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ABSTRACT

This report summarizes the findings of some recent pivotal studies of class size, especially as they relate to students at risk. Of particular note is a large-scale study of class size, which was designed to test the conclusions of G. Glass and M. Smith (1978) and G. Robinson (1990) about the advantages of small class size. This study, Project Student-Teacher Achievement Ratio (Project STAR) was conducted in Tennessee beginning in 1985. Project STAR was a controlled scientific experiment that studied a large number of teachers (over 300 each year) and a large number of students (more than 10,000 in all) over 4 years. Both norm-referenced and curriculum-referenced tests were administered each year. Because of the tight experimental control of Project STAR and the magnitude of the study, educations can be confident of certain principles: (1) small classes (17 pupils or fewer) are more effective academically than larger classes (22 and above) in the primary grades in all subject areas; (2) the advantage of small classes is greater for minority students and students in inner-city schools than for white students; and (3) the advantage of small classes can probably be attributed to the fact that students are more actively engaged in learning compared to their peers in larger classes. Even these strong findings do not fully resolve questions of the cost effectiveness of small classes. In addition, there is still not enough information to tell whether small classes might be especially advantageous if the teachers received special training to take advantage of small class size. There is little information to tell whether small classes could be especially beneficial when used in conjunction with other compensatory or accelerated programs. Current research does not tell much about the effects of small class size in middle school or high school. (Contains 13 references.) (SLD)

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Jeremy D. Finn

LSS Spotlight on Student Success
A Digest of Research from the Laboratory for Student Success, No. 207

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The debate about class size is not new. In fact, the Babylonian Talmud, completed in the sixth century, contains class size principles for study of the Bible: "The number of pupils assigned to each teacher is 25. If there are 50, we appoint two teachers. If there are 40, we appoint an assistant, *at the expense of the town*" (translation from Epstein, 1976, p. 214, emphasis added). The two principles embodied in this statement have confronted one another ever since—the desirability of limiting the number of students working with one teacher, and the real economic considerations to be faced. Fourteen centuries later, we continue to debate the benefits and costs of small classes.

Assessing the immediate costs of small classes is relatively straightforward, although some schools are finding ways to minimize the expense through principles of "substitution" rather than "add-on." Assessing the benefits is more complex because of the uncertainties it involves. We are uncertain whether real achievement gains will be realized from smaller classes; we are uncertain whether important non-achievement gains might occur as well; and we are uncertain whether any of these benefits are worth the additional expense.

The intent of this report is to summarize the findings of some recent pivotal studies of class size, especially as they impact on students at risk. Three themes are apparent in this work:

- Small classes are academically advantageous, particularly for minority students or students living in poverty.
- Small classes promote the development of classroom behaviors that are important to learning and may provide significant long-term benefits.
- The advantages of small classes are best realized when there are no major obstacles to implementation.

RECENT RESEARCH ON SMALL CLASSES

The extensive research on small classes has been reviewed time and time again. Of the many reports that have been produced, however, three deserve particular attention because they created the foundation for the current state of knowledge. The first is Glass and Smith's (1978) statistical review—a "meta-analysis"—of the findings of over 80 empirical studies. While their review identified many weaknesses in these studies, including the fact that no scientifically controlled experiment had ever been performed on the question of class size, Glass and Smith arrived at two major conclusions. First, "reduced class size can be expected to produce increased academic achievement" (p. iv), and second, "the major benefits from reduced class size are obtained as the size is reduced below 20 pupils" (p. v).

Several years later, Educational Research Service (Robinson, 1990) synthesized a much larger set of studies. The review concluded that results were "mixed," that is, it is difficult at best to decide whether small classes are more effective than large classes, but to the extent that they are, two conclusions can be drawn. First, small classes are probably most beneficial in reading and mathematics in the early primary grades, and second, "students who are economically disadvantaged or from some ethnic minorities perform

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better academically in smaller classes" (p. 85).

