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PRESS CONTACT:
Lydia Pelliccia
202.422.5205, lpelliccia@lipmanhearne.com
Gladys Arrisueño
202.797.6477, garrisueno@brookings.edu

New Study Shows the Unintended Consequences of Moving More Pupils Into Eighth Grade Algebra and Other Advanced Math Classes

Approximately 120,000 Unprepared Students are Now Struggling

Washington, D.C., September 22, 2008 – A new report from the Brown Center on Education Policy at the Brookings Institution finds that the nation's push to challenge more students by placing them in advanced math classes in eighth grade has had unintended and damaging consequences, as some 120,000 middle-schoolers are now struggling in advanced classes for which they are woefully unprepared.

"The 'democratization of algebra' sounds like a worthy goal – it certainly stems from good intentions," says Tom Loveless, the Brown Center's director and author of the new study, which is being released as an advance excerpt of the 2008 Brown Center Report on American Education. But, he adds, "when a large number of students who don't even know basic arithmetic are placed in classes with students several grade levels ahead of them, the result is false democratization. That's bad for the misplaced students, and it's bad for their well-prepared classmates too."

Algebra in eighth grade was once reserved for mathematically gifted students. But a campaign to extend algebra to many more eighth graders, which began in the 1990s on the grounds that greater equity and future opportunities require broader access to algebra, has had considerable success: The proportion of eighth graders taking algebra nearly doubled from 1990 to 2007, reaching 31 percent, and today more U.S. eighth graders take algebra than any other math course. Until now, however, no empirical evidence has existed to demonstrate whether the push for universal eighth-grade algebra is a good idea, particularly for students who have weak math skills.

The new Brown Center study tackles this question by examining rarely used research data from the National Assessment of Educational Progress (NAEP). Unlike most NAEP data, these restricted-use files allow investigators who have obtained a license to drill down and examine student-level information on a nationally representative sample of 160,000 eighth graders.

The results are sobering. Between 2000 and 2005, as enrollment in advanced math classes rose among eighth-graders and enrollment in basic math declined, there was a significant jump in the percentage of very low scoring students in advanced courses. Among students in the bottom 10 percent nationally on the NAEP math test, enrollment in advanced math classes rose from 8.0 percent in 2000 to 28.6 percent in 2005. The percentage of low achievers enrolled in basic courses fell from 73.7 to 46.3 percent.

During the same period, students in the 10th percentile and below more than doubled as a proportion of those in advanced classes, the study finds, rising from 3 percent in 2000 to 7.8 percent in 2005. That might at first glance seem to be a trivial percentage, but it adds up to a significant number of students – about 120,000 nationwide.

Indeed, Loveless, himself a former public school teacher, notes that having even two children performing significantly below grade level in a class poses problems for classroom instructors, who may water down instruction as a result. That can be bad news for the well-prepared classmates of misplaced students. “Well prepared students need a real algebra class, not a fake one teaching elementary school mathematics,” the report says.

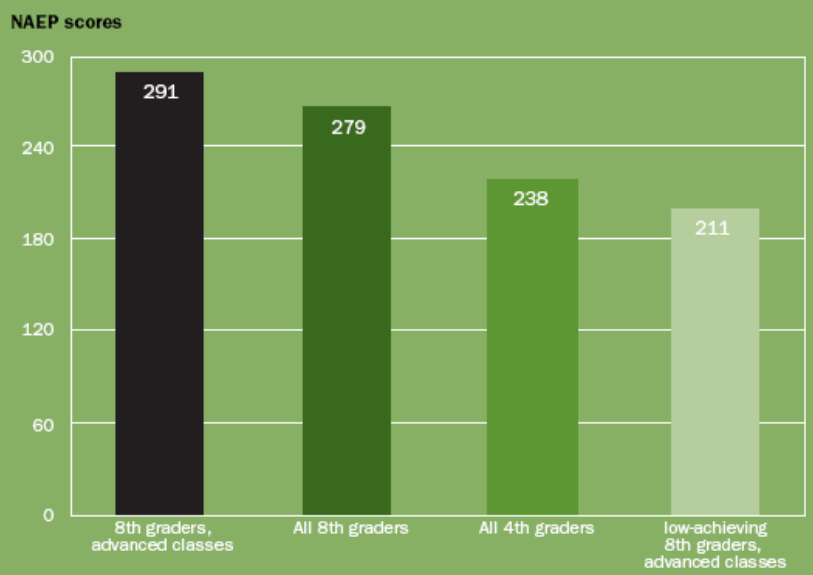
The Brown Center study illustrates just how far “misplaced” students lag behind their peers in advanced math classes. Despite being enrolled in Algebra I, Geometry, and Algebra II, misplaced eighth graders have NAEP scores well below average for ***fourth*** graders. In fact, they know about as much math as a typical second grader. The report reproduces several sample NAEP items to show the gaps in knowledge among these low-scoring students on key pre-algebra concepts such as percentages, decimals, and fractions.

