Plato Knew

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ATTENTION
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Executive Summary

Although school reformers have not gone so far as attempting to reach the Platonic ideal student-teacher ratio of one to one, tutor to pupil, they have been enthusiastic advocates of reducing class size. It is a proposal which has enormous popular and political appeal, one of those innovations that just "feels" like it should work. Some two decades of research studies have indicated a relationship between classes of fewer than 20 students in the early elementary grades and achievement gains for the children fortunate to be in them.

Dr. Novello's paper focuses on two guiding questions: first, has all this research really proved anything, and second, what has happened in Nevada?

In response to the first question, the research results have, for the most part, been mixed. Some have suggested dramatic and lasting achievement gains from reduced class size, some have produced effects which had no staying power, and some have shown no relationship whatsoever between class size and achievement. Quite a bit of the research has indicated that teaching technique was an essential ingredient for success.

Most of the large state-funded studies, such as those in Wisconsin, Indiana, and North Carolina have suffered from obvious research flaws, but Tennessee's *Project STAR (Student-Teacher Achievement Ratio)* has been touted in all the literature for its accuracy. Kindergarten, first-, second-, and third-grade pupils and teachers in 79 schools were randomly assigned to three different kinds of classes (13-17 students, 22-26 students without or with an instructional aide). The children in the small classes were reported to have dramatically outperformed their counterparts in the larger classes. The presence of a second teacher, or instructional aide, had no effect. Studies tracking these same students all the way through high school showed that the ones who had been in the small classes continued to achieve at a higher level than the others.

While these results were very impressive to school administrators, politicians, and lay people, a trained researcher could immediately spot problems with the studies themselves. For example, failure to control for certain variables such as differences or similarities in the classes or teachers, misrepresentation of correlational research as causal, and considering a result to be significant when it was not of *statistical significance* might have seriously corrupted the data.

Responding to the second question posed earlier, Nevada has spent around $254 million to achieve nothing. We still rank 44th out of 51 (the states and the District of Columbia) in teacher-student ratio. The main difficulty has been the lack of sufficient rooms to accommodate smaller classes, since funding for capital expenditures is a district issue. Team teaching has been as unsuccessful as *Project STAR* predicted it would be.

Dr. Novello's recommendation is to abandon the class-size reduction plan in Nevada and institute strict academic standards with high-stakes testing to see if the standards are being met. The money that we have been spending on trying to achieve small classes could be used to reward teachers whose students meet the standards and succeed at the tests.

Introduction

Plato knew that the ideal class size was one. His education consisted of question-and-answer dialogues with his teacher, Socrates, as they strolled the streets of ancient Athens. Jean-Jacques Rousseau knew it also. His fictitious orphan, Emile, was raised and educated by a tutor. Throughout history it has been shown time and time again that the one-to-one relationship of pupil and tutor *always* benefits the pupil. Based on that information, it is a wonder we have not tried to improve upon the ratio, providing each student with two or more teachers.

Recognizing that the Platonic ideal of one-to-one, let alone the fantasy of two for one, is unattainable, the concept of small classes persists in being a seductive one. Common sense tells us that a teacher with 15 pupils can give each one of them more attention than if he has 30 students. That is, of course, if he is the kind of teacher who is inclined to give individual attention. Evidently parents tend to become more involved when their children are in small classes. Observers of small (under 20) and large (over 20) classes have reported greater friendliness, socialization, and interactivity and fewer disciplinary incidents in the small classes. Any reasonable teacher would be happier with a small group to manage and mold than a larger one.

