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Review of *Middle Class or Middle of the Pack*

Reviewed By

Martin Carnoy

Stanford University

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Summary of Review

In *Middle Class or Middle of the Pack: What can we learn when benchmarking U.S. schools against the world's best?*, America Achieves draws attention to what the group describes as the relatively low achievement of U.S. middle class students on the mathematics and science portions of the 2009 Program of International Student Assessment (PISA) test and, based on this "wake up call to America's middle class," urges U.S. high schools to participate in a new OECD test so schools can compare their 15 year-old students' performance with the average performance of 15 year-old students in other countries. The message American Achieves promotes is that such comparisons are valid and can help improve high school performance. The report does not provide evidence supporting this message; nor do PISA reports nor the broader literature on school reform. Overall, the report is not grounded in research but rather is an assertion that measurement, by itself, is an effective reform tool. The report makes no attempt to reveal how this particular test would be connected to specific curricula, strategies for teaching mathematics and science, or teacher professional development strategies. Thus, the report is of no utility to policymakers.

Kevin Welner
Project Director

William Mathis
Managing Director

Erik Gunn
Managing Editor

National Education Policy Center

School of Education, University of Colorado
Boulder, CO 80309-0249
Telephone: (802) 383-0058

Email: NEPC@colorado.edu
http://nepc.colorado.edu

Publishing Director: Alex Molnar

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Review of *Middle Class or Middle of the Pack*

Martin Carnoy, Stanford University

I. Introduction

In the complex world of educational reform, the messages of America Achieves' short, authorless advocacy "report"[1] are simple ones: average middle class students in the United States are doing much worse in mathematics and science on the 2009 Program in International Student Assessment (PISA) than students in several Chinese cities and a substantial group of developed countries. But students in some U.S. high schools do as well or better on a PISA-type OECD test designed for individual schools than the average national PISA scores in high scoring countries. The report urges U.S. high schools to take the OECD test as the first crucial step to understanding how their students, too, can become as good in math and science (and reading) as the world's best.

Jon Schnur, the executive director and cofounder of America Achieves, has been active in educational reform policy for many years. He was an education advisor in the Clinton administration and has been involved in non-profit organizations aimed at improving education since 2000. His reform advocacy covers a lot of topics, many of them worthwhile, including training school leaders (principals), charter schools, and Common Core standards. Now, apparently, his vision includes getting U.S. high schools to be evaluated on an international scale by taking OECD's PISA school test.

The America Achieves piece advocating this vision is not a research paper. So this review focuses only on whether it accurately assesses the size of U.S. education's math and science problem, and whether the solution proposed to that problem—to benchmark individual high schools' math and science performance by using the OECD school test—is a logical path to improving student learning.

America Achieves is correct in drawing attention to U.S. students' relatively low mathematics and science performance, but it misrepresents the degree of the problem by not including U.S. middle class students' performance on tests other than the PISA, such as the Trends in International Mathematics and Science Survey (TIMSS) and the National Assessment of Educational Progress (NAEP), and by not including trends over time in both TIMSS and PISA. These alternative measures suggest that U.S. students perform better internationally in math and science than is shown by the PISA test.

This review concludes that America Achieves' focus on individual schools as the locus of an educational reform strategy is not supported by previous research. Most importantly, neither the piece nor the America Achieves website provides any evidence that its "solution" of having schools take an OECD test and comparing their results with international PISA scores will improve U.S. high schools' math and science education.

II. Findings and Conclusions

America Achieves reaches the "… inescapable conclusion from data from the 2009 PISA study…that a large percentage of American middle class high schools have not kept pace as countries like Singapore, Finland, Korea, and Germany have raised standards, invested in teachers and lifted their overall performance" (p. 2). The piece compares the average 2009 PISA mathematics and science test scores of U.S. students in the second and third quartiles of a PISA-constructed socio-economic index (called the ESCS) with the average test scores of similar ESCS students who took the PISA test in other countries. It reports that U.S. students in both quartiles scored lower than students in more than a score of other countries in math and that in science, U.S. students in the second quartile scored lower than 15 countries and, in the third quartile, lower than 24 countries.

Against these dire results, the piece reports the results for several individual U.S. high schools that participated in a pilot OECD Test for Schools based on PISA. Students taking the test in all but one of these featured high schools outperformed average student 2009 PISA scores in most participating countries and regions. The piece ends by urging high schools to meet the challenge of taking the OECD Test for Schools, which will be available in the fall of 2013.

