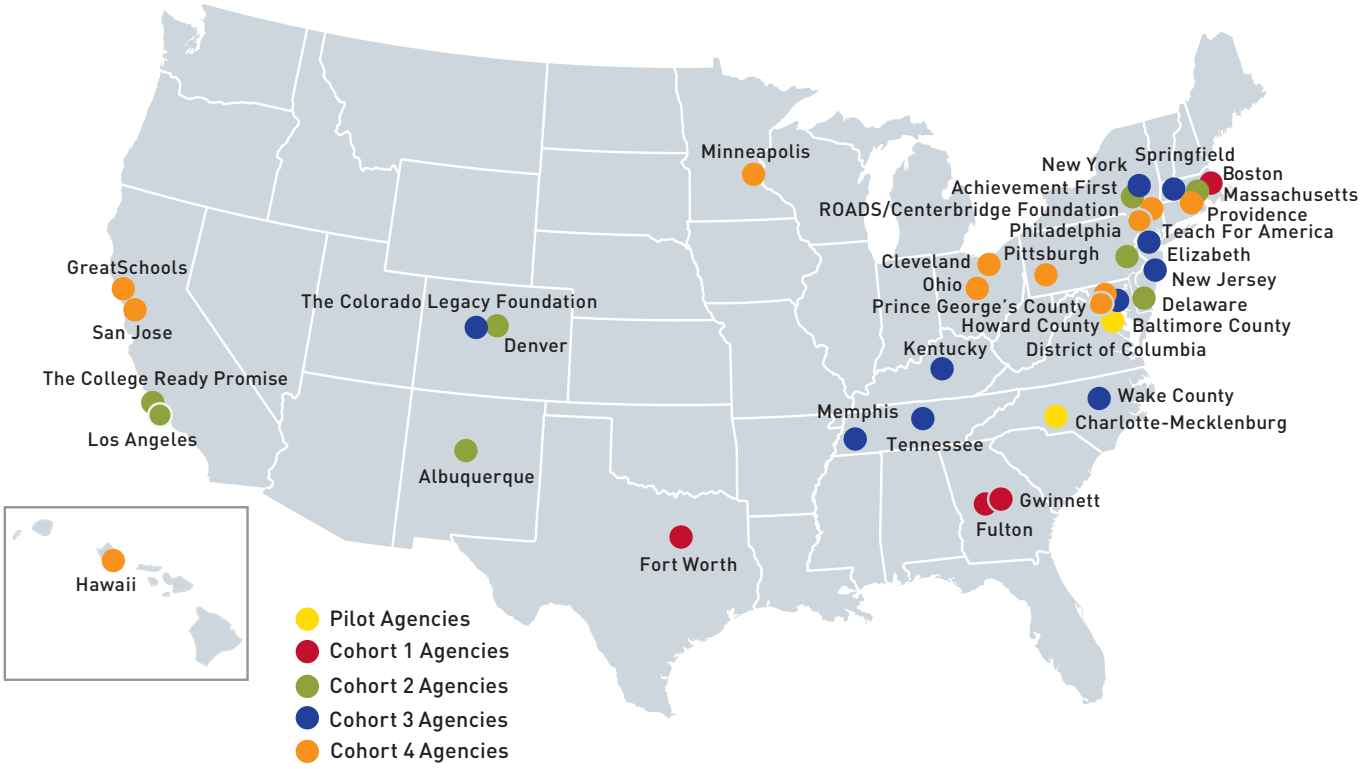
STRATEGIC DATA PROJECT

LEARNING ABOUT TEACHER EFFECTIVENESS:

SDP HUMAN CAPITAL DIAGNOSTIC

Gwinnett County Public Schools, Georgia

MAY 2012



THE STRATEGIC DATA PROJECT

The Strategic Data Project (SDP), housed at the Center for Education Policy Research at Harvard University, partners with school districts, school networks, and state agencies to bring high-quality research methods and data analysis to bear on management and policy decisions.

SDP's theory of action is that if we are able to bring together the right people, the right data, and the right analysis, educational leaders can significantly improve decisions, thereby increasing student achievement.

SDP fulfills this theory of action with three primary strategies:

1. conducting rigorous "diagnostic" analysis on teacher effectiveness and college-going success using agency data;
2. placing top-notch analysts as data fellows in partner agencies for two years; and
3. distributing our analytic results and learnings to support broad adoption of methods and data use practices throughout the education sector.

SDP was launched in June 2009 and currently partners with nine states, twenty-two school districts, three networks of charter schools, and four nonprofit organizations. The project is supported by the Bill & Melinda Gates Foundation.

