With the Best of Intentions:
School-Level Interventions and the Pursuit of Proficiency

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Abstract

This paper analyzes the effectiveness of a battery of formative assessments, 4Sight, which are broadly aligned with annual assessments required by NCLB. These formative assessments are designed to provide teachers with feedback on student performance throughout the year in order to raise end of year student test scores. Methodologies for evaluating the effect of using 4Sight on test score outcomes are drawn from the program evaluation literature, and include individual and school-level OLS, quartile regressions, and probit regressions, as well as matching at the school-level. Micro-econometric results show that 4Sight had no discernible effect on math scores and a small negative effect on reading scores in its first year in Pennsylvania. Policy recommendations include continuing a smaller-scale trial period of 4Sight for several more years in conjunction with careful, improved alignment between 4Sight and PSSA, ongoing empirical analysis of its effects, and incorporating more opportunity for feedback to teachers and students to improve 4Sight as a formative assessment. Perhaps the most surprising finding of this paper is that while 4Sight has a very small effect on student outcomes, students receiving tutoring under NCLB are significantly and between four and nine percent less likely to pass their exams, even after controlling for all covariates, including eligibility for tutoring. This implies that the publicly-funded tutoring is actually disadvantaging those students who receive it. These results should serve as a cautionary example to school, district, and state-level policy-makers when choosing interventions designed to improve student performance on tests tied to NCLB.

1. Introduction and Research Questions

The enactment of the No Child Left Behind (NCLB) Act in 2002 has hastened the spread of a culture of testing in the K – 12 public schools of our nation. Since its enactment, Section 1111 of NCLB has required each state to devise academic standards on which to base their local school

curriculum and annual assessments in math, reading, writing, and science. Year after year, NCLB requires an increasing fraction of public school students to pass these assessments as a condition to the state, district, and school continuing to receive federal funding, which makes up 9% of public school funding nationwide.[1] Failure at the school level to meet such targets over time can lead to sanctions and mandatory school reform, and each summer the release of school-level test results in every state has substantial repercussions for local superintendents, school boards, teachers, and principals. Political consequences and push back at sanctions are substantial, and the pressure to improve test scores increasingly reaches every classroom and lesson plan on a daily basis in public education.

While there is growing focus and concern about the consequences of the culture of testing on students, teachers, schools, and other stakeholders,[2] there is far less focus on the tests themselves, and on the procedures that states and school districts are using to raise their performance. As a practical matter, it is extremely difficult to devise a test of 6th grade math of several hours duration that will test the knowledge and skills of what a 6th grade student is expected to know about math.[3] Historically, teachers within a school or district, taking advice from organizations such as the National Council of Teachers of Mathematics (NCTM) or the National Council of Teachers of English (NCTE), would devise their own set of 6th grade math or reading standards, upon which they would base their teaching, curriculum, and assessments. With the advent of federally-mandated state-wide standardized testing, schools and districts have had to realign their curricula and teaching to address the same academic standards that are

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[1] As of 2004-05. (Hoover Institution 2006)

[2] News articles such as "Schools Found Likely to Miss NCLB Targets" (Cavanagh and Hoff 2008) and "No Easy Answers About NCLB's Effect on 'Poverty Gap'" (Viadero 2007) summarize some of the research and public opinion regarding the effects of NCLB.

[3] See Table A.1 in the appendix for the list of Pennsylvania's math academic standards for 6th graders.

assessed in the state exams. The principle of teaching to and assessing the same set of academic skills is called alignment.

In response to increasing pressure for students to perform well on state assessments, many states and districts are turning to intra-school year tests which demonstrate how each student is progressing towards preparation for the end-of-year state assessment and enable meeting deficiencies before the high stakes test. These interim tests are sometimes referred to as formative assessments, "ongoing assessments designed to make students' thinking visible to both teachers and students" (National Research Council 2000, p.24), or as benchmark assessments, which seek to predict a student's score on an upcoming assessment, such as the state assessments required under NCLB. This paper provides analysis of the alignment, use, and level of success of one such set of tests, 4Sight, a "benchmark assessment" which is written and sold to school districts in a variety of states by the Success for All Foundation of Maryland. In broader terms, the use and analysis of 4Sight should be considered an example of a type of reform that schools, districts, or states may choose to purchase and invest human resources into as part of the push to increase student test scores motivated by the sanctions and reform mandated by NCLB.

