Class Size Reduction: What It Is, and Isn’t

Class size reduction programs are popular with the public. In the last 10 years, 40 states have implemented such programs. Class size reduction seems to enhance the social experiences of both teachers and students. Teachers who are effective with small classes know how to individualize teaching. They have clear expectations, they are less distracted by discipline problems, and they balance teacher-directed and child-centered teaching.

People have been discussing the benefits of class size reduction programs for many years. Such programs are credited with improving the achievement of students in the early grades and in particular those considered to be at risk. Unfortunately, people often mean different things when they use the term class size reduction. Some define it as a reduction in the average number of students per teacher school-wide. Others say it means a reduction in the number of students in a particular classroom. Terminology is used loosely in some research, too. Some researchers conflate three related but distinct terms: class size reduction, pupil-teacher ratio, and class size.

UW-Madison education professor Beth Graue and colleague Erica Rauscher recognize that such blurring of meanings poorly serves the needs of education policymakers and stakeholders. To sort out the terminologies, they interviewed scholars who have worked on the topic and began unpacking the assumptions used in research, policy, and practice.

Let’s consider a hypothetical school with 30 certified staff members and 300 K–2 students—a 10:1 ratio. One might consider a pupil-teacher ratio the appropriate tool for understanding class size and its impact on instruction. But wait—the pupil-teacher ratio approach is actually intended for economic analyses, not for analyzing instructional effectiveness. The pupil-teacher ratio addresses staff expenditures, including those for both classroom and specialist teachers. In our hypothetical school, the 10:1 ratio represents the average of lower special education ratios and higher general education ratios—not the actual number of students per teacher in every child’s classroom. Thus, a school’s pupil-teacher ratio says little about what actually happens in a classroom and how human resources are allocated.

It isn’t surprising that problems arise when (a) implementations of class size reduction programs rely on data from pupil-teacher ratio studies, (b) data that describe class size and pupil-teacher ratio are used to support (or undermine) class size reduction programs, and (continued on next page...
FROM THE DIRECTOR

Research engages the field of practice

The Education Sciences Reform Act of 2002 established the Institute of Education Sciences (IES) within the U.S. Department of Education to bring rigorous and relevant research, evaluation, and statistics to the nation’s education system.

Solid research has the potential to provide parents, educators, students, policymakers, and the general public with reliable information about educational practices that improve academic achievement and that improve educational access for all students.

Research focuses on solving particular problems, for example, closing the achievement gap, helping more students perform well on state assessments, and improving the cost-effectiveness of various policies and practices.

In this issue of Highlights you will find examples of using research to guide practice: A study of the connections between distributed leadership and instructional change; a study of differentiated instruction in mixed-ability settings; a study of Class Size Reduction policies; and a call for more research on prevention and early intervention services that could reduce risk of failure for linguistically diverse students.

Adam Gamoran
WCER Director
Professor, Sociology and Educational Policy Studies

(c) tools to evaluate class size reduction programs use the assumptions underlying pupil-teacher ratios.

Teaching and group size

The logic of class size reduction implies a chain of effects: Smaller groups mean more intimate learning relationships, which then provide more in-depth knowledge. Instruction becomes more responsive to student needs, yielding greater achievement. This logic also implies that teachers in class size reduction contexts actually know how to create these changes in their classrooms, or that they are provided with the support necessary to achieve these goals.

But research has often found the opposite: that teachers use the same strategies regardless of class size. While teachers claim to provide more individualized instruction in smaller classes, observations of teaching practice don’t bear this out.

Graue points out that investments in class size reduction need to be accompanied by support for teacher change. States and districts should make proportional investments in professional development so that educators have the tools they need to make the most of smaller classes.

Instruction and professional development

Student outcomes are difficult to interpret when class size reduction is not clearly described or enacted. To better understand the outcomes, Graue says, we need to better understand the nature of instruction in varied instructional contexts. That will require a two-pronged approach:

1. Use the growing body of research on best practices to build a framework for instructional strategies that capitalize on the benefits of smaller class size. Class size reduction requires specific actions by teachers to change the learning opportunities available to students.