SDP HUMAN CAPITAL DIAGNOSTIC

INTRODUCTION AND BACKGROUND

Teachers play a critical role in student learning and achievement. Recent research has shown that a teacher's effectiveness is more important—has more impact on student achievement—than any other factor controlled by school systems, including class size or the school a student attends.[1] Only recently, however, has the data become available to measure teacher effectiveness in ways that can inform education policy and practice.

To this end, we at the **Strategic Data Project** designed the Human Capital Diagnostic as a means to:

1	better inform district leaders about patterns of effectiveness among their teachers; and
2	identify potential areas for policy change that could leverage teacher effectiveness to improve student achievement.

This report, which represents a selection of findings from our full diagnostic, illuminates teachers' effectiveness patterns and compares these patterns across a combination of teacher, school, and student characteristics.

The Human Capital Diagnostic represents a partnership between SDP and Gwinnett County Public Schools (GCPS) to bring data to bear on policy and management decisions. As such, it is neither an exhaustive set of analyses, nor does it contain specific recommendations for the district to consider. The diagnostic is, however, a set of standardized analyses that can help the district better understand its current performance, set future goals, and strategically plan responses.

CONTENTS

Additionally, the diagnostic is meant to demonstrate how districts can capitalize on existing data to better inform decision making. For the diagnostic, researchers connected student data (including demographics and test scores) to teacher human resource data, allowing the calculation of objective measures of teacher effectiveness that can be linked to teacher characteristics. The diagnostic analyses leverage these effectiveness measures to explore their relationships with characteristics of teachers, schools, and students. They are not intended to draw conclusions about the overall contribution made by any individual teacher.

These analyses were completed by members of the research team at the Center for Education Policy Research at Harvard University with the support of GCPS staff, the GCPS SDP Fellows, and Faculty Advisors.

SDP HUMAN CAPITAL DIAGNOSTIC

THE SDP PATHWAY FOR HUMAN CAPITAL

The **SDP Pathway for Human Capital** is a framework we use to examine the movement and allocation of teachers in GCPS.

Five key phases of a teacher's career in the district are included in this framework:

HUMAN CAPITAL DIAGNOSTIC PATHWAY	
	The recruitment process is a district's first opportunity to secure a high quality teaching force for its students. Understanding the pace of hiring and how new hires are allocated across the district can inform the development of strategies to attract effective educators.
RECRUITMENT	
	Teachers are not randomly assigned to students. In some districts, more experienced teachers may be assigned to more advantaged students, which may widen existing achievement gaps. Examining teacher placement patterns can identify opportunities to raise student achievement and reduce achievement gaps by more equitably distributing the most-effective teachers across the system and within schools.
PLACEMENT	
	Teachers have long and varied careers in the profession. Along the way, many encounter opportunities to develop their teaching skills and increase their instructional effectiveness. In the development phase, we explore the extent to which methods of development commonly accessed by teachers—such as earning graduate degrees or learning from experience—are most associated with gains in student achievement.
DEVELOPMENT	
	Performance evaluations in most districts make few distinctions among teachers. The lack of rich information on performance hampers a district's ability to pay special attention to underperforming teachers, target professional development to those teachers, or counsel out poor performers. In the absence of detailed, quantifiable evaluation data, SDP examines the extent to which teachers' past classroom effectiveness predicts their effectiveness in the future.
EVALUATION	
	Many urban districts lose half of their new teachers within their first five years of teaching. High attrition rates among new teachers may lower student achievement as teachers improve most in their first years in the classroom. It would be particularly problematic if more-effective teachers leave at higher rates than less-effective teachers. SDP explores retention patterns overall and across various teacher characteristics, including classroom effectiveness, to understand how attrition impacts student achievement.
RETENTION/ TURNOVER	

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UNDERSTANDING TEACHER EFFECTS

What is a teacher effect and how is it estimated?

A teacher effect is an estimate of an individual teacher's impact on the amount his or her students learn from one year to the next, as measured by students' performance on a standardized test of student achievement. Teacher effects are also commonly referred to as value-added measures. In the GCPS Human Capital Diagnostic, teacher effects are based on students' performance on the state of Georgia's Criterion-Referenced Competency Tests (CRCT). Teacher effects are estimated by statistically isolating the portion of each student's test score growth attributable to that student's primary teacher from such other factors as achievement in the previous year, demographic characteristics, and peer effects. *Intuitively*, a teacher effect measures the amount a GCPS student would be expected to learn as a result of being assigned to a particular teacher as compared to what they would have learned from the average teacher in the district. As this implies, teacher effects are relative, not absolute, measures. Even if GCPS teachers as a group were among the most effective in the nation, some would still be categorized as "least effective" for the purposes of this diagnostic.