Research

That common-sense "gut feeling" has led school reformers and teachers and researchers to try to prove the advantages of small classes. For the most part, their results have been mixed. Mary Smith, Gene Glass and others (1982) examined a number of research studies pertaining to the relationship of class size to achievement and other outcomes. They found that small classes were associated with higher achievement at all grade levels, especially if students were in the small classes for more than 100 hours, and if student assignment was carefully controlled. Jeremy Finn (1998) reported on a 1989 study by Slavin of empirical research that used comparable students in classes of fewer than 20 for at least a year, concluding that the reduced class size had a small positive effect on students, but the effect did not persist after their reduced class experience. In 1986, Glen Robinson and James Wittebols published a review that grouped similar kinds of research studies. They concluded that the clearest evidence of positive effects was in the primary grades, particularly kindergarten through third grade, and that reducing class

size was especially promising for disadvantaged and minority students. They cautioned that positive effects were less likely if teachers did not change their instructional methods and classroom procedures in the smaller classes. Holly Johnston's 1998 Master's paper reached the same conclusion.

Other research analyses have concluded that class size reduction does not have an appreciable effect. Tom Tomlinson (1988) examined trend data from the 1950s to 1986 in the United States and did not find any consistent relationship between class size and standardized test scores. Allan Odden (1990) reviewed the existing research and argued that a system-wide class reduction policy would produce only modest gains in student achievement and incur an unjustifiably high cost. An analysis (1998) of the relationship between class size and student achievement for Florida students using 1993-94 school level data found no relationship between smaller classes and student achievement. While Ronald Ferguson (1991), using data from more than 800 Texas school districts containing more than 2.4 million students, found that district student achievement fell as the student/teacher ratio increased for every student above an 18 to 1 ratio, he also noted that measures of teacher quality such as literacy skills and professional experience were even more strongly related to higher student scores. Barbara Harvey (1994) noted that small class size did not remediate poor academic achievement among kindergartners and first graders who had already been retained. And in an extremely sophisticated study, Shuwan Chiu, James Wardrop, and Katherine Ryan (1999) used the unbalanced nested ANOVA to determine that class size interacted with course level, not with motivation or discipline, in student evaluations.

The granddaddy of the naysayers over the years has been economist Eric Hanushek from the University of Rochester. He applied econometric statistical investigation to the relationship between class size and student performance and found as many negative as positive estimates. In his 1998 testimony to the Federal Government, he concluded:

Existing evidence indicates that achievement for the typical student will be unaffected by instituting the types of class size reductions that have been recently proposed or undertaken. The most noticeable feature of policies to reduce overall class sizes will be a dramatic increase in the costs of schooling, an increase unaccompanied by achievement gains. (Page 1)

There have been many opponents of Hanushek regarding costs, among them Jeremy Finn, Charles Achilles, Rob Greenwald, Larry Hedges, and Richard Laine, all of whom used

different analytical techniques on the same data. One of the most outspoken Hanushek critic has been Harold Wenglinsky, who conducted a 1997 study called *When Money Matters.* He used data about fourth graders and eighth graders drawn from three national level databases generated by the National Center for Education Statistics and found that class size served as an important link between school education spending and student mathematics achievement at both levels, although in different ways. At the fourth-grade level, lower student/teacher ratios were positively related to higher mathematics achievement, while at the eighth-grade level, lower student/teacher ratios improved the school social environment which in his thinking would lead to higher achievement. He also found that the largest effect occurred in districts where there were below-average socioeconomic status students, accompanied by above-average teacher costs.

Project STAR and Some Starlets

Beginning in 1984, Indiana's *Prime Time* project allocated money to support the reduction of class size to 18 in first-grade, second-grade, and then kindergarten and third-grade classrooms. Implementation of *Prime Time* was not rigorously controlled, and the results were mixed.

Beginning in 1990, Burke County, North Carolina, pilot-tested and then phased in a class size reduction project in the county school district. The project also included professional development activities covering instruction and assessment, so the results were not simply a function of reducing class size. The Burke County initiative found that students in the smaller classes outperformed a matched comparison group in first, second, and third grades on both reading and mathematics achievement tests and that the percentage of classroom time devoted to instruction in the smaller classes was 86% compared to 80% in the larger classes.