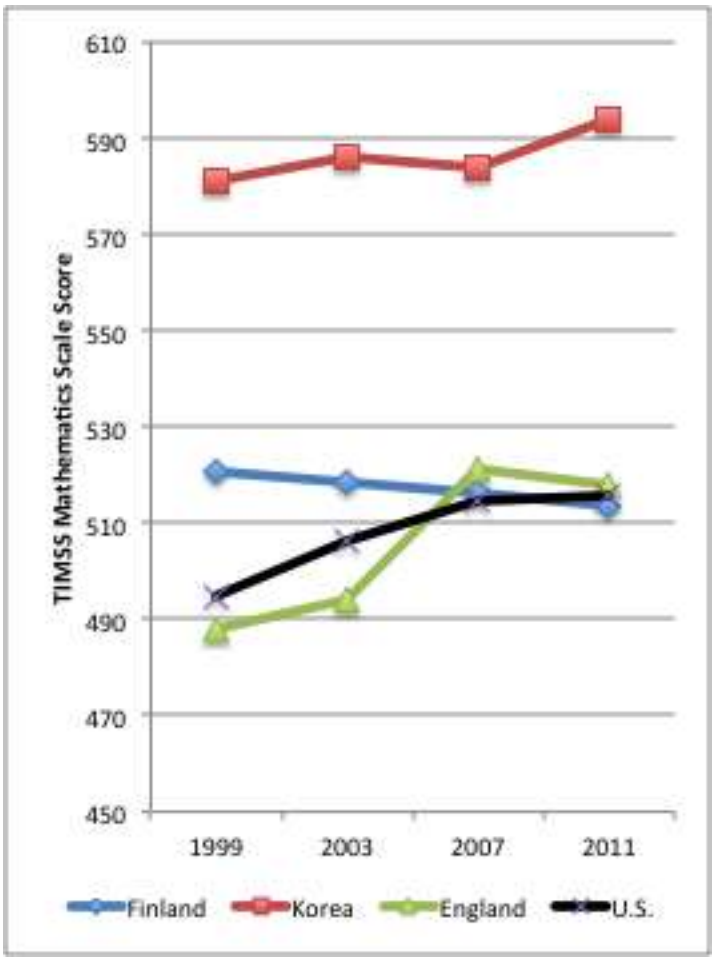
III. The Piece's Rationale for Its Findings and Conclusions

America Achieves sees great deficiencies in American education and tends to view higher student learning (performance on tests) as the key to higher economic growth, reducing poverty, and reducing inequality in American society. In this view, high levels of poverty among American children are not a major impediment to raising student learning—rather it is the quality of education offered children from all social classes that is the key to how well children do academically. America Achieves also regards student test performance data as crucial to school improvement: "Information and learning are powerful tools for educators eager to make evidence-based decisions around school rigor, high expectations, and improving teaching and outcomes" (p.12).The report views the PISA test as a better measure of student learning than the other assessments schools now employ. It also considers comparing individual schools' test performance with national averages in other countries as a valid form of measuring student learning and an effective reform tool, by itself.

IV. The Report's Use of the Research Literature

Research on U.S. Math and Science Performance

The only explicit research America Achieves uses is test results on the 2009 PISA for particular social class groups, showing that they are lower than scores for similar social class students in a number of other countries. The results are similar to other estimates using the PISA test,[2] and support earlier studies that American schools do not provide the same "quality" mathematics and science education as do schools in other countries. However, America Achieves ignores other national and international test results that suggest progress in mathematics and science teaching in the United States. Its piece also implicitly ascribes all the difference in test scores between middle class U.S. students and their counterparts in high scoring countries to school effects, when there is considerable research suggesting that at least in Asian countries, families invest major private resources in years of "cram schooling" and tutoring.[3]