What teachers are included in this report?

Teacher effects can only be estimated for teachers who can be linked to a classroom roster of students in grades for which information is available on student test performance the previous year. In this report, we primarily present results for math teachers tied to students in grades 2–8 using the school years 2005–06 to 2009–10. We conducted similar analyses for reading and English/Language Arts (ELA) teachers in those same grades and years, but generally do not present those results in this report for two reasons. First, the variation in effectiveness among reading teachers is substantially smaller than that among math and ELA teachers. This finding is consistent with other research on teacher effectiveness and may suggest that families and other factors outside the classroom have a larger influence on children's reading performance than is the case in other subjects. Second, we do not present results among ELA teachers because, in most instances, they are very similar to our findings concerning math teachers. We explicitly make note in the text of instances where ELA and math results diverge.

Our full diagnostic report for GCPS includes math and ELA teachers in grades 2–8. All data for these analyses come from GCPS administrative records.

What are the limitations of teacher effects?

Teacher effects are a uniquely valuable performance measure, objectively capturing the impact individual teachers have on students while controlling for the most important ways in which teachers and students are assigned to classrooms (i.e. teachers being assigned to classrooms with lower or higher achieving students). As with any performance measure, however, they come with several caveats.

- Teacher effects measure teachers' peformance only as it relates to student achievement on the CRCT. Teacher effects are only as good as the assessments used to formulate them. Assessments that are insufficiently challenging or that are poorly aligned to the curriculum the district expects its teachers to cover will not yield accurate estimates.
- Some students receive supplemental instruction, from reading specialists or math coaches, for example, that influences their academic progress and cannot be accounted for when estimating teacher effects.
- Care is required when interpreting results concerning group averages of teacher effects. Although we often report findings concerning differences in average effectiveness of teachers from different groups, there is often far more variation in teacher effects within these groups than between them. As shown in summary analysis 8, while novice teachers are, on average, less effective than their more experienced peers, many novice teachers outperform more experienced teachers. SDP's model for estimating teacher effectiveness is meant for understanding aggregate trends, not for the evaluation of individual teachers.

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KEY FINDINGS IN GWINNETT COUNTY PUBLIC SCHOOLS

HUMAN CAPITAL PATHWAY

1. Teacher effectiveness varies substantially in GCPS as measured by value-added measures.

RECRUITMENT

2. High-poverty schools in GCPS have a disproportionately larger share of new hires than low-poverty schools.

3. Over time, late hires continue to be slightly less effective than their peers who were hired before the school year began.

PLACEMENT

4. Less experienced GCPS teachers are assigned to lower-performing students both districtwide *and* within individual schools.

DEVELOPMENT

5. GCPS teachers become more effective in math and ELA during their first 2–3 years in the classroom. After two years, teachers continue to make gains in effectiveness in ELA, while, on average, there are no improvements in math teacher effectiveness.

6. GCPS elementary and middle school teachers with advanced degrees are, on average, no more effective than their colleagues without such degrees.

7. There is no difference in the effectiveness of new hires who are alternatively-certified compared to their traditionally-certified peers. In contrast, National Board certified teachers outperform other teachers with the same levels of experience.

EVALUATION

8. Teacher effects for novice GCPS teachers are, on average, predictive of future teacher effects.

RETENTION/ TURNOVER

9. Top-quartile novice teachers remain teaching in the district at slightly lower rates than their less-effective colleagues. Top-quartile experienced teachers remain teaching at slightly higher rates than their less-effective colleagues.

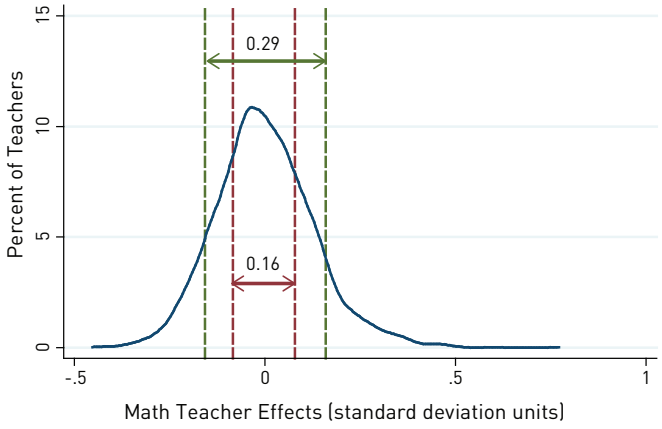
SDP HUMAN CAPITAL DIAGNOSTIC

SUMMARY ANALYSES

1. How much does teacher effectiveness vary among GCPS math teachers?

Teacher effectiveness varies substantially in GCPS.