Our analysis of 4Sight examines the Pennsylvania version of the reading and mathematics tests at the 6th grade level. Our purpose is threefold. First, we examine the alignment of 4Sight with the academic standards of the state of Pennsylvania. Second, we examine the way Success for All and the Pennsylvania Department of Education (PDE) suggest that 4Sight is used. Finally, we statistically analyze the effects of the initial use of 4Sight in Pennsylvania and the subsequent performance of students on the state NCLB-approved examination, the Pennsylvania State System of Assessment (PSSA).

Our findings indicate that 4Sight is not fully aligned with the state standards, with the reading tests covering only 40% of the content contained in the Pennsylvania reading standards and the math tests covering 80% of the content contained in the state math standards. We also determine that, according to its proposed use by Success for All and the PDE, 4Sight only provides feedback to teachers regarding their students' performance. By not also providing students with feedback as to their strengths and weaknesses, 4Sight fails to conform to the definition of a formative assessment, as defined by the National Research Council. Finally, our estimates of OLS and matching models of the education production function reveal that 4Sight had little or no statistically significant effect on student performance on the PSSA in its pilot year.

Our results suggest several policy recommendations. The failure of 4Sight to have a significant positive effect on PSSA scores might be caused in part by its incomplete coverage or its failure to conform to the criteria of formative assessment. We suggest that the coverage of 4Sight be expanded to become fully aligned with the Pennsylvania state standards in math and reading. Furthermore, we suggest that Success for All and the PDE include additional tools and training with 4Sight to allow both teachers and students to receive feedback from each test so that it becomes a true formative assessment. Finally, we suggest that careful and thorough statistical analysis of PSSA performance with regard to 4Sight use be continued for several more years, until a reliable pattern of the effects of 4Sight use can be observed.

On a broader scale, our findings suggest that policy-makers within the school system seeking any type of intervention to increase student test scores should proceed with caution. Pennsylvania's large-scale pilot-year implementation of 4Sight was most likely motivated by increasing pressure to increase student performance. However, if the empirical results from the

pilot year are representative of the effect 4Sight will continue to have on student performance, this is an intervention whose use it would have behooved the state to embark upon using a smaller and more organized trial period, and this should serve as an example for policy-makers in the future.

2. Some Background on Student Achievement Testing and Testing in Pennsylvania

Pennsylvania began testing students state-wide as a result of the School District Reorganization Act (Act 229), which required the State Board of Education to develop an "evaluation procedure designed to measure objectively the adequacy and efficiency of the educational program offered by the public schools of the Commonwealth."[4] The purpose of these tests was to allow districts to appraise their own educational performance and to provide "uniform evaluation" across school districts. In conjunction with Educational Testing Service (ETS), the Pennsylvania Department of Education (PDE) constructed the first state assessment of students in Pennsylvania, which took place in the 1969-70 school year, testing students in grades 5 and 11 in many subject areas; grade 8 testing was added in 1974. This program, which reported only school-level scores, ran through 1988, when the state implemented student-level competency testing, Testing for Essential Learning and Literary Skills (TELLS), designed to identify students in grades 3, 5, and 8 with difficulties in reading or mathematics. TELLS continued until 1991, and in 1992 the current Pennsylvania System of School Assessment (PSSA) began testing reading and mathematics at grades 5, 8, and 11, and writing at grades 6 and 9.

In 1999, the Pennsylvania State Board of Education adopted a new set of academic standards detailing the knowledge and skills students should have at each grade level so that in

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[4] Quoted text in this section comes from Act 229. For further detail about the history of standardized testing in Pennsylvania, see Chapter 1 of the *Technical report for the Pennsylvania System of School Assessment: 2006 Reading and mathematics grades 4, 6, and 7* (Data Recognition Corporation 2007).

