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Research Brief

School Racial and Economic Composition & Math and Science Achievement

By Susan Eaton



This is the first in a series of three research briefs summarizing findings from the newest and most rigorous research related to racial and socioeconomic diversity in public schools. The studies on which this brief is based were published recently in three special issues of the peer-reviewed journal, *Teachers College Record*, edited by Professors Roslyn Arlin Mickelson of the University of North Carolina at Charlotte and Kathryn Borman of the University of South Florida.

The weight of evidence from these studies demonstrates that racially isolated, high-poverty schools tend to negatively influence math and science course-taking patterns and achievement as meas-

Why This Research is Important

This research augments an already extensive body of work in this area, which has reached similar conclusions. However, the work published this year in TCR is particularly rigorous. It draws from several strong data bases and employs cutting-edge statistical methods. This comprehensive collection of studies pays meticulous attention to separating the discrete contributions that schools, teachers, families and students themselves make to a variety of important educational outcomes, such as test scores and graduation rates. We urge courts, policymakers, education rights lawyers, educators and others to use this new work as a guide in decisions and advocacy related to diversity, schooling and equal opportunity.

ured by test scores. Meanwhile, under certain conditions, lower poverty schools and schools that do not enroll highly disproportionate shares of African American and/or Latino students tend to be positively associated with math and science achievement.

What this research suggests about the relationship between racial and socioeconomic composition of schools/classrooms and MATH achievement:

- A study of math test scores over more than 30 years finds that “increases in school segregation correspond to significant increases in the black-white and Latino-white test score gaps.” School segregation’s negative influence on achievement “outweigh[s]” the positive influences that come from improvements in racial minority groups’ overall income and other family background characteristics.¹
- Racially diverse schools vary in the extent to which their African American and Latino students have opportunities to take advanced placement courses in math. In a study of math course-taking patterns and grade point averages, researchers find that in schools where whites and Asians are “overrepresented” in high-level sophomore math classes, both the senior-year grade point averages of African American and Latino students and their 4-year college-going rates tend to be lower.²

- A study following a cohort of students from 7th through 12th grade explores what factors predict students' math attainment and what factors predict how much students improve during their secondary school years. Several factors affect these outcomes, including a student's self-esteem and the level of the course in which the student begins. However, the only "school-level" variable that has a statistically significant effect is the percentage of African American and Latino students in a school. More specifically, suppose we have two students (A and B) who were similar in all the background variables, but A attends a school with a high concentration (75 percent) of African American and Latino students and B was attends a school with a low concentration (25 percent) of African American and Latino students. Student A's annual learning growth in math would be one-sixth that of student B. These effects are strongest for students who start off with lower achievement in math and in lower-level math courses.³
- In a study of Australian schools, increases in the overall socioeconomic status of a school are associated with consistent increases in student achievement in math (in addition to science and reading). This relationship is strongest in schools with relatively higher levels of socioeconomic status. The finding holds for students from all socioeconomic backgrounds.⁴

What this research suggests about the relationship between racial and socioeconomic composition of schools/classrooms and SCIENCE achievement:

- A study of schools participating in an international test of science-related skills necessary for college and work shows that the most successful countries have low levels of so-termed "horizontal" segregation. (Horizontal segregation

refers to the unequal distribution of socioeconomic status across a school system). Generally, the less segregated schools systems were, the better the results on the test.

- The study of international test scores also shows that students in schools with relatively low average levels of socioeconomic status report less time spent on science instruction than do students in schools with relatively higher levels of socio-economic status. This difference is consequential, the study finds, because of the positive association between amount of time spent on science instruction and science test scores.⁵
- A study of high schools across Missouri explores a variety of conditions that could influence science proficiency in 10th grade. The research finds that both high percentages of low-income students and high percentages of African American/Latino students are associated with lower levels of science proficiency in a school.
- In the Missouri study, other factors that contribute to low scores include high rates of student mobility,⁶ high dropout rates and high suspension and expulsion rates. In schools where low-income and African American/Latino percentages are high and dropout rates are high, science proficiency scores tend to be lower. Schools with more student mobility and larger shares of low-income students tend to have lower science proficiency scores.
- In the Missouri study, researchers also find that some of the factors associated with lower science proficiency scores may be counteracted by having a larger share of courses taught by highly qualified teachers who are appropriately certified. Schools with greater percentages of African American/Latino students together with a larger percentage of teachers with master's degrees tend to have higher science