Distribution of Math Teacher Effects
All Teachers, 2005-06 through 2009-10



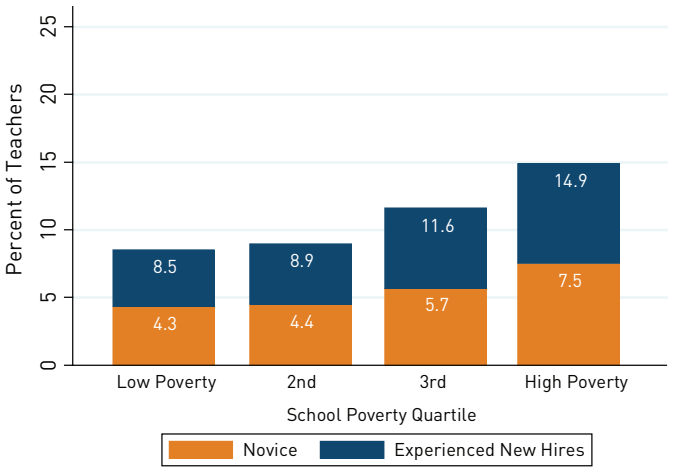
Students assigned to a teacher at the 90th percentile of teacher effectiveness in math or ELA (not shown) learn approximately 0.32 standard deviations more, on average, than students assigned to a teacher at the 10th percentile. How large is this difference? For fourth graders at the 50th percentile of the GCPS test score distribution in 2010, a 0.32 standard deviation improvement would raise their achievement to the 63rd percentile. Another way of looking at it is that a difference of 0.32 standard deviations is roughly the same as an additional year of learning for students in upper elementary grades.[2]

As in other districts and states where similar analyses have been conducted, teachers effectiveness varies widely and can account for a large share of the differences in the academic progress made by GCPS students.

2. What proportion of teachers are new hires in schools, by school poverty level?

High-poverty schools in GCPS have a disproportionately larger share of new hires than low-poverty schools.

Percent of Novice and Experienced New Hires
By School Poverty Level



Schools with the greatest proportion of students qualifying for free or reduced-price lunch have 74% more novice teachers than schools with the lowest proportion of subsidized lunch students. These high-poverty schools also receive more new hires with prior teaching experience. Together, with analyses that look at retention by school poverty levels (not shown), high-poverty GCPS schools experience the highest rates of turnover in the district.

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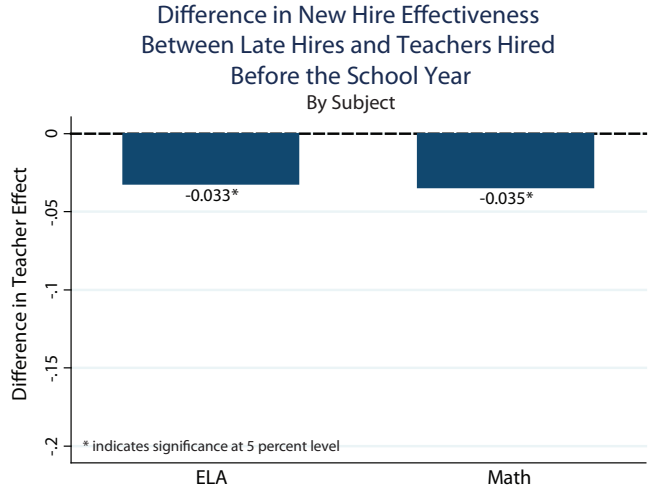
SUMMARY ANALYSES