2000, the purpose of the PSSA became two-fold: to measure student attainment of academic standards and to assess the extent to which school policies enabled students to achieve proficiency. This change pre-dated the inception of NCLB by two years. As a result, Pennsylvania used the standards and assessments they already had in place in order to meet the requirements of the federal legislation. Testing has expanded over the years since 2002; one requirement of NCLB is that every student[5] be tested in grades 3, 5, 8, and 11. The majority of these students must also have their scores included in the school-level reports documenting the fraction of students within subcategories[6] that have performed at or above a level defined as "proficient."[7] In 2006, Pennsylvania testing was expanded to include grades 4-8 and 11. To meet the requirement of NCLB, each year a school must make Adequate Yearly Progress (AYP). In 2006 in Pennsylvania, meeting AYP meant that a school had at least a 95% participation rate in the PSSA, at least 45% of students scored at or above proficiency on the math assessment, and at least 54% of students scored at or above proficiency on the reading assessment within each subcategory.

In this paper, we use scores from the spring of 2006 6th grade math and reading PSSA tests. The academic standards adopted by the PDE in 1999 are the foundation upon which these tests are designed. In 2005, the PDE developed Assessment Anchor Content Standards (Assessment Anchors) to further clarify the material students should learn and would be tested on in each grade. As a result of these two adoptions, material on each of the tests is broken down first into reporting categories, which describe broad categories of content, then further into assessment anchors, and finally into eligible content, which specifies the type of question that

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[5] Students are exempted from taking the tests if they are in their first year as a limited English proficiency (LEP) student. Students with severe cognitive disabilities may qualify to take an alternate assessment.
[6] Proficiency rates are reported for the entire school and nine subgroups (if they have at least 40 students): American Indian, Asian, Black, Hispanic, White, Multi-Racial, IEP, LEP, and Economically Disadvantaged.
[7] Pennsylvania defines four performance indices: Advanced, Proficient, Basic, and Below Basic.

may be asked on the PSSA[8] The reading test is broken into two reporting categories, "Comprehension and Reading Skills" and "Interpretation and Analysis of Fictional and Nonfictional Text." The math test is broken into five reporting categories: "Numbers and Operations," "Measurement," "Geometry," "Algebraic Concepts," and "Data Analysis and Probability." The further breakdown of reporting categories into assessment anchors and eligible content is presented in Section 8 below.

3. Overview of 4Sight and its Use in Pennsylvania

4Sight is a set of math and reading tests written by the Success for All Foundation of Maryland which they define as "a benchmark assessment tool that enables you to predict your students' reading – and in some states, math – achievement multiple times throughout the year." (Success for All 2009b) As of the 2008-09 school year, versions of 4Sight are available in 16 states (Success for All 2009c), with each state's tests tailored to assess the current set of academic standards on which that state bases its NCLB assessments. In Pennsylvania, 4Sight is available for grades 3-11 in both math and reading. These tests are designed to be given to students up to five times throughout the year, and predict student performance on the PSSA (Success for All 2009a).[9] An analysis of the 6th grade Pennsylvania 4Sight tests administered during school year 2005-6 performed by the authors revealed that each test contains between 28 and 36 questions, and each of the five versions of the math or reading test covers the same set of eligible content.

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[8] For a list of assessment anchors and eligible content by reporting category and grade, please see the appendix.
[9] The 4Sight Reading and Math Benchmarks 2008-2009 Technical Report for Pennsylvania provides statistical evidence that 4Sight allows "educators to use the estimated student proficiency levels and diagnostic subscale data with confidence to inform their instruction and professional development." (Success for All 2009a, p. 21) While the purpose of the Technical Report was to assess the accuracy of the predictive power the 4Sight exams provide for the PSSA, the purpose of our paper is to examine the effect of 4Sight on student performance on the PSSA.

Neither the reading nor the math 4Sight tests covers all of Pennsylvania's eligible content, meaning that students should be learning and will potentially be tested on the PSSA on content not assessed by 4Sight. The details of 4Sight's alignment with Pennsylvania's 6th grade math and reading eligible content are presented in Appendix Tables A.1 and A.2. These tables list the reporting categories, assessment anchors, and eligible content covered by the PSSA. Eligible content which is italicized is not assessed by 4Sight. We find that the 4Sight math test covers 80%, and the 4Sight reading test covers 40% of the eligible content contained in Pennsylvania's 2006 academic standards.