2. Provide professional development for teachers and administrators. Next-generation efforts to implement and research class size reduction should focus on the knowledge educators need to use class size reduction effectively and on models of education that develop that knowledge.

Beyond class size

To ask two related and larger questions: Is class size reduction intended to close the achievement gap? Or is it a tool to boost achievement for all students? (See related story about tracking, page 5.) If the former, a targeted approach is called for; if the latter, a universal approach.

Graue says that questions about class size reduction point to the basic inequality of schooling in the U.S. What investments are we as a society willing to make to put success within reach of all children? What mechanisms might reduce existing inequalities?

Class size reduction alone cannot undo the damage done to children by poverty, violence, or inadequate child care, Graue says. Benefits aside, class size reduction is enacted in an institutional context of high-stakes testing, crumbling infrastructure, increasing numbers of children with high needs, and competition from other programs for teacher attention and effort. Committing resources to class size reduction is a good first step toward correcting the inequities that form the foundation of schooling. But alone, it’s not enough.

Beth Graue

Adam Gamoran
WCER Director
Professor, Sociology and Educational Policy Studies
Scientific Teaching in Practice

The U.S. trains outstanding scientists. Some doctoral students emerge as rigorous experimentalists and strong analytical thinkers. They’re intellectually prepared for any number of employment opportunities.

But universities still need to improve in two areas: preparing undergraduate students as scientists and preparing graduate students to teach.

Too often, undergraduate teaching involves transmitting factual information, rather than encouraging analytical thinking. Graduate students and postdoctoral researchers who will become teachers are not usually taught how to teach such skills. To produce a generation of science undergraduates who think scientifically, teachers need to know how to foster scientific curiosity, reasoning, and problem solving.

The Wisconsin Program for Scientific Teaching (WPST) at the University of Wisconsin–Madison trains graduate students and postdoctoral students in the life sciences to practice this kind of scientific teaching. Participants in the WPST Teaching Fellows Program develop scientifically based teaching materials that define students’ learning goals, include classroom activities to address these goals, and assess student learning. Participants explore the challenges and benefits of diversity in teaching methods and in the students they teach.

The WPST Teaching Fellows Program includes an 8-week course, Teaching Biology, followed by developing units and implementing them in the classroom.

From 2004 to 2007, 44 Fellows participated. They developed 17 ‘teachable units’ and posted them online. A ‘teachable unit’ is built on a scientific framework and addresses a challenge in the instructor’s courses. As they develop unit materials in teams of 2 or 3, Fellows learn an iterative process of instructional design. They list concrete learning goals, design activities to meet the goals, and revise their instruction based on evaluation of progress toward the goals. Peer review and dissemination are embedded in the process.

Examples of units include:

- **Statistical tools for Biology**: active learning exercises in which students learn how to use statistics to guide experimental design; links to inquiry-based lab experiments on behavior and population biology of *Daphnia magna* (planktonic crustaceans).

**Influenza**: active learning exercises in which students learn about virus structure and life cycle; students model the epidemiology of outbreaks of viral diseases based on hypothetical viruses with various quantitative features.

Assessment of 44 participating Fellows shows that they devoted, on average, greater than 66% of class time to active learning events. They included teaching methods to reach diverse students. All units described learning goals for one or more content areas. Most units (76%) also stated the expectation that students would learn one or more aspects of scientific discovery, such as the scientific method, or science as an iterative process based on empirical evidence. Nearly every unit included some form of baseline data collection to assess students’ prior knowledge or misconceptions.

Most Fellows responding to a survey said that scientific teaching is a difficult but worthwhile effort. They said they were confident they are good teachers, and that they felt part of a scientific teaching community.