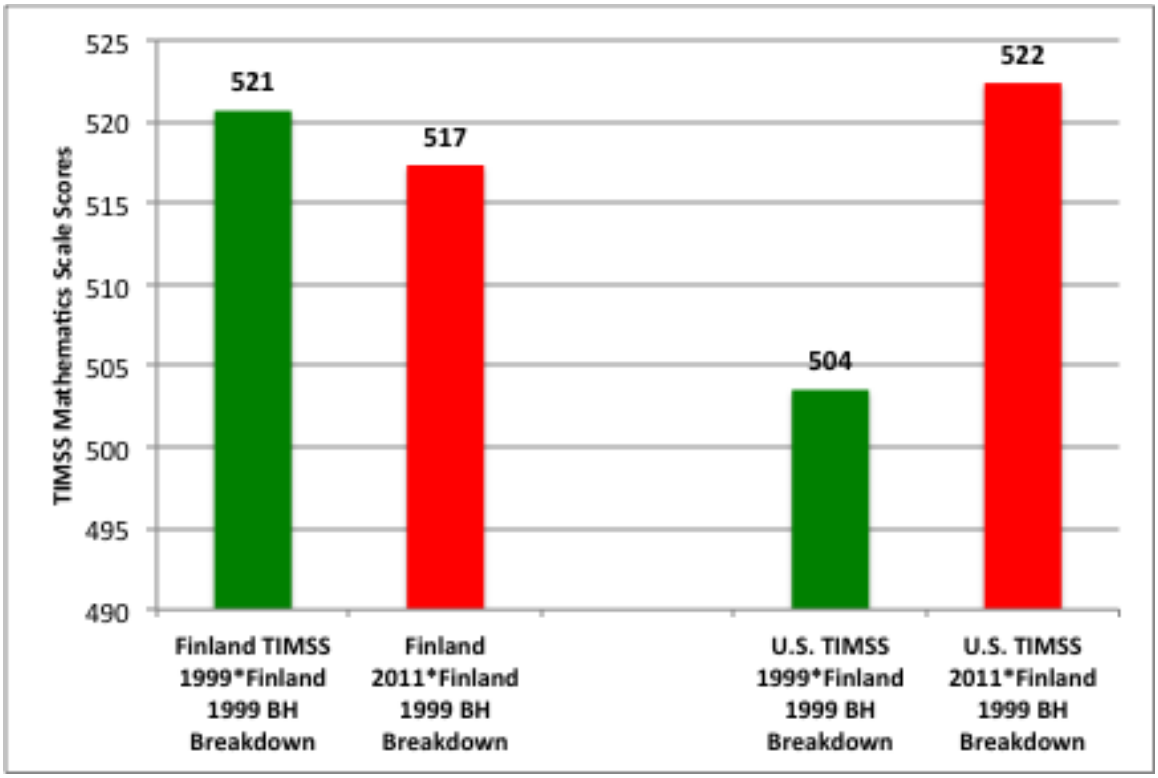


Source: Author's estimates from TIMSS 1999, 2003, 2007, and 2011 databases.

Figure 1. TIMSS Mathematics Scores, Middle Class Students (26-100 Books in the Home), by Country, 1999-2011

The notion that American students are doing poorly in mathematics (and somewhat less poorly in science) is not a new one. America's "math and science problem" was the subject of extensive and highly publicized reports in the late 1990s based on the results of another international test, the 1995 Trends in International Math and Science Survey (TIMSS).[4] TIMSS assessed fourth- and eighth-graders' mathematics and science competence in specific curricular subject matter, and asked teachers what they actually taught. The TIMSS test also spawned another widely publicized videotape study that compared mathematics and science teaching in various countries.[5] The TIMSS research concluded that U.S. mathematics and science curricula were "a mile wide and an inch deep" and that they focused on repetition rather than complex problem solving.

Nevertheless, much has happened since 1995. Many U.S. states adopted new math standards in the 1990s and early 2000s. Results of the National Assessment for Educational Progress (NAEP) show steady and very large increases in fourth- and eighth-grade mathematics (science has only been tested since 2009) over the past two decades across social class groups and across U.S. states.[6] The nation's middle class students[7] have also made substantial gains on the eighth-grade TIMSS compared with countries such as Korea and Finland, which are held up by America Achieves as examples of high scoring countries (Figure 1). Recent data suggest that mathematics gains on the TIMSS test by U.S. students were much greater than similar social class students in Finland from 1999-2011, and that U.S. students now outperform students in Finland (Figures 1 and 2), although not Korea (Figure 1).[8]



Source: Author's estimates from TIMSS 1999 and TIMSS 2011 databases.