In interpreting these findings, one caveat must be noted. The conclusions drawn by Glass and Smith and by Educational Research Service were not based on the analysis of pupil:teacher ratios for a school or district, since the pupil:teacher ratio can camouflage many features of instruction. The studies were based on actual counts of the number of pupils in a classroom. That these two ways of looking at class size—teacher:pupil ratios and actual student counts—do not have the same impact has been demonstrated repeatedly (see, for example, Boozer & Rouse, 1995). Small classes—to the extent that they are effective—owe their effectiveness to the small number of pupils in a particular classroom, with one or more teachers.

The third noteworthy study is a large-scale experiment designed to test the four propositions of Glass and Smith and Robinson—Tennessee's Project STAR (Student-Teacher Achievement Ratio). In 1985, all pupils entering kindergarten in 79 schools across the state were assigned at random to a small class (13-17 pupils), a regular class (22-26 pupils), or a regular class with a full-time teacher aide. Teachers were also assigned at random to the class groups; no special instructions of any sort were given to the teachers or aides. The class groupings were maintained through third grade, with assessments of achievement and self-concept administered annually.

Project STAR was built on the principles identified by Glass and Smith and by Educational Research Service. The intervention began in the early primary grades; small classes had fewer than 20 students; the study's design enabled researchers to look at the effects on minority as well as majority students. Project STAR was a controlled scientific experiment with a number of additional features: it was based on a large number of teachers (over 300 each year) and students (over 10,000 in all); students were followed for four years; and both norm-referenced and curriculum-based achievement tests were administered each year. Because of these features, Project STAR provided educators with definitive answers about the impact of small classes in the primary grades.

The results of Project STAR are presented in numerous reports (e.g., Finn & Achilles, 1990; Mosteller, 1995; Word et al., 1990). Although the study had many facets, six primary findings stand out:

- Statistically significant differences were found among the three class types on every achievement measure every year of the study;
- The differences were always between the performance of small classes and other class types—not between teacher-aide and regular classes;
- The same benefits were found for boys and girls alike;
- In each grade, there was a greater small-class advantage for minorities or for students attending inner-city schools on some or all measures;
- The small-class advantage began in kindergarten, increased by the end of first grade, and remained stable through grades 2 and 3;
- No differences were found on student self-concept or motivation.

The magnitude of the small-class advantage was about 2/10 of a standard deviation, or about .1GE in kindergarten in each subject area. The advantage was about 3/10 of a standard deviation, or about .2GE, in each subject in subsequent grades. The effect was slightly smaller among White students and somewhat larger among minority students each year. The minority-White achievement gap was reduced substantially in small classes, especially on the criterion-referenced tests. For example, in regular classes the pass rate for African-American students on the first-grade reading test was 14% below the rate for White students; in small classes, the difference was reduced to just 4%.

To the credit of Project STAR researchers, the students were followed in subsequent years after returning to regular-size classes; the continued effort was called the Lasting Benefits Study (LBS). The carryover effects of small classes continued through at least grade 7[1] although the small-class advantage was diminished to about 1/6 of a standard deviation on each test. To date, minority-White differences have not been examined in the follow-up study.

An important component was added to the grade-4 assessment that may provide the key to understanding why a consistent small-class advantage was found each

[1] Data collection continued through grade 11, but results for grades 7-11 have not been analyzed to date.

year. In grade 4, teachers were asked to rate each pupil on the *Student Participation Questionnaire*, a 26-item scale that reflects the effort the student puts forth in the classroom, the initiative the student takes with regard to learning tasks, and students' non-participatory behavior (disruptive behavior and passive/withdrawn behavior). Previous research had shown that these "engagement behaviors" are essential keys to learning in the classroom setting, and that poor engagement behaviors are especially problematic among students at risk (Finn, Pannozzo, & Voelkl, 1995). The questionnaire included such behaviors as paying attention, completing assignments on time, persisting when confronted with difficult tasks, and asking questions to get more information. The Project STAR follow-up showed that students who had been in small classes were significantly above their peers in regular-size classes on all behavior dimensions.[2] Small-class participation increased students' active engagement in learning—a set of constructive behaviors that persisted after small classes were disbanded.