Christine Pfund, associate director of the WCER-housed Delta program and co-director of the WPST, co-authored an assessment study of the WPST Fellows program in partnership with WCER evaluator, Christine Pribbenow. This study indicates that the Teaching Fellows Program effectively trains scientific teachers, as reflected through practice, philosophy, and the products created:

- Fellows learned the key elements of scientific teaching and integrated them into their teaching.
- They acquired a scholarly approach to teaching.
- They developed classrooms that reflect the nature of science.
- They moved from teacher-centered toward student-centered teaching philosophies.
- They developed a community through partnering with other instructors to create online teaching materials and peer-reviewed publications.
The Merits of Training Mentors

In research universities, graduate students and postdoctoral researchers often serve as the primary mentors for undergraduate researchers. This arrangement provides undergraduates with guidance from someone who is accessible and whose primary focus is laboratory work. It also provides graduate students and postdoctoral researchers with experience as mentors.

The Wisconsin Mentoring Seminar helps mentors sharpen communication skills through exercises that include interviews with their undergraduate researchers. They learn to recognize and reconcile their differing expectations about time commitment, independence, and skill proficiency.

Christine Pfund and colleagues at the UW–Madison Wisconsin Program for Scientific Teaching developed and evaluated this mentor-training seminar. By improving mentors’ skills, it aims to enhance the research experience of undergraduate students. Participating science graduate students and postdoctoral researchers are learning to communicate more effectively, discuss mentoring approaches, consider issues of human diversity, and apply a “scientific teaching” approach to mentoring.

That means mentors are encouraged to approach teaching with the same rigor and spirit of experimentation that they bring to their science research. They develop their own systematic approaches by identifying objectives and approaches to overcome associated challenges. Then they evaluate their approaches considering feedback from their undergraduate researchers, peers in the laboratory, and research advisers.

Each seminar consists of 8 sessions of discussion facilitated by faculty or staff using a collaborative, problem-solving format. The seminar was developed using an iterative approach of design, testing, evaluation, and revision.

From 2003-2005 the mentoring seminar was offered 22 times at 11 institutions. To evaluate the impact of the seminar, Pfund and colleagues gathered data about mentors who either did or did not participate in the seminar and the undergraduate researchers under their supervision at UW-Madison. Undergraduate researchers emphasize communication as a key feature of good mentoring and they consistently report that mentors who participated in the seminar were more available to them, were more interested in them as individuals, and gave them more independence. These mentors were significantly more likely to discuss expectations with their undergraduate researchers, to consider issues of diversity, and to discuss mentoring with peers and faculty than are those who did not participate in the seminar. With support from NSF, WCER researchers Pfund and Christine Pribbenow, in partnership with Robert Mathieu and others from campus, are now working to adapt research mentor training across STEM and are implementing this training broadly through the Delta Program. In addition, WCER technical staff member Jessica Miller has designed a website which will allow users to build their own research mentor training curriculum online.

Christine Pfund
Lack of Research Hinders ELL Teaching

More than 20% of K–12 students speak a language other than English at home, and that percentage is expected to rise to 40% by the year 2030, according to the U.S. Dept. of Education.

Academic skills are considered critical to students’ future physical, emotional, and vocational wellness. But public school records reveal that English language learner (ELL) students, as a group, attain the lowest academic achievement scores. A lack of academic skills is related to poorer health and increased rates of pregnancy, incarceration, and mental illness.

Student-service providers, including school psychologists, want to offer linguistically diverse students the services that are effective and legally required. But they need access to professional guidance, culturally appropriate assessment tools, and effective intervention strategies.

Unfortunately, the school psychology literature does not reflect the linguistically diverse demographics of children attending U.S. schools, says UW-Madison education professor Craig Albers. Albers and colleagues conducted a study of peer-reviewed articles published between 1995 and 2005 in leading school psychology and other journals (see sidebar).

They found that published research documents the problems of linguistically diverse students, including lower self-efficacy and self-concept, significantly higher reported social alienation, and disproportionately high levels of certain disorders (e.g., post-traumatic stress, anxiety, depression, suicidal ideation). But they found relatively little research addressing prevention and comprehensive early intervention services that could reduce risk.

Moreover, few articles focused on ELL-related issues, and of those that did, most contained no information that would guide practices with ELL students. This suggests significant issues have yet to gain the attention of researchers, educators, and student-service providers, Albers says.