proficiency scores than might be predicted based on demographics alone.⁷

- A study of Australian schools shows that increases in the overall socioeconomic status of a school are associated with consistent improvements in student science achievement (in addition to math and reading). This relationship is strongest in schools with relatively higher levels of socioeconomic status. The finding holds for students from all socioeconomic backgrounds.⁸

What Explains These Relationships?

Over the years, scholars have advanced several theories to help explain why the racial and socioeconomic composition of schools and classrooms has had a consistent association with achievement and social and economic mobility. For example, one theory, based in sociology, posits that schools that serve more advantaged students tend to have more political clout and thus more resources.

Alternatively, a theory based in cognitive science posits that interaction with diverse groups creates opportunities for deeper, more complex modes of thought as opposed to automatic thinking that leads to stereotyping. In his *Teachers College Record* article, Douglas Harris of the University of Wisconsin-Madison attempts to more firmly link theory about how peers influence each other with what the research actually says.⁹ Based on the evidence, Harris posits a new theory he calls “group-based contagion” in which a student follows the lead of her classmates and especially those whom she perceives to be members of her “group.”

Under this theory, multiple “groups” exist, interact and influence each other. At the same time, Harris proposes, peers “indirectly” affect each other by influencing school resources, particularly the qualifications of teachers who teach there. For example, previous studies demonstrate that it is more difficult to attract and retain teachers in high-poverty schools.¹⁰ Thus, the presence of larger shares of middle-class students would tend to attract qualified teachers.

What Else Do We Know?

The relationship between the racial and socioeconomic composition of schools/classrooms and math/science achievement

The research published in *Teachers College Record* offers yet more evidence that racial and economic diversity and predominantly middle-class school settings tend to contribute positively to academic achievement. Diversity and/or reductions in concentrated poverty certainly do not guarantee that students’ academic achievement will improve. However, research strongly suggests that schools that have relatively lower levels of poverty and that do not segregate African American and Latino students offer more favorable conditions than high-poverty schools, where a host of challenges threaten to undermine learning. For example, in 2007, the National Academy of Education reviewed the research on the impact of racial diversity in schools.

The Academy concluded: “[T]he research evidence supports the conclusion that the overall academic and social effects of increased racial diversity are likely to be positive. Racial diversity does not guarantee such positive outcomes, but it provides the necessary conditions under which other educational policies can facilitate improved academic achievement, improved intergroup relations, and positive long-term outcomes.”¹¹

What Should We Do?

Recommendations for Policymakers, Advocates & Educators

- Given the demonstrated relationship between the overall socioeconomic status of a school and student achievement, policy and advocacy efforts should attempt to decrease the number of students who attend schools with high concentrations of poverty. Similarly, policy and programming should offer opportunities for

economically disadvantaged children to attend low-poverty schools outside traditional school boundary lines. Enforcement of these boundary lines, coterminous with racially segregated housing patterns, often result in racially and economically segregated schools within metropolitan regions.

- Federal and state governments should increase financial and technical support to expand and improve interdistrict school desegregation programs that allow children in higher-poverty neighborhoods to attend more affluent schools.
- Government funds and technical assistance should be made available to support and improve “magnet” schools that draw a racial and economic mix of students from a region or from several demographically distinct neighborhoods.
- In diverse schools, educators should avoid sorting students for instruction in ways that stratify them by socioeconomic status. Racial diversity at the school level does not guarantee improved achievement or increased opportunity for African American and Latino students. Adequately preparing students so that they have access to higher level courses within such schools is also important, as course-taking patterns, often stratified by race and SES, tend to influence grades later.
- Education policy and practice should support efforts to hire and retain well-qualified teachers

in schools with a majority of African American and Latino students, as the presence of appropriately certified teachers and teachers with master’s degrees seems to slightly mitigate some negative effects associated with racial segregation and concentrated poverty.