NAEP scores of different student groups, 2005

Fig 2-3

Low-performing eighth graders in advanced classes score even below the average fourth-grade student.

Source: Author's calculations from NAEP restricted-use data set: U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics. NAEP 2005 Mathematics Restricted-Use Data Files, Grade 8 (NCES 2007-486) and NAEP data explorer http://nces.ed.gov/nationsreportcard/nde/



Sample NAEP item (working with percentages)
Grade 8 Item Block 2005-8M3 No. 17:

Table 2-3

There were 90 employees in a company last year. This year the number of employees increased by 10 percent. How many employees are in the company this year?

A) 9
B) 81
C) 91
D) 99 ✔
E) 100

	Overall	Advanced Classes	Misplaced 10th
Percent answering correctly	36.5	48.7	9.8

Source: NAEP question tool http://nces.ed.gov/nationsreportcard/itmrls/startsearch.asp and author's calculations from NAEP restricted-use data set: U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics. NAEP 2005 Mathematics Restricted-Use Data Files, Grade 8 (NCES 2007-486).

Sample NAEP item (rounding decimals)
Grade 8 Item Block 2005-8M4 No. 9:

Table 2-4

Alba needed to know about how much the sum of 19.6, 23.8, and 38.4 is. She correctly rounded each of these numbers to the nearest whole number. What three numbers did she use?

A) 19, 23, 38
B) 19, 24, 38
C) 20, 24, 38 ✔
D) 20, 24, 39

	Overall	Advanced Classes	Misplaced 10th
Percent answering correctly	85.2	87.9	37.1

Source: NAEP question tool http://nces.ed.gov/nationsreportcard/itmrls/startsearch.asp and author's calculations from NAEP restricted-use data set: U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics. NAEP 2005 Mathematics Restricted-Use Data Files, Grade 8 (NCES 2007-486).

The study also gives detailed information about the characteristics of these misplaced students, their families, and their schools. It finds that they are disproportionately black and Hispanic; have parents whose own education is below the national average; come from low-income households; attend large urban schools with predominantly low socioeconomic status populations; and have math teachers with less experience and mathematics training than the typical teacher of advanced math students in eighth grade.

"No element of this story is educationally sound," the report says. "No social benefit can be produced by placing students in classes for which they are unprepared." It also notes that hundreds of thousands of well-prepared students – "also predominantly black, Hispanic, or poor" – are sitting in the same classrooms as misplaced students and are "equally deserving of a good education."

The study makes a variety of reform recommendations that would create a more realistic algebra policy, from early intervention and teaching of basic skills to new research that tests the

effectiveness of different approaches to math remediation. As things stand, however, the report concludes, the push for universal eighth grade algebra "is creating more problems than it solves."

"This is not a call to lower expectations for what students can learn," Loveless emphasizes. "Instead we have to give more students the preparation they need to succeed in algebra. That won't be achieved by designating an arbitrary grade in which all students are swept into an algebra course, then turning a blind eye to the troubling results."

About the Brown Center on Education Policy &
The Brookings Institution

Established in 1992, the Brown Center on Education Policy conducts research on topics in American education, with a special focus on efforts to improve academic achievement in elementary and secondary schools. The Brown Center is part of The Brookings Institution, a private nonprofit organization devoted to independent research and innovative policy solutions. For more than 90 years, Brookings has analyzed current and emerging issues and produced new ideas that matter — for the nation and the world. Interpretations or conclusions in Brookings publications should be understood to be solely those of the authors.

For a full copy of the report as well as information about other Brown Center events and publications, please visit the Brown Center's Web site at www.brookings.edu/reports/2008/0922_education_loveless.aspx or call Gladys Arrisueño at 202-797-6477.