In particular, Albers’s review revealed pronounced gaps in the literature concerning:

1. administering and interpreting social-emotional and behavioral assessments,
2. reports leading to the development of new assessments,
3. implementing or improving social-emotional and behavioral intervention strategies for ELL students, and
4. reports focusing on the development of new intervention techniques.

Without this kind of information, Albers says, school psychologists and other educators may feel unprepared to respond to their students’ academic, social-emotional, and mental health needs.

Albers says school psychologists need more ELL research in these critical areas:

1. traditional assessment practices, including continuing examination of potential bias relating to cognitive testing and other assessment procedures;
2. knowledge and application of assessment and intervention services relating to ELL students’ behavioral, social, and emotional needs, resulting in well-defined evidence-based practices;
3. prevention and early intervention services with ELL students, including the extension of response-to-intervention (RTI) procedures; and
4. training and professional development regarding ELL student issues.

This research was partially supported by an award from the Wisconsin Alumni Research Foundation.

About This Study

Albers reviewed journals that (a) focus on school psychology, special education, speech-language, or counseling; (b) are peer reviewed; (c) transmit research results to practitioners; and (d) focus on K–12 issues or students aged 3–21.

An individual article was considered to focus on ELL students if it specifically indicated that the topic was directly connected to ELLs or if ELL participants were central to the study.

ELL-related articles published within school psychology journals were categorized as having a primary focus on (a) assessment, (b) consultation, (c) intervention, or (d) other miscellaneous issues.

Most coverage of ELL student-related issues occurred in the special education journals (11.3% of the articles). Speech-language journals accounted for 10.1%, school psychology journals 6.5%, and counseling journals 4.8%.
New Directions for Mixed Ability Instruction

How can teachers best organize students for instruction? After a century of research on tracking and ability grouping, one might expect a definitive answer to this question. Yet every approach has disadvantages as well as advantages, and the consequences vary by context.

Here’s the dilemma: On the one hand, schools are asked to provide all students with a common set of cognitive and social skills essential for full civic and economic participation in adult society. On the other hand, schools are structured to sort and select students for different career paths based on their individual orientations and capacities. This tension between commonality and differentiation underlies the tracking debate. The former aim is consistent with mixed-ability teaching. The latter is consistent with tracking. The debate has no simple resolution because school systems embody both goals.

UW-Madison sociology and education professor Adam Gamoran says recent research has advanced knowledge of tracking in three areas.

First, international scholarship offers new knowledge about the consequences of tracking in contexts beyond the U.S. and the UK, where most prior research has been conducted. International research shows that, despite the various forms of tracking, the results are broadly similar: Student achievement tends to diverge, and tracking reinforces initial differences by social class.

Second, studies of attempts to reduce or eliminate tracking and ability grouping yield important insights into why tracking resists change. For example, teachers oppose detracking when they believe they are not equipped to successfully instruct students of widely varying abilities in the same classroom. Mathematics and foreign language teachers tend to be more resistant than teachers in other subjects due to beliefs about the sequential nature of knowledge in these disciplines.

Third, studies on classroom assignment and instruction point toward new possibilities. These new approaches don’t resolve the tension between commonality and differentiation. They may, however, capture the benefits of differentiation for meeting students’ varied needs without intensifying the inequality that commonly accompanies tracking and ability grouping. For example, the technical challenges of mixed-ability teaching have defied easy solution. Recent research, however, has identified conditions under which effective teaching in mixed-ability contexts may be more successful than in the past. Two approaches merit further experimentation in research and practice: (a) raising standards for low achievers in differentiated classrooms and (b) providing differentiated learning opportunities in mixed-ability classrooms.

Raising standards for low-achieving students

Years of tracking research show that low-level, dead-end courses should be eliminated. High school courses such as general math and business English do not prepare students for postsecondary opportunities. But this widely accepted conclusion still leaves open the possibility that providing meaningful instruction at all skill levels could make differentiated classes an effective way to organize students for learning.