At the same time, Project STAR and LBS provided only limited information about teachers' behavior in small classes. Observations of Project STAR classrooms indicated that small classes had greater numbers of students "on task" and that small-class teachers were more consistent in managing the classroom (Evertson & Folger, 1989). Other non-STAR studies support these conclusions. For example, Bourke (1986) found that teachers of small classes spend less time on classroom management and have more protracted interactions with their students. Kiser-Kling (1995) found that small classes are characterized by a greater percentage of "task-oriented events" and a smaller percentage of "institutional events" (e.g., discipline; organization).

WHERE DOES THIS LEAVE US TODAY?

Because of the tight experimental control exercised in Project STAR, and because of the magnitude of the study, educators can be confident of certain principles:

- Small classes (17 pupils or below) are more effective academically than larger classes (22 and above) in the primary grades in all subject areas.
- The advantage of small classes is greater for minority students or students attending inner-city schools than for White students.
- The advantage of small classes can probably be attributed to the fact that students are more actively engaged in learning compared to their peers in larger classes. It also seems that teachers spend more time in direct instruction and less time in classroom management when the number of students is small.

Questions About Implementing Small Classes

Question 1: *Is it worth it?*

Even the strong findings of Project STAR and LBS leave open the question of whether the benefits of smaller classes offset the costs. On the expenditure side of the ledger, economists and others have recommended that small classes be targeted to those schools and districts where their effects are needed most (e.g., Odden, 1990). And some schools are currently reconsidering their budgets with the perspective that small classes reduce the need for other specialized services.

On the benefit side, critics note that the size of the effects obtained in Project STAR are not large in comparison to other interventions, for example, peer tutoring or Success for All. Proponents note that there is more to Project STAR/LBS than meets the eye. In particular, the benefits associated with small classes were realized in every subject area in every year of the study; the "total" impact is much greater than any one statistic would reveal. The benefits of small classes were realized by boys and girls alike and by minority and White students alike. Small classes are not "band-aids" for particular students having specific problems, but impact all students.

More significantly, small classes may reduce the need for other costly services. For example, the LBS grade-4 study documented that students in small classes were less disruptive than their peers in regular classes. Likewise, a small-class initiative in a high-poverty school district in North Carolina resulted in reduced disciplinary problems over successive years (Kiser-Kling, 1995). In short, the time and effort needed to control discipline problems may be reduced. Likewise, there is some indication from Project STAR that grade retentions are reduced

[2] The *Student Participation Questionnaire* was completed again in grade 8 but, to date, the data have not been analyzed.

when students are in small classes (Harvey, 1993). Finally, there is the real possibility, though undocumented, that the need for special education and other remedial programs (for example, Reading Recovery) would be reduced. Small classes are a fundamental ingredient of all special education programs, not to mention other interventions to serve students having academic difficulty. Unfortunately, thorough analyses of these and other trade-offs have not been performed to date.

Question 2: *What conditions are necessary for positive outcomes to be realized?*

At present, about half the states in the U.S. are considering or implementing small-class initiatives for some or all of their school districts. The questions that will be raised about implementation are uncountable. For example, there is little or no information available to tell us whether still greater benefits would accrue if teachers received special training to take advantage of the small-class setting. And there is little or no information to tell us whether small classes might be especially efficacious if used in conjunction with other compensatory or accelerated programs.

At the same time, the Project STAR/LBS studies were conducted under conditions that, if disregarded, are likely to counteract some or all of the small-class advantage. First, the classes were comprised of a small number of students (12-17) with a single teacher in a single classroom. This is *not* simply a ratio of 15 to 1 (that might be attained with 30 students and 2 teachers) but truly a small class environment; this feature is essential. Second, the teachers were all fully certified elementary teachers in Tennessee, qualified for the positions they were given. It is an open question whether less qualified staff members could counteract the positive effects of small classes. Third, no regular school resources were "traded in" for the small classes (e.g., libraries or bilingual programs).

CONCLUDING REMARKS

This report emphasizes research on the effects of small classes in the early grades. There are two reasons for this. First, most of the current (and best) research to date has been conducted in kindergarten through grade 3. Second, the early years lay the foundation for much that follows. At the same time, research to date does not clearly delineate the conditions and consequences of small class size in the middle- or high-school grades. This work has yet to be undertaken.

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