- People can learn from efforts in a variety of places where educators and other leaders break up concentrations of poverty and reduce racial segregation in an effort to provide more equitable educational opportunities. See, for example:

Interdistrict Options in the United States
http://charleshamiltonhouston.org/assets/documents/publications/Wells_Boundary_Crossing.pdf;

Regional Schooling Opportunities,
Omaha, Nebraska
http://charleshamiltonhouston.org/assets/documents/publications/OmahaMetro_Agreement_Smaller.pdf

Housing and School Opportunities,
Baltimore Region
http://www.prrac.org/pdf/Baltimore_MobilityReport.pdf

A Comprehensive Plan for Regional
Integration: Twin Cities
http://www.irpumn.org/uls/resources/projects/Regional_Integration_-_Schools_and_Housing.pdf

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Endnotes

- 1 Mark Berends & Roberto V. Penaloza, *Increasing Racial Isolation and Test Score Gaps in Mathematics: A 30-Year Perspective*, 112 Teachers Coll. Rec. 978 (2010). Using data from the National Center on Education Statistics, the authors calculate that the average proportion of African American and Latino students in the school of the typical African American child increased from 36 percent in 1972 to 60 percent in 2004. For the typical Latino student, the increase in that same period was from 33 percent to 60 percent. However, for the typical white student, the proportion of African American and Latino students in school declined from 17 percent in 1972 to 14 percent in 2004.
- 2 Chandra Muller, Catherine Riegle-Crumb, Kathryn S. Schiller, Lindsey Wilkinson & Kenneth A. Frank, *Race and Academic Achievement in Racially Diverse High Schools: Opportunity and Stratification*, 112 Teachers Coll. Rec. 1038 (2010).
- 3 Xiaoxia A. Newton, *End-of-High-School Mathematics Attainment: How Did Students Get There?* 112 Teachers Coll. Rec. 1064 (2010).
- 4 Laura B. Perry & Andrew McConney, *Does the SES of the School Matter? An Examination of Socioeconomic Status and Student Achievement Using PISA 2003*, 112 Teachers Coll. Rec. 1137 (2010).
- 5 Researchers define a “low-SES” school as one in which the average level of SES in the school is below the 25th percentile of student SES in the country of reference. About 1 in 8 schools in the US would be considered low-SES. These schools enroll about a quarter of all 15 year olds in the United States.
- 6 By student mobility, the researchers are referring to the rate at which students leave/transfer from the school and/or new students arrive at the school. Generally, these mobility rates tend to be higher in schools that enroll disproportionate shares of students from low-income families and in urban schools.
- 7 Mark C. Hogrebe & William F. Tate IV, *School Composition and Context Factors That Moderate and Predict 10th-Grade Science Proficiency*, 112 Teachers Coll. Rec. 1096 (2010).
- 8 Perry & McConney, *supra* note 4.
- 9 Douglas N. Harris, *How Do School Peers Influence Student Educational Outcomes? Theory and Evidence from Economics and Other Social Sciences*, 112 Teachers Coll. Rec. 1163 (2010).
- 10 See, e.g., Richard Ingersoll, *Why Do High-Poverty Schools Have Difficulty Staffing Their Classrooms with Qualified Teachers?* (Center for American Progress & Institute for America’s Future, November 2004), available at <http://www.americanprogress.org/kf/ingersoll-final.pdf>
- 11 National Academy of Education, *Race-Conscious Policies for Assigning Students to Schools: Social Science Research and the Supreme Court Cases*. (2007), available at http://www.naeducation.org/Meredith_Report.pdf

For more information on the National Coalition on School Diversity, go to www.school-diversity.org