Gamoran says at least three changes are needed to make low-track classes more effective:

1. The assessments toward which students strive need to be tied to futures that are more visibly meaningful to students than is currently the case.
2. The assessments need to offer incentives for students as well as schools.
3. The connection between the course curriculum and the assessments needs to be tighter than has typically been the case in the U.S.

Providing differentiated learning opportunities

Studies of effective instruction in mixed-ability classes show several common ingredients. First, the teachers in these success stories all recognized that students differ in the skills and interests they bring to class. Second, all of the successful cases used differentiated instruction involving either supplemental instruction or matching students’ varied skill levels to particular instructional strategies within the mixed-ability setting. Third, the teachers in each case had access to important resources that allowed them to supplement instruction and tailor it to students’ needs.

The bigger picture

Ultimately, how students are arranged matters less than the instruction they encounter. Research in the last decade has focused on the instruction provided to students assigned to classes in different ways. Bringing together research on tracking with research on teaching offers the most useful way to continue to shed light on this topic.
Distributing Leadership to Support Instructional Change

Discussions of distributed leadership have been dominated by descriptions of what it is and what forms it takes. Now a plausible case can be made that distributing leadership to teachers can support instructional change, says UW–Madison education professor Eric Camburn.

In a 2008 study Camburn determined that configuring and activating teacher leadership positions can support the adoption of specific instructional practices advocated by the America’s Choice program.

The America’s Choice program distributes leadership responsibilities to teacher leaders in schools. The mechanisms driving instructional change in a sample of urban elementary schools was Camburn’s focus.

America’s Choice calls for two teacher leader roles—design coach and literacy coordinator. Design coaches provide broad support for implementing the America’s Choice program. The literacy coordinators specifically help teachers implement the program’s early grades literacy curriculum.

Camburn’s study measured the extent to which these teacher leaders served as resources for adopting new teaching practices. He also measured changes in instructional practice, including the use of ability grouping, individualized instruction, and think-alouds.

Because Camburn wanted to determine how these factors worked over time, he examined 31 schools early in their adoption of America’s Choice and again 2 years later.

Teacher leaders as resources

In 2001–2002, teachers in the 31 America’s Choice schools were about three times more likely than their peers in comparison schools to work with teacher leaders in their schools. In 2003–2004, these teachers were only slightly more likely to work with teacher leaders than teachers in comparison schools. Camburn cautions that these results do not show that teachers’ work with teacher leaders in America’s Choice schools decreased over time; rather, teachers’ collaboration in the comparison schools increased during this period.

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African American teachers spent significantly more time working with teacher leaders than teachers of other races in both school years studied. Teachers with fewer years of experience spent more time working with teacher leaders in the 2001–2002 school year, but the estimate for teacher experience was not statistically significant during the 2003–2004 school year. Teachers with less content knowledge for teaching literacy also spent more time working with teacher leaders. Camburn says these latter two results may indicate a rational allocation of leadership resources in schools: Less experienced and less knowledgeable teachers receive greater attention from teacher leaders.

Instructional practice changes

Camburn found that teachers in the sampled America’s Choice schools were much more likely than those in comparison schools to use the kinds of teaching practices called for in the America’s Choice design. These include explicit instruction in writing, teacher conferencing, attention to literary techniques, and guided-reading strategies. Further, African American teachers were much more likely than teachers of other races to engage in these practices. Teachers’ work with teacher leaders was one of the strongest predictors of the instructional outcome measure.

The study next sought to understand whether there is a connection between these two results: Did collaboration between America’s Choice teachers and their teacher leaders actually lead to more use of the practices the program advocates?

Camburn’s study found solid evidence supporting this hypothesis, and the result held across both school years sampled. This finding suggests that design coaches and literacy coordinators continued to support teachers’ adoption of literacy practices consistent with the America’s Choice design.

Camburn mentions two limitations of this study. First, the results are based on a specific case—namely, the distribution of leadership to teachers within the context of a single comprehensive school reform program. A second limitation lies with the study’s use of annual surveys, rather than multiple data sources, to measure instruction and key independent variables. These limitations notwithstanding, the study advances research in this area by going beyond the description of distributed leadership to examine its consequences for instructional change.

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