Beginning in 1996-97, Wisconsin initiated a class size reduction program called the *Student Achievement Guarantee in Education (SAGE) Program.* In addition to class size reduction, participating schools were required to implement a rigorous academic curriculum, provide before and after school activities for students and community members, and implement professional development and accountability programs. Preliminary findings were that *SAGE* first-grade students performed consistently better than comparison students on the Comprehensive Test of Basic Skills and that the achievement gap narrowed between white and

African-American students in the *SAGE* smaller classes, but widened in the larger classes. Second-grade *SAGE* students' academic achievement remained higher than that of the comparison group, but the difference did not increase substantially.

Anyone familiar with the rigors of educational research could immediately spot the flaws in the above studies. Indiana admitted to its lack of controls, Burke County included professional development as a variable without controlling for it, and the *SAGE* program, in addition to adding uncontrolled variables, used volunteer schools who chose to participate, eliminating the all-important factor of random selection.

This brings us to Tennessee's *Project STAR (Student-Teacher Achievement Ratio)* and its subsequent studies. This nearly flawless research project was huge, involving kindergartens through third grade classes in 79 schools, more than 300 classrooms and 7000 students whose students were tracked through first four, then eight, and finally, all twelve years of school plus kindergarten. Teachers and students were randomly assigned to the three different kinds of classes (13-17 students, 22-26 students with or without an instructional aide). All participating schools implemented at least one of each of the three types of classes in order to control for influences coming from the variations in the quality of the participating schools that might affect the quality of the classroom activity. The teachers were given no special training or materials and both norm- and criterion-referenced standardized tests were administered at the end of each school year. The only fly in this nearly perfect ointment was that the participating schools may have volunteered for that privilege.

Project STAR found:

- Smaller class students substantially outperformed larger class students on both standardized (Stanford Achievement Tests) and curriculum-based tests (Basic Skills First). This was true for both white and minority students in smaller classes, and for smaller class students from inner city, urban, suburban, and rural schools.
- The positive achievement effect of smaller classes on minority students was double that for majority students initially, and then was about the same.
- A smaller proportion of students in the smaller classes was retained in-grade, and there was more early identification of students' special educational needs.
- There were no significant differences in academic achievement for students in the larger classes with or without an additional instructional aide.

Three follow-up studies from Tennessee have allegedly corroborated the excellent results of *Project STAR*. The *Lasting Benefits Study* tracked the same students into fourth grade, when the

smaller-class students returned to regular size classes and found that they still outperformed the other students in all academic subjects. This lasted through eighth grade, but decreased in magnitude. HEROS, Inc., a nonprofit research and evaluation organization, undertook a longitudinal study of the effects of *Project STAR* through high school and released preliminary findings in 1999, concluding:

> ...students who attended small classes completed more advanced courses than did students who attended regular and regular/aide classes. Therefore, it appears that small-class students were better prepared to enter college than their peers from the larger size classes. Furthermore, it seems that the students who were in STAR small classes were less likely to be retained, and were less likely to drop out of school. (Pate-Bain, Page 6)

Helen Pate-Bain, the Chairperson of HEROS, Inc., just happens to be the same person who initiated *Project STAR*.

As might be expected, one of the most vocal critics of the project is our old friend, Eric Hanushek. In his government testimony, he said:

If smaller classes were valuable in each grade, the achievement gap would widen. It does not. In fact, the gap remains essentially unchanged through the sixth grade, even though the experimental students from the small classes return to larger classes for the fourth through sixth grades. The inescapable conclusion is that the smaller classes at best matter in kindergarten.

The STAR data suggest that perhaps achievement would improve if kindergarten classes were moved to sizes considerably below today's average. The data do not suggest that improvements will result from class size reductions at later grades. Nor do they suggest that more modest reductions, say to 18 or 20 students per class, will yield achievement gains (Page 4).

A serious analytical error appears in the results of the latest study in the STAR galaxy, one which might have infected the earlier two as well: the HEROS blithely describe their highly positive findings (as quoted above), failing to mention that only two of the outcomes had *statistical significance*. To a researcher, if a result does not have statistical significance, it cannot be said to have any significance, period.