The 2005-06 school-year was the pilot year for 4Sight in Pennsylvania. The use of 4Sight was determined at the school level, with 750 schools from 310 districts choosing to use 4Sight[10]. Schools chose to use 4Sight for one of several reasons, listed by the Pennsylvania Training & Technical Assistance Network (PaTTAN), an initiative of PDE:

> 4Sight has been used to assist districts in promoting change, addressing program needs, initiating data discussions, and fostering a data-driven culture. In addition, 4Sight has focused prevention and intervention efforts and provided a consistent reporting system for Pennsylvania districts involved in the Educational Assistance Program (EAP) Tutoring Initiative. (PaTTAN 2009)

Schools who chose to use 4Sight in 2005-06 paid $1,000 per building for up to 500 students to use the online version of the test, or about $3 per student per subject to use the paper version of the test.

Schools using 4Sight participated in training sessions organized by PaTTAN and designed to instruct teachers and administrators on the successful use of 4Sight. Topics covered in these sessions include general data analysis, using 4Sight data to prioritize concerns and determine root causes, and identifying targets to improve student achievement (PaTTAN

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[10] Pennsylvania had approximately 3,000 public schools and 501 school districts in 2005-06, according to the National Center for Education Statistics (NCES) Common Core of Data (CCD).

2008).[11] Teachers learned to interpret the results of the 4Sight exams in terms that allowed them to alter their teaching and improve student performance on certain tasks/eligible content. Neither PaTTAN nor Success for All provides a format specifically for feedback to the students, so while 4Sight does provide teachers with feedback regarding student performance, that feedback may never explicitly reach the student. In this sense, the benchmark assessment 4Sight fails to conform to the National Research Council's definition of a formative assessment.

4. Evaluation Methodology and Data Requirements

We are interested in evaluating the impact of 4Sight use on student performance, as measured by PSSA performance. In terms of statistical analysis, we are attempting to measure a "treatment effect:" the effect on a student of being "treated" by 4Sight. There is an extensive literature on the evaluation of social programs, most notably a literature evaluating the effectiveness of job training programs, motivated by LaLonde (1986) and discussed in detail in a handbook chapter by Heckman, LaLonde, and Smith (1999). In addition to the econometric hurdles of evaluating a treatment effect, we must evaluate this effect in the context of an education production model, which, in the absence of a large amount of data, adds to the complexity of the econometric evaluation.

Data Requirements

Ideally, a model of student achievement would be evaluated using each student's complete history of educational inputs (Boardman, Davis, and Sanday 1977) and their endowment, or natural ability as a student, which is inherently unobservable. A complete history of educational inputs would include family inputs, such as the parents' educational attainment and intelligence, student inputs, such as the amount of time spent studying, teacher inputs, such

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[11]Thanks also to Marge McMackin for detailing the training process to the authors.

as the teaching ability of each teacher the student has ever had, and school inputs, such as the academic support that students receive over time. Unfortunately, an exhaustive amount of information in each of these areas is never available to the econometrician, so we must make do with what information and proxies are available, and choose a model carefully to control for missing data as much as possible.

We can think of 4Sight as a treatment in the sense that some students receive it while others do not. The coefficient we are interested in is the expected effect of using 4Sight on a student's PSSA score. In order to evaluate this coefficient, it is desirable to observe each student's PSSA score, with and without having been treated, as demonstrated in equation (1).

(1) $\quad \varepsilon \left[PSSA_{i,4Sight} - PSSA_{i,4Sight} \right]$

Since instead each student is either tested or not tested, and we observe only one PSSA score (either under treatment or non-treatment), we must instead compare two groups of different students, who have been either treated or not treated. Instead of evaluating the coefficient in equation (1), we will be evaluating the coefficient in equation (2), which is equal to equation (1) if the assignment of treatment is random.