3. How much does the timing of hiring teachers relate to teacher effectiveness?

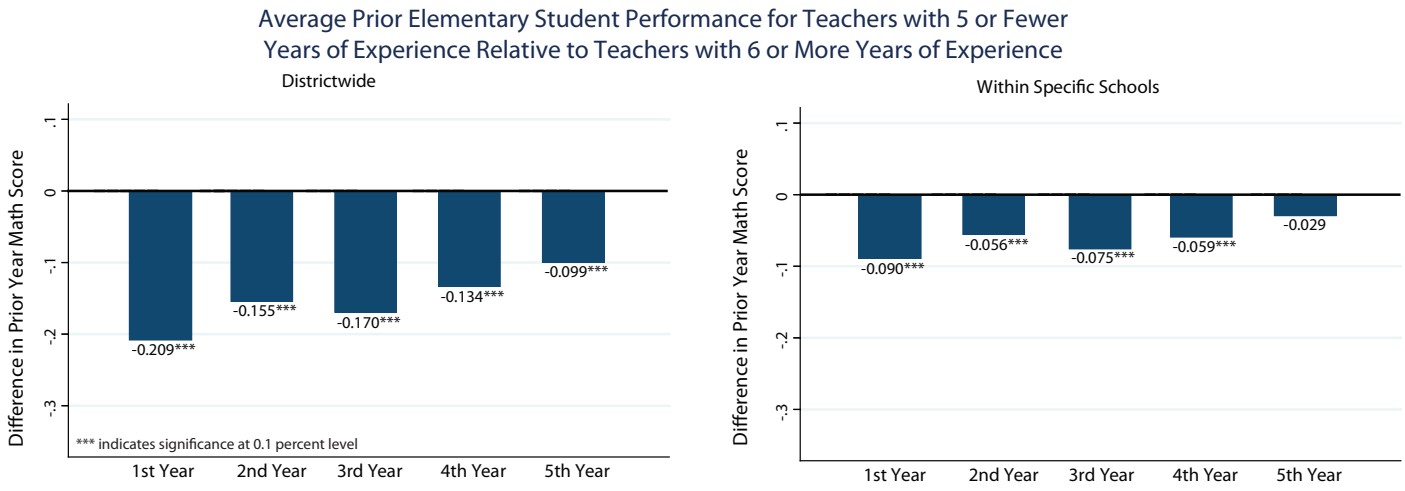
Over time, late hires continue to be slightly less effective than their peers who were hired before the school year began.



Students in classrooms taught by new hires who were hired late performed less well, on average, than those in classrooms taught by teachers who were hired before the school year began. This trend persists after the initial hiring year, so that late hires remain marginally less effective, even up to five years after hiring (not shown).

4. How academically prepared are students who are placed with inexperienced teachers?

Less-experienced GCPS teachers are assigned to lower-performing students both districtwide *and* within individual schools.



Districtwide, novice and early career elementary teachers are disproportionately placed with students with lower standardized math scores from the previous year. As shown in the left panel, this sorting results, in part, from higher turnover rates in schools with lower-performing students. The same patterns are evident, however, even within individual schools as seen in the right panel. This type of sorting matters because, on average, novice teachers are 0.075 standard deviations less effective than their peers with five or more years of experience (not shown). This finding about novice teachers also holds true for elementary school teachers in ELA and middle school teachers in math and ELA (not shown). The effect on students is compounded if students with lower standardized test scores are repeatedly assigned to teachers with less experience.

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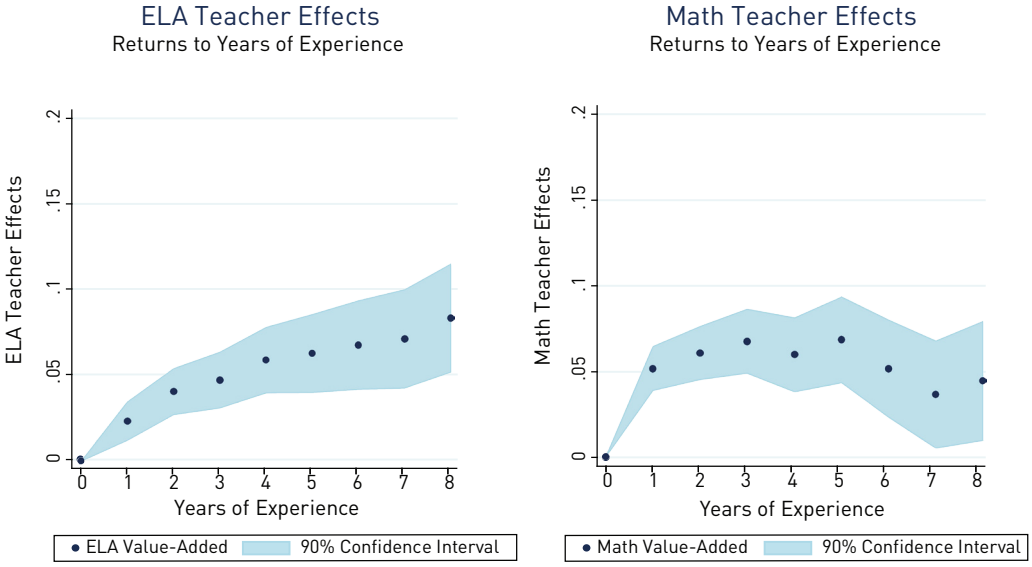
SUMMARY ANALYSES

