elementary classrooms are new to teaching, new to the classroom, and new to their school setting. They need help “getting started.”
- Many veteran teachers are transferring from other settings to small classes. The instructional practices they have learned from years of experience are not always “current best practice.” (An understatement.) Updating is important.

- It may be possible to *enhance* the benefits of small classes by taking advantage of the opportunities small classes provide. Professional development can show teachers how to cover content in greater depth (Anderson, 2000) and how to take best advantage of the increased sense of community that typify small classes.

The report “The Professional Development and Support Needs of Beginning Teachers” (Pannozzo and Finn, 2000) discusses these issues further as well as how to target programs to be most useful.

(2) Confuse “pupil-teacher ratios” with “class size”

I'd like to emphasize the difference between these concepts. “Class size” is the number of students regularly in a teacher's classroom for whom that teacher is responsible each day. The idea of class size is important to **teachers** because it constrains all of her interactions with pupils, encourages or discourages learning behavior and pro- or anti-social behavior, and is clearly related to the amount of material students learn. As my colleague Charles Achilles would say, “A class with 15 students and one teacher has a class size of 15. A class with 28 pupils and one teacher has a class size of 28. A class with 28 pupils and two teachers and a full-time teacher aide still has a class size of 28.”

The “pupil-teacher ratio” is the ratio of the number of students in an educational unit to the number of full-time equivalent education professionals assigned to that unit. Pupil-teacher ratios have been used by **economists** for many years to develop funding formulas for districts and states. However, the pupil-teacher ratio for a school, district, state, or nation **does not describe the proximal setting in which pupils are learning**. In the U.S., many urban districts have small pupil-teacher ratios (including Boston and New York City), because of the large number of ancillary staff members, even though most students spend the entire school day in overcrowded classrooms (see, for example, Lewit and Baker, 1997; Miles, 1995).

Why is the distinction important? This distinction is important for two reasons. First, the strong research base on small classes does not apply to large classes, no matter how many teachers are present. Some schools, facing a shortage of classroom space, have created large classes with several teachers, or with teachers and aides, instead of small classes. Although large team-taught classes may sometimes be effective, this has not been confirmed with large samples or through a controlled experiment. Simply put, we don't have the same level of scientific information about how these classroom arrangement works.

Two, critics have used data on pupil-teacher ratios to attempt to disprove that small classes are beneficial (e.g., Hanushek, 1998). Because pupil-teacher ratios are usually computed for large, heterogeneous units (i.e., **school districts, states, or countries**), it is little surprise that they have a weak relationship with academic achievement. These levels of analysis may be appropriate for an economist's work but not for an educator concerned with teaching and learning in individual classrooms.⁶

Unanswered Questions/Ongoing Research

Many questions remain to be answered. Among those that are asked repeatedly:

- How small is “small?” Is a class of 20 students likely to be as effective as, say, 17?
- How effective are small classes in the middle grades? In high school?
- Can the effects of small classes be **enhanced** through particular instructional strategies? By combining CSR with other interventions, for example, preschool programs or remedial programs? By taking advantage of the improved sense of community that arises in small classes?
- And many more...

Two broad questions are being addressed currently. First, **what are the long-term impacts of small classes in the early grades?** Alan Krueger and his colleagues have been augmenting the STAR data with information about students who take college admissions tests (SAT or ACT), information about child bearing, information about delinquent or criminal behavior, and will eventually collect information about unemployment rates. Preliminary reports have already documented the relationships of class size with some of these outcomes (e.g., Krueger, 2000; Krueger and Whitmore, 2001). Also, together with HEROS, Inc., the primary STAR organization in Tennessee, we are also performing a number of follow-up analyses.⁷ We will examine the high-school courses taken by STAR participants, high school grades, and graduation rates, and will conduct approximately 500 telephone interviews to document postsecondary schooling and employment. In all, we will have a formidable 17-year data base that can be used for this and other purposes.

The second question we⁸ are pursuing is the “black box” question: **Why do small classes work as well as they do?**⁹ Many people speculate that teachers change their instructional styles in small classes, providing more one-on-one teaching and higher-quality instruction. Interestingly, neither STAR nor other process studies support this hypothesis. It is pretty clear that teachers of small classes spend more time on direct instruction and less time on classroom management and discipline. However, few if any qualitative differences occur spontaneously when class sizes are reduced. In general, changes in instruction are small and do not explain the consistent academic benefits that are found.