(2) $\quad \varepsilon \left[PSSA \mid 4Sight, X \right] - \varepsilon \left[PSSA \mid \text{No } 4Sight, X \right]$

Descriptive Statistical Analysis

The basic framework for our models is of education production. Economic theory tells us that student achievement can be thought of as a function of inputs from the student, the student's family, and the student's schools over time. We first examine the efficacy of 4Sight using OLS regression to estimate a linear version of the education production model of student achievement including one lagged-test score along with the covariates. The model is illustrated in equation (3), where $PSSA_t$ and $PSSA_{t-1}$ are a student's test scores in years t and $t-1$

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respectively, X_t includes a set of student characteristics at time t and S_t includes a set of school characteristics at time t.

(3) $PSSA_t = \alpha PSSA_{t-1} + \beta X_t + \gamma S_t + \delta 4Sight + \varepsilon_t$

The major econometric hurdle to be overcome in models of student achievement is the lack of data on each student's complete history of educational inputs and their endowment, which is difficult to observe. The model expressed in equation (3) overcomes the issue by using a lagged-test score as a proxy for non-contemporary inputs, such as school and family inputs prior to time t, and the student's endowment. Identification of the coefficients of interest assumes that the lagged-test score provides a sufficient statistic for unobserved non-contemporary and endowment inputs which decline geometrically with age.[12] Additionally, because our data is non-experimental, identification of a "treatment" effect on students using 4Sight requires that no endogeneity exists between unobservables not accounted for in the model and selection into the treatment group.

Tables A.1 and A.2 in the appendix demonstrate that 4Sight covers between 35-100% of the eligible content within a reporting category for any given grade. In order to examine the relationship between alignment and student outcomes, we use this variation in coverage to analyze the different effects of 4Sight between reporting categories. We use OLS to evaluate a value-added model of student achievement within each reporting category and then compare the coefficients on 4Sight with the coverage of the particular reporting category.

Correcting for Selection Bias

As stated above, we require selection into treatment to be random in order for equation (2) to identify the average treatment effect of 4Sight. In fact, schools choose whether or not their

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[12] Todd and Wolpin (2003) provide a detailed discussion of the econometric assumptions imposed when using a single-year lagged test-score value-added model.

students use 4Sight, and these schools do not necessarily make the decision randomly. We might assume that schools take into consideration the costs of 4Sight and compare them to what there is to be gained: improvement in test scores. We might therefore expect that schools with more money and lower test scores would be more likely to use 4Sight than schools with less money and higher test scores.

As is evident from the descriptive statistics in Tables 1-8, the distribution of covariates among students and schools using 4Sight and those not using 4Sight are different. This suggests the use of a matching model to correct for selection bias and identify a treatment-on-the-treated effect on test score outcomes. We use the approach first used by Rosenbaum and Rubin (1983) of matching on propensity scores. The propensity score, or the probability of a student receiving treatment given their characteristics, is defined in equation (4), where *4Sight$_{it}$* is a dummy variable signifying whether student *i* received treatment in time *t*, *PSSA$_{it}$* is a set of student *i*'s test scores in time *t*-1 and *X$_{it}$* and *S$_{it}$*, are sets of contemporaneous student and school characteristics for student *i* in time *t*.

(4) $\Pr\left(4Sight_{it} = 1 \mid PSSA_{i,t-1}, X_{it}, S_{it}\right)$

Because selection is determined at the school level, and because *S$_{it}$* is composed of all individuals within a particular school, *S$_{it}$* is a sufficient statistic for determining student *i*'s treatment. For this reason, we have aggregated all data to the school level for the purpose of calculating propensity scores. Matching thus occurs at the school level, estimating the average treatment on the treated (ATT) in terms of average test score. Estimation of the ATT is performed using the nearest-neighbor method.[13]

Dependent Variables

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[13] For a discussion on identifying ATT, see Heckman, Lalonde, and Smith (1999).