Figure 2. United States and Finland: Change in TIMSS Mathematics Score, 1999-2011, Assuming Social Class of Students Taking Test Is Constant at 1999 Finnish Social Class Composition

The NAEP and TIMSS U.S. results stand in contrast to PISA scores, which show no gain for U.S. middle class students in mathematics and science in 2000-2009. This is not unusual, since among a number of high scoring countries (Canada, Finland, Korea Germany, France, and United Kingdom), only middle class students in Germany show gains in math[9] and science (Finland also showed a gain in science, but not in math). In Germany this is

apparently due to scores rising for first and second-generation immigrants from Slavic countries, not from school system improvements.[10] The overall record suggests that contrary to the benefits America Achieves promises from taking the PISA test, "learning lessons from PISA" is associated with declining or stagnating PISA mathematics scores during the past decade.[11] Neither do the data America Achieves present support its claim that "…a large percentage of American middle class high schools have not kept pace as countries like Singapore, Finland, Korea and Germany have raised standards, invested in teachers, and lifted their overall performance" (p.3). There is little, if any, evidence available that educational policy changes have been responsible for increased student performance in any of these countries.[12]

Focusing on Individual High Schools as an Educational Improvement Strategy

America Achieves supports the Common Core, so it is hardly wedded to a school-by-school improvement strategy. Yet pushing the PISA school test and individual school assessment (by the OECD) presumes a body of evidence that this will significantly increase student learning. Effective schools research, which comes the closest to America Achieves' argument in this piece, has a long tradition in American educational reform literature.[13] Yet, it has been consistently deprecated by researchers for good reason. It does not meet standards of causal inference and faces serious scaling up issues.

Further, recent results from CREDO at Stanford University, analyzing charter schools' performance, suggest that individual middle and high schools do not tend to improve over time. The CREDO study followed charter schools over a four-year period. Such schools are generally under substantial pressure to perform well. They also have more flexibility than traditional public schools to innovate to improve test performance standards. Yet, the study shows that very few of the hundreds of charters in its sample improved their students' average performance. CREDO concluded that for the vast majority of charter schools their students' performance gains in year one of operation is an excellent predictor of performance gains in later years.[14] And recent studies of student achievement gains in several states consistently show that most variation is between classrooms in the same school rather than between schools.[15]

Using the PISA School Test as a Driver of School Improvement

It is questionable to compare the performance of a group of 15-year-old students in a single school with national results, but other factors make it even more difficult to justify using an international test as a driver of educational improvement. There is tremendous variation in academic performance for students within the same social class among U.S. states. For example, Massachusetts' middle class students score about as high as those in Japan on the TIMSS. Alabama's students score more than a standard deviation lower (Table 1). A school's state location influences its academic performance, just as country location has an effect. Researchers have just begun to research these differences, but America Achieves' comparisons using the PISA School Test ignore these differences and the reasons for them.

Table 1. TIMSS 2011 Mathematics Scores by U.S. States and Student Social Class (Books in the Home)

	TIMSS 2011 Mathematics Scores									
Books in Home	*United States*	*Alabama*	*Colorado*	*Conn.*	*Calif.*	*Florida*	*Indiana*	*Mass.*	*Minn.*	*North Carolina*
0-10	465	434	464	446	452	484	479	503	494	484
11-25	485	448	487	475	469	498	500	522	506	518
26-100	516	481	521	521	507	518	526	563	543	539
101-200	542	510	544	550	532	544	544	575	568	560
> 200	548	502	557	565	535	553	558	598	574	585
Average	509	466	518	518	493	513	522	561	545	537

Source: Author's estimates from TIMSS 2011 database.

In addition, 45 states, as of this writing, are committed to the Common Core Curriculum. Two assessment consortia have been formed to develop tests aligned with the Common Core, and each participating state is a member of one (or both) consortia. The assessments are scheduled to be implemented by 2015. The PISA School Test is not aligned with any particular curriculum; indeed, math and science education specialists would be hard pressed to show teachers how to teach the types of questions that PISA asks in mathematics and science. The discrepancies could send educators in contradictory directions.

The OECD PISA team has described why students in some countries score high on math and science tests.[16] The reasons are: competitive pay for well-trained teachers with high levels of content knowledge who know how to motivate their students,[17] school principals who focus on instruction, and a demanding curriculum, usually national. The problem with this type of advice provided by the OECD is that it is not based on any causal connection between such "lessons" and better student performance either in countries or schools on the math and science skills evaluated by the PISA test. Neither America Achieves nor the OECD provides the empirical evidence for this connection.