5. How does teacher effectiveness change over the course of a teacher's career?

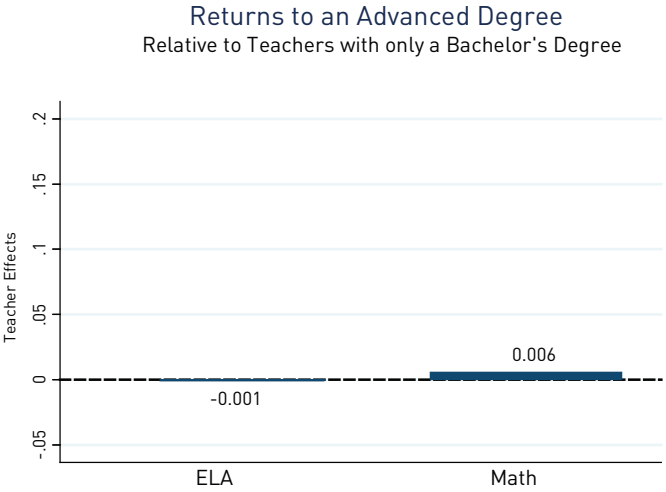
GCPS teachers become more effective in math and ELA during their first years in the classroom. After two years, teachers continue to make gains in effectiveness in ELA, while, on average, there are no improvements in math teacher effectiveness.



In both math and ELA, GCPS teachers experience the largest gains in their effectiveness during the first two years of teaching. Generally, the longer-term patterns in math and ELA are not consistent with many studies of teachers in other districts and states nationwide, which show that a teacher's performance largely plateaus by his or her third or fourth year.[3]

6. Are teachers with advanced degrees more effective?

GCPS elementary and middle school teachers with advanced degrees are, on average, no more effective than their colleagues without such degrees.



Georgia's teacher salary schedule compensates teachers for holding advanced degrees. On average, however, elementary and middle school teachers with advanced degrees are no more effective than their counterparts lacking such degrees. This result is consistent with findings in the national literature.[4]

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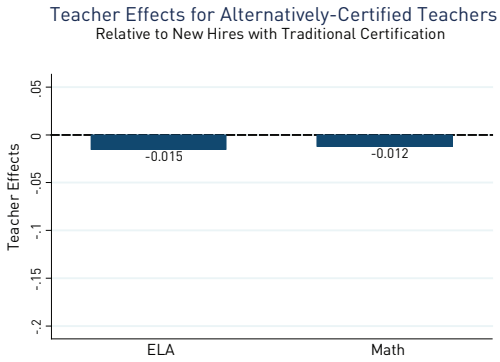
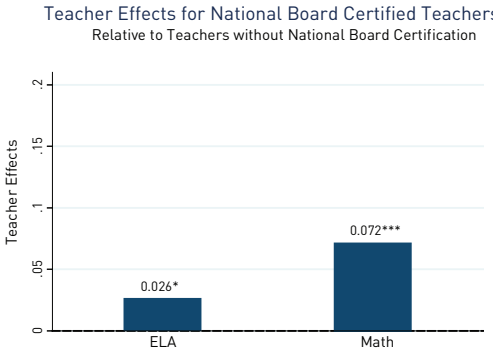
SUMMARY ANALYSES

7. How effective are alternatively-certified GCPS teachers compared to those traditionally certified?

There is no difference in the effectiveness of new hires who are alternatively-certified compared to their traditionally-certified peers. In contrast, National Board certified teachers outperform other teachers with the same levels of experience.