We are pursuing a second hypothesis—that students become better students in small classes, that is, they become more engaged in learning and display more pro-social behavior and less anti-social behavior. We have located 15 studies of students’ learning and social behavior; they vary considerably in quality. Nevertheless, of 46 measures of students’ engagement in learning, 30 are consistent with this hypothesis; not one is contradictory. Likewise, of 27 measures of students’ social behavior, 17 support our hypothesis; again, not one finding favors large classes.

Psychological theory also explains why students may become better students in small classes. We have identified four theoretical perspectives that explain why student behavior differs in small and large classes.¹⁰ We call the first the “firing line hypothesis:” in a small class, each student experiences continuing pressure to participate. S/he may be called upon at any time to answer questions or participate in a class discussion; s/he can’t avoid the teacher’s attention by sitting in some obscure place in the classroom; and the teacher can’t readily ignore any particular pupil, **even if she would like to.**

Second, small classes tend to encourage a closer “sense of community” among students and between teachers and students (see, for example, Bateman, 2000). Teachers of small classes report that they know each individual student better than they would in a larger class. Students tend to be more supportive of one another and to develop a stronger sense of identification with the class as a whole.

Third, the concepts “social loafing” and “diffusion of responsibility” have been used to explain why smaller groups of people are more responsive than individuals in larger groups (see Darley and Latane, 1968; Levine and Moreland, 1998). And fourth, the study of group dynamics has shown that “small-group norms” are different from “large-group norms.” Researchers have documented a negative correlation between the size of a group and its functional size, that is, the number of group members who participate in any given activity (Bray, Kerr, and Atkin, 1978). Again, these principles apply to the classroom as well.

All four perspectives lead to the conclusion that the intensity of the teaching/learning experience is increased for students in smaller classes. Of course more research is needed to test these (non-mutually-exclusive) propositions.

One Final Comment

My final point today is the need for further research based on ongoing CSR programs. In recent years, many districts have undertaken CSR, often without any accompanying research or evaluation. It may not be necessary to show that academic achievement is improved in every site. It is necessary, however, to make sure that smaller classes are implemented correctly and that problems are addressed quickly. Several evaluations, including the one we conducted in Buffalo, New York (Finn, Gerber, and Pannozzo, 2000), have identified implementation problems so that mid-course corrections could be made. It is also important that basic information is available to administrators, parents, and legislators to demonstrate whether resources have been invested properly.

There is still a lot to learn about small classes and classroom processes. CSR sites provide researchers with a rare opportunity—a large number of “natural laboratories” for answering questions about implementation, processes, and outcomes. If you are working in a setting where class sizes are reduced, please encourage the administrators to engage

in formative evaluation **and** research—for their benefit and for the benefit of the broader education community.

Footnotes

¹ Through good planning and flexibility, some districts are able to reduce class sizes without increasing per-pupil expenditures (see, for example, Achilles, Harman, and Egelson, 1995)

² Despite our efforts, we have not yet found a satisfactory way to combine these into a measure of “overall impact.”

³ The Tennessee state testing program for all students ends in Grade 8, but there was no indication that the benefits would not continue beyond that grade.

⁴ Henry Levin conducted an independent analysis of these variables, presented at the American Educational Research Association meeting in 1998, and obtained figures very similar to Krueger’s.

⁵ Our current research includes data on the employment of STAR participants after they leave high school. Hopefully, we will be able to provide direct evidence on this issue.

⁶ Other economists have called Hanushek’s conclusion of “no relationship” into question, showing that more appropriate analyses of his data—even based on pupil-teacher ratios—lead to the opposite conclusion (for example, Hedges, Laine, and Greenwald, 1994; Krueger, 2000).

⁷ With support from the William T. Grant Foundation.

⁸ Myself together with Gina Pannozzo and Charles Achilles.

⁹ Work is supported by The Spencer Foundation.

¹⁰ I emphasize that this is still theory at this point in time, derived from a combination of research findings, anecdotal reports, classroom observations, and debate about what is happening in the classrooms.

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