V. Review of the Report's Methods

America Achieves employs no research methods of its own. Its contribution is limited to using data from another (not cited) study that estimates PISA scores for students in a number of countries in the second and third quarters of social class as measured by the PISA ESCS index. It also reports the scores for several sample high schools that participated in a

pilot of the OECD's PISA Test for Schools and compares the average scores of students in these schools with average PISA math scores in Chinese cities and a number of countries. It suggests that schools can use such comparisons (based on an OECD analysis of each high school and its students' PISA performance) to significantly improve performance.

The implication is that just knowing its relative position compared with high-performing countries and other U.S. high schools with "similar" students would be the first step for an individual high school to begin to improve its students' performance. As noted, America Achieves provides no evidence for this claim.

VI. Review of the Validity of the Findings and Conclusions

America Achieves' data showing that U.S. middle class students score lower on the PISA mathematics and science tests than middle class students in a number of other countries is basically correct. However, another international test, the TIMSS, suggests that U.S. middle class students may be doing better in math and particularly in science compared with high-scoring countries. TIMSS results also suggest that U.S. students have made gains in 1999-2011 in math and science when many high-scoring countries have not. America Achieves suggests that individual high schools in the United States can derive benefits from comparing the performance of a given cohort of their students on a PISA School Test with the average performance of a set of countries or regions on the PISA national test. Yet, the PISA School Test is not aligned with the curricula that individual high schools are using, nor is it aligned with the Common Core or the testing consortia which are the driving curriculum and assessment forces in United States education. Nevertheless, America Achieves claim that such comparisons can provide "lessons" to schools, but the evidence over the past ten years suggests that most countries do not improve their PISA performance as a result of simply participating in the test.

VII. Usefulness of the Report for Guidance of Policy and Practice

America Achieves' report is a sales pitch to U.S. high schools to participate in a new OECD PISA test designed for high schools. One argument given for their participation is that U.S. students' mathematics and science performance is low compared with students' performance in other countries and that for a school to begin to improve its performance it is important to see where it stands internationally. A second is that since some U.S. high schools already took this test and are doing well compared with high-scoring countries, it is possible for others to emulate them. A third argument is that an OECD analysis of those results will contribute to a strategy for improvement for those high schools not measuring up. None of these arguments is substantiated with any evidence aside from the fact that, on average, middle class students score relatively low on the PISA test. The report offers nothing useful to policymakers.

Notes and References

1 America Achieves (April, 2013). *Middle Class or Middle of the Pack*. New York: America Achieves. Retrieved May 14, 2013, from http://www.americaachieves.org/docs/OECD/Middle-Class-Or-Middle-Of-Pack2.pdf/.

2 Carnoy, M. & Rothstein, R. (2013). *What Do International Tests Really Show About U.S. Students' Performance on International Tests*. Washington, DC: Economic Policy Institute.

3 Bray, M. 2006. Private supplementary tutoring: comparative perspectives on patterns and implications. *Compare, 36,* (4), 515-530.

4 Schmidt, W.H., McKnight, C.C, & Raizen, S.A. (1997). *A Splintered Vision: An Investigation of U.S. Science and Mathematics Education*. Dondrecht, Netherlands: Kluwer;

Schmidt, W.H., McKnight, C.C., Valverde, G.A., Houang, R.T., & Wiley, D.E. (1997). *Many Visions, Many Aims, Volume 1*. Dondrecht, Netherlands: Kluwer;

Schmidt, W.H., Raizen, S.A., Britton, E.D., Bianchi, L.J., & Wolfe, R.G. (1997). *Many Visions, Many Aims, Volume II*. Dondrecht, Netherlands: Kluwer.

5 Hiebert, J., Gallimore, R., Garnier, H., Givvin, K. B., Hollingsworth, H., Jacobs, J., Chui, A. M., Wearne, D., Smith, M., Kersting, N., Manaster, A., Tseng, E., Etterbeek, W., Manaster, C., Gonzales, P., & Stigler, J. (2003). *Teaching Mathematics in Seven Countries: Results from the TIMSS 1999 Video Study,* NCES (2003-013). Washington, DC: National Center for Education Statistics, U.S. Department of Education.

Roth, K.J., Druker, S.L., Garnier, H.E., Lemmens, M., Chen, C., Kawanaka, T., Rasmussen, D., Trubacova, S., Warvi, D., Okamoto, Y., Gonzales, P., Stigler, J., & Gallimore, R. (2006). *Teaching science in five countries: Results from the TIMSS 1999 Video Study* (NCES 2006-11). Washington, DC: National Center for Education Statistics, U.S. Department of Education.