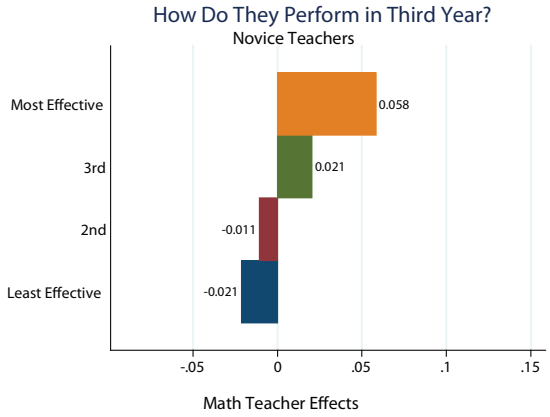




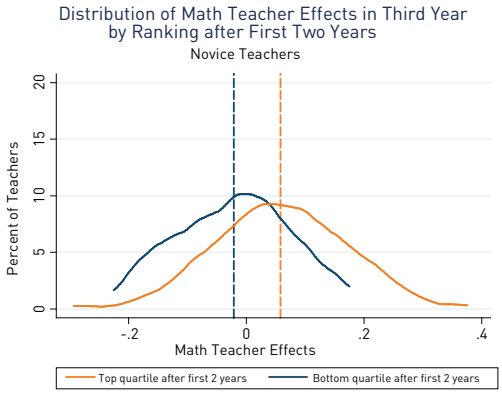
Although there are many alternative pre-service certification programs, on average, alternatively-certified new hires are no more or less effective than traditionally-certified new hires (top panel). In contrast, math and ELA teachers who are National Board certified, a national in-service professional certification program, are more effective, on average, than their non-certified colleagues.

8. Among novice teachers, do estimates of teacher effectiveness predict future performance?

Teacher effects for novice GCPS teachers are, on average, predictive of future teacher effects.



After ranking novice teachers by quartiles using two years of prior data, teachers, on average, perform consistently in their third year. For example, on average, teachers who ranked in the top quartile after the first two years continued to exhibit larger teacher-effect estimates in their third year than teachers ranked in the three lower quartiles. This result suggests predictive power for estimating future effectiveness. These results hold true for ELA teachers as well (not shown).



Looking at effectiveness in year 3 by prior rankings, however, we find that prior teacher effectiveness estimates, while informative, are imperfect. They do not perfectly predict effectiveness in year 3. Effectiveness in the third year varies widely and even overlaps for the two groups. This result suggests that prior teacher-effect estimates and rankings are more appropriate as predictors in the aggregate than for individual teachers.

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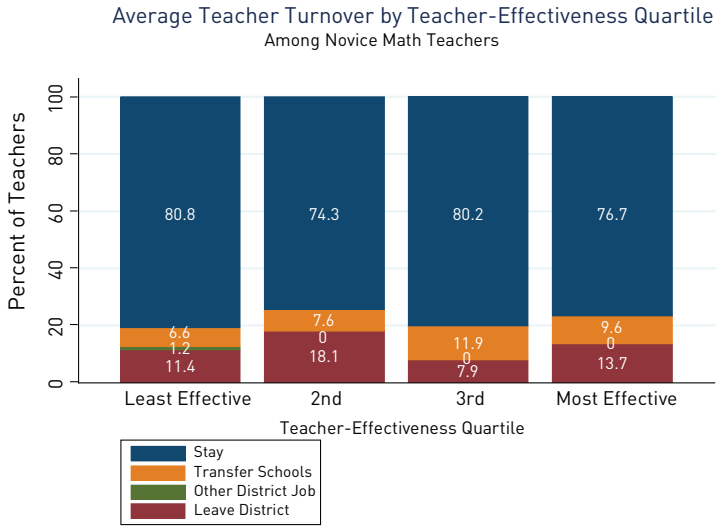
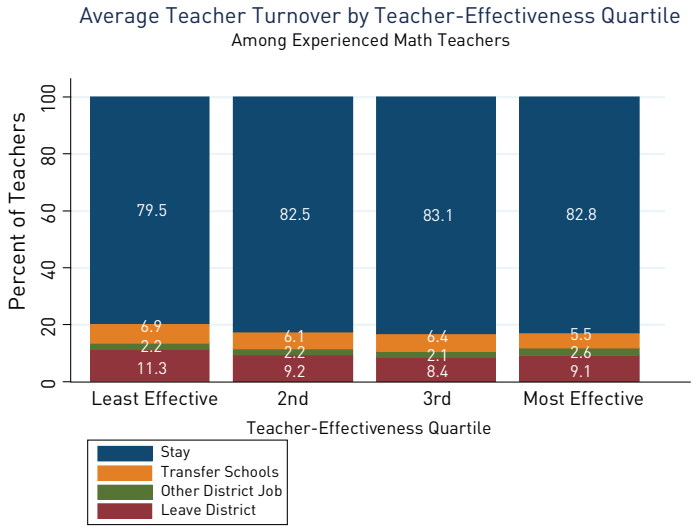
SUMMARY ANALYSES

9. At what rates are the most- and least-effective novice and experienced GCPS teachers being retained?

Top-quartile novice teachers remain teaching in the district at slightly lower rates than their less-effective colleagues. Top-quartile experienced teachers remain teaching at slightly higher rates than their less-effective colleagues.