Data on student performance comes from the Data Recognition Corporation (DRC), which writes, administers, and scores the Pennsylvania System of School Assessment (PSSA) for the Pennsylvania Department of Education, under a signed confidentiality agreement with the Pennsylvania Department of Education. For the 2004-05 school-year, data includes detailed test score information for students in grades 5 and 11. For the 2005-06 school-year, data includes detailed test score information for students in grades 3-8 and 11. Using identifiers[14] from the data, we have created a 2-year data set matched at the individual-level, with a match-rate of 89.0%, limited to students in 5th grade in 2004-05 advancing to 6th grade in 2005-06.

PSSA scores are reported to students as scaled scores, which translate a raw score into a number greater than or equal to 700 according to a table created by PDE in association with psychometricians in any given test year. These scaled scores are normed to a school-level mean (1300) and standard deviation (100) based on raw school-level scores in the base year (1996). These scores can be appropriately interpreted at an interval-level, meaning that a 5-point difference means the same whether the base score is 1200 or 1600. [15] In addition, students see their PSSA performance broken down by reporting category. To evaluate student performance from year to year within each reporting category, we have constructed percentage correct scores for each student in each reporting category, calculated simply as the number of questions a student answered correctly divided by the number of questions asked in that category.

Explanatory Variables

The DRC test-score data includes identifying, socio-economic, and academic data for each student taking the test. We have used this data to create a set of dummy variables for each individual student including: gender (male = 0, female = 1), race categories (white, black,

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[14] Identifiers available were a state identification number, the student's name, and the student's birth date.

[15] More information is available in the *Technical Report for the Pennsylvania System of School Assessment: 2006 Reading and Mathematics Grades 4, 6, and 7* (Data Recognition Corporation 2007).

Hispanic, other), tutoring eligibility and tutoring status,[16] Title I status (indicates that a student is low-income or attending a school with a large percentage of low-income students), Title III status (indicates that the student is receiving instruction in English as a second language), IEP status (indicates that the student has a learning disability), and gifted status. We also know which school each student attended in each year, and have merged student-level data to school-level data according to the student's sixth-grade school. School-level data includes mean teacher experience,[17] percentage of teachers with master's degrees, mean teacher performance on standardized-tests (Praxis and National Teacher Examinations (NTE)) measured as percent-correct on the respective tests[18], student-teacher ratio, weapons violations per student, percent of students qualifying for Free and Reduced Lunch, and percent of white students. These data are also provided by PDE to this project as part of the master confidentiality agreement.

Data on the use of 4Sight is at the school-level by grade and subject (math or reading), and was available for a limited time from PDE.[19] We have merged this data to the individual-level dataset, so that a variable indicates whether a particular student used 4Sight math in 2005-06 and another variable indicates whether the student used 4Sight reading in 2005-06. Data regarding the coverage of 4Sight by reporting category comes from our analysis[20] of the 4Sight exams in conjunction with field discussions with area experts.

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[16] Tutoring eligibility and status refer to sanctions required by NCLB Section 1116 Subsection (e) (1). Low-income students at schools which have failed AYP for at least two years in a row become eligible for private tutoring, which is paid for using federal Title I money. Not all students who are eligible choose to use this service; the tutoring status variable indicates the student did choose to receive this tutoring.

[17] Mean teacher experience is defined as the average number of years a teacher has been employed as a licensed professional in public K-12 in the state of Pennsylvania.

[18] See Strauss, Bowes, Marks and Plesko (2000) for a discussion and rationale for this transformation of teacher test scores. See Strauss and Sawyer (1986) for an earlier analysis of the effects of NTE on student achievement in North Carolina.

[19] We received this data from the PDE website in early 2008. It has since been removed.

[20] The Pittsburgh Public Schools classified the questions on each 4Sight exam into the corresponding Reporting Categories, Assessment Anchors, and Eligible Content, and provided us with this information. The authors performed subsequent analysis of the coverage of 4Sight compared to the PSSA.