6 Institute for Educational Sciences, National Center for Educational Statistics (2013). *Mega-States: An Analysis of Student Performance in the Five Most Heavily Populated States in the Nation.* Washington, D.C.: NCES.

7 Defined as students with 26-100 books in the home. For a defense of using books in the home as a definition of social class, see Carnoy, M. & Rothstein, R. (2013). *What Do International Tests Really Show About U.S. Students' Performance?* Washington, DC: Economic Policy Institute.

8 Carnoy, M. & Rothstein, R. (2013). *What Do International Tests Really Show About U.S. Students' Performance?* Washington, DC: Economic Policy Institute.

9 Carnoy and Rothstein (2013). *What Do International Tests Really Show About U.S. Students' Performance on International Tests.* Washington, D.C.: Economic Policy Institute.

10 Stanat, P., D. Rauch, and M. Segeritz. (2010). "Schulerinnen und Schuler mit Migrationshintergrund." In E. Klieme, C., Artelt, J. Hartig, N. Jude, O. Köller, M. Prenzel, W. Schneider, & P. Stanat, (eds.), *PISA 2009. Bilanz nach einem* Jahrzehnt, 200–230. Munster, Germany: Waxmann. Retrieved June 3, 2013, from http://www.pedocs.de/volltexte/2011/3536/pdf/Stanat_et_Al._Schuelerinnen_und_Schueler_D_A.pdf/.

The OECD report, *Lessons From PISA for the United States: Strong Performers and Successful Reformers in Education*, written at the behest of U.S. Secretary Arne Duncan, also admits that the many reforms implemented in Germany's educational system were begun too late to have had a significant impact on the observed rise in PISA scores:

Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA). (2011). *Lessons From PISA for the United States: Strong Performers and Successful Reformers in Education*. Paris: OECD. Retrieved May 14, 2013, from http://dx.doi.org/10.1787/9789264096660-en/.

11 OECD. (2010). *PISA 2009 Results: Learning Trends, Volume V*. Paris: OECD, Figure V.3.1.

12 As noted, the increase in German scores cannot be attributed to any particular educational policy. Singapore did not participate in the PISA before 2009, but has participated in TIMSS since 1995; its eighth-grade students have always scored among the highest on the TIMSS math and science tests, but performance has not increased significantly in 1995-2011. Korean scores have risen significantly in mathematics and science on the TIMSS but not the PISA. In Sahlberg's interesting analysis of Finland's successful educational transformation into one of the highest scoring countries on the PISA test, he argues that Finns performed close to overall averages in international tests (except in reading) before the 1990s:

Sahlberg, P. (2011). *Finnish Lessons*. New York: Teachers College Press.

Yet, Finland was one of the highest scoring countries in the First International Mathematics Study (1967). Finnish students had average scores on certain portions of the Second International Mathematics Study in the late 1980s, such as algebra) and have continued to score close to average in those mathematics domains until today. See:

Mullis, I.V.S., Martin, M.O., Foy, P., & Arora, A. (2012). *The TIMSS 2011International Results in Mathematics*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College, Chapter 3.

13 Reviews of the effective schools literature include:

Purkey, S.C. & Smith, M. (1983, March). Effective Schools: A Review. *The Elementary School Journal, 83* (4), 426-452;

Rowan, B., Bossert, S., & Dwyer, D. (1983, April). Research on effective schools: A cautionary note. *Educational Researcher, 12*, (4), 24-31.

14 CREDO (2013). *Charter School Growth and Replication*, Volume I. Stanford, CA: CREDO. http://credo.stanford.edu/documents/CGARGrowthVolumeIN.pdf/.

15 For example, Rivkin, S., Hanushek, E., & Kain, J. (2005, March). Teachers, Schools, and Academic Achievement. *Econometrica*, *73*,(2), 417-458.

16 For example, OECD (2011). *Lessons From PISA for the United States: Strong Performers and Successful Reformers in Education*. Paris: OECD.

17 See also:

Measures of Effective Teaching Final Report (Gates Foundation). (2013).*Ensuring Fair and Reliable Measures of Effective Teaching*. MET Project. Retrieved June 3, 2013, from http://www.gatesfoundation.org/media-center/press-releases/2013/01/measures-of-effective-teaching-project-releases-final-research-report/.

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REVIEWER:	Martin Carnoy, Stanford University
E-MAIL ADDRESS:	Carnoy@stanford.edu
PHONE NUMBER:	(650) 906-7469

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