The most-effective novice teachers in math and ELA tend to stay in the district at slightly lower rates and leave the district at slightly higher rates than the least-effective novice teachers. On the other hand, among experienced teachers, the most-effective math and ELA teachers stay in the district at slightly higher rates and leave at slightly lower rates.

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NOTES

Endnotes

1. Rivkin, S.G., Hanushek, E.A., and Kain, J.F. (March 2005). Teachers, schools, and academic achievement. *Econometrica*, *73*(2), 417–458.

2. Hill, C.J., Bloom, H.S., Black, A.R., and Lipsey, M.W. (December 2008). Empirical benchmarks for interpreting effect sizes in research. *Child Development Perspectives*, *2*(3), 172–177.

3. Boyd, D.J. (Spring 2006). How changes in entry requirements alter the teacher workforce and affect student achievement. *Education Finance and Policy*, 1(2), 176–216.

4. Gordon, R., Kane, T.J., and Staiger, D.O. (March 2006). Identifying effective teachers using performance on the job. *Hamilton Project Discussion Paper*. The Brookings Institution.

Figure Notes

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1. Sample: Second- through eighth-grade unique math teachers in 2005–06 through 2009–10. N=4,141. Figure is based on three-year pooled estimates of teacher effects for each teacher.

2. Sample: Second- through eighth-grade unique math and ELA teachers in 2005–06 through 2009–10 who were newly hired at the district. Math teachers=1,008; ELA teachers: 1,037. Figure is based on three-year pooled estimates of teacher effects for each teacher. Likely due to factors external to the district, such as the current economic climate and slower student population growth in GCPS, trends in hiring and retention for the most recent year of data (2009–2010) do not conform to general trends seen over time. *p<.05

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3. Sample: All teachers in 2005–06 through 2009–10. Low-Poverty Quartile: N=14,609; 2nd Quartile: N=12,739; 3rd Quartile: N=11,208; High-Poverty Quartile: N=11,881. Experienced new hires may have one or more years of previous teaching experience. Low-poverty schools (Q1) had 8.21-34.77% students who are eligible for free or reduced-price lunch (FRPL);Q2 schools had 35.92-46.49% FRPL students; Q3 schools had 49.35-75.76% FRPL students; high-poverty schools (Q4) had 76.04-96.24% FRPL students.

4. Sample: Second- through fifth-grade elementary school students in 2005–06 through 2009–10 with a prior math CRCT test scores and a primary math teacher; also, their corresponding elementary school math teachers in 2005–06 through 2009-10 with teacher-effect estimates. N(students)=87,041 N(teachers)=3,577. ***p<.001

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5. Sample: Second- through eighth-grade math teachers in 2005–06 through 2009–10 with teacher-effect estimates. N(math teachers)= 12,267; N(ELA teachers)= 12,207. Effects are estimated using teacher fixed effects.

6. Sample: Second- through eighth-grade math teachers in 2005–06 through 2009–10 with teacher-effect estimates. N(math teachers)= 12,267; N(ELA teachers)= 12,207. Degree information is based on salary grade. Having a master's, specialized, or doctoral degree all count as an advanced degree. Additional analyses were conducted to see if there were differential effects among all advanced-degree types. Because there were no differential effects, this analysis focuses on the aggregate effect of having an advanced degree.

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7. Second- through eighth-grade math teachers in 2005–06 through 2009–10 with teacher-effect estimates. Left Panel: N(math new hires)= 1,014; N(ELA new hires)= 1,045. Right Panel: N(math teachers)= 12,267; N(ELA teachers)= 12,207.
*p<.05, ***p<.001

8, 9. Sample: Second- through eighth-grade novice math teachers in 2005–06, 2006–07, and 2007–08 who stay and teach for at least three years (through 2007–08, 2008–09, or 2009–10) and who have teacher-effect estimates. N=153.

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10. Sample: Second- through eighth-grade novice math teachers in 2006–07 through 2008–09 with teacher effects estimates. Least-Effective Quartile: N=167; 2nd Quartile: N=144; 3rd Quartile: N=126; Most-Effective Quartile: N=73.

11. Sample: Second- through eighth-grade experienced math teachers in 2006–07 through 2008–09 with teacher effects estimates.

The Strategic Data Project thanks Berney Kirkland, Eniko Nagy, and Amy Wooten for their input and guidance. These analyses were conducted by Zack Mabel and Eniko Nagy. Todd Kawakita and Ashley Snowdon created this report.

Center for Education Policy Research

HARVARD UNIVERSITY