Discussion

In addition to the matter of statistical significance which marred the results of at least one *Project STAR* follow-through study, all of the research pertaining to class size has been affected by another misrepresentation of the data. Careful perusal of the studies reveals the consistent use of words such as "link, relationship, effect, association." These are the words of correlational research and in no way do they imply causality. The high correlation of small classes and high test scores simply does not prove statistically that the small classes *cause* the high test scores. In order to prove that small classes cause higher achievement, a researcher would have to administer a pre-test, followed by the treatment, including control for nonessential variables, and conclude with the same test again. There was no pre-testing done in any of the research, meaning that the studies had to *assume* similarity of the treatment groups, effectively eliminating the possibility of proving class size as a cause of enhanced achievement.

The study done by Harold Wenglinsky, called *When Money Matters,* reached some extraordinarily questionable conclusions. For example, his prediction that an improved social environment in a classroom would lead to higher achievement is unwarranted. He also engaged in some mathematical trickery by equating a percentage of a grade level to the same percentage in speed of progress. In other words, he said that a small-class student who was one-third of a grade level ahead of his counterparts would be expected to progress 33 percent more quickly than he would have in a large class. There is no logical basis for that kind of formula.

Nevada

In 1989, under Governor Bob Miller, Nevada enacted the Class-Size Reduction Act (CSRA). The measure was designed to reduce the pupil-teacher ratio in public schools, particularly in the earliest grades. According to a report by the National Conference of State Legislatures, the designated ratio in Nevada is 15:1, the lowest of any state in the nation.

From its inception through 1997, the latest year for which figures are available, Nevada has spent some $254 million on the program. Since facilities are funded entirely with local capital expenditure money, the state has been unable to compensate for the lack of sufficient classrooms to accommodate the target ratio. Therefore, around 36% of the reduced first- and second-grade classes have been team taught rather than self-contained.

As of 1999, Nina Shokraii Rees and Sarah Youssef of the Heritage Foundation reported that the pupil/teacher ratio in Nevada was 19:1, and the pupil/teacher rank was 44th out of 51 (50 states and the District of Columbia). A great deal of money has been spent on this project with very little to show for it.

Clearly, one of the problems in Nevada has been the attempt to reduce class size by putting two teachers in one room with a large group of students. The STAR results showed no achievement gains under those circumstances. Another problem faced in Nevada that was not a consideration in Tennessee, is the diversity of the population coming from multiple language backgrounds. Other programs, such as Reading Recovery, Reading Renaissance, Success for All, or even the much-maligned DISTAR might make better use of the funds.

Conclusion and Recommendations

As the WestEd writers said in their Policy Brief, "Class size reduction has enormous intuitive and political appeal" (Page 11). However, they quickly added,
"A fundamental condition for the success of CSR *or any educational intervention* is good teaching....Research, experience, and a policy climate of higher expectations suggest that novices and veterans alike may need support to learn strategies that build on the opportunities smaller classes present" (Page 11).

In his 1999 book promoting small classrooms, Charles Achilles stressed the importance of observing teaching in action and demonstrating specific applications of teaching and learning in those classrooms.

The way that Eric Hanushek put it was:

The quality of the teacher is much more important than class size. Considerable evidence shows that by far the largest differences in the impact of schools on student achievement relate to differences in the quality of teachers. Thus, whether or not large-scale reductions in class sizes help or hurt will depend mostly on whether or not any new teachers are better or worse than the existing teachers. (Page 4)

Teachers do not just automatically change their behavior and creating substantial changes in teachers' classroom behavior is no easy feat.

Perhaps, rather than attempting to reduce class size, Nevada should capitalize on its corps of teachers, give them the funds and let them use their own ingenuity to meet tough standards

and produce results on well-designed high-stakes tests. Some questions to ponder when considering class size:

- Is compulsory attendance in a class of 15 more motivating than in a class of 25?
- Is learning arithmetic in a group of four better with four groups or eight groups?
- Can a teacher who doesn't know the subject hide that fact in any size class?
- How many introductory college classes are small in size?
- Does learning how to study have anything to do with anything?

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