5. Empirical Results

Characteristics of the Data at the Student and School Levels

Descriptive statistics on students by 4Sight use, along with t- or F-values from a difference of means test comparing 4Sight users with 4Sight non-users, are provided in Tables 1 and 3. Table 1 shows statistics for students using 4Sight for math, and Table 3 shows statistics for students using 4Sight for reading. The correlation between students using 4Sight for math and those using 4Sight for reading is 0.8, meaning that most students using one are also using the other; as a result, the tables show similar statistics. Students using 4Sight are significantly more white, richer (as indicated by their Title I status), more likely to speak English as a first language (as indicated by their Title III status), more likely to be denoted as gifted, and less likely to be on an individualized education plan (an indicator of special education status) than students not using 4Sight. Students are equally as likely to qualify for tutoring under NCLB, but more likely to receive tutoring if they belong to the group using 4Sight. Differences in gender and homelessness are insignificant between the two groups. Students using 4Sight have teachers with significantly more experience and who are less likely to have a master's degree. Students using 4Sight are in significantly smaller classrooms as measured by student-teacher ratio, have significantly more peers on free or reduced lunch, and have significantly more white peers. These statistics indicate that students using 4Sight are more likely to belong to a school with slightly higher socio-economic status than their non-4Sight counterparts, but that students at their school are also more likely to be enrolled in programs such as Title I, NCLB tutoring, and free or reduced lunch. This is in accord with a model in which schools that are more pro-active in seeking helpful programs for their students are selecting into 4Sight use.

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Descriptive statistics on schools by 4Sight use, along with t-values from a difference of means test comparing 4Sight users with 4Sight non-users are provided in Tables 5 and 7. As in the individual-level statistics, schools using 4Sight are significantly more white, richer (as indicated by their Title I status), and have a higher percentage of students denoted as gifted, and a lower percentage of students on an individualized education plan than schools not using 4Sight. Schools using 4Sight have a higher percentage of students both qualifying for and receiving tutoring. Student-teacher ratios remain significantly lower, and teacher experience remains significantly higher for schools using 4Sight, but all other characteristics are not significantly different. Again, this is in accord with a model in which pro-active schools, via their teachers, administrators, or parents, self-select into treatment and use 4Sight.

Characteristics of the PSSA

Tables 2 and 4 show average student PSSA scores by 4Sight use. In both cases (4Sight math and reading), 4Sight users have math and reading scores that are significantly lower (by 9-11 points) than students not using 4Sight. One standard deviation for each of these tests is between 207 and 226 points, so the group means differ by approximately 5% of a standard deviation. Tables 6 and 8 show average school PSSA scores by 4Sight use. There is no statistically significant difference between either test for either 4Sight group at the school-level.

Individual Student Results: Scaled Scores

Individual-level OLS estimates of equation (3) were estimated[21] with and without the control variables, and are presented in Tables 10 and 11. Each table has six columns. The first regresses a student's math scaled score from 2006 on the student's prior math scaled score from 2005, the second column adds dummy variables for treatment with 4Sight math and 4Sight reading, and the third and fourth columns add individual and school characteristics (where white

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[21] The stochastic specifications for all models are presented in Table 9.

is the eliminated race category). The fifth and sixth columns include information on teachers'

Praxis scores and NTE scores, respectively. These have been run as separate regressions because

the data on teachers' test scores are incomplete, and their inclusion reduces the number of

observations available for regression. In each case, the teacher test scores were also run in

separate regressions (so that only one teacher test score is included in each regression) in order to

correct for multicollinearity between these variables. Neither the signs nor the significance

levels of the coefficients on these variables change much when separate regressions are

performed, and results can be obtained from the authors by request.

Table 10 presents results for the PSSA math scaled scores. The first row of coefficients

can be interpreted as elasticities of student performance in 2006 given performance in 2005.

Column (1) shows that in the absence of covariates, a 10% increase in 2005 scaled score implies

an 8.5% increase in 2006 scaled score. This elasticity does not change in a statistically

significant manner in column (2), when the use of 4Sight is added to the regression. The

coefficient on 4Sight math is insignificant and near zero. Column (3) adds individual-level

covariates to the regression, all of which are significant. With the addition of the individual-

level covariates, the effect of 4Sight remains the same. Column (4) adds school-level covariates

to the regression, all of which are significant. With the addition of the school-level covariates,

the effect of 4Sight becomes positive and significant, but small; an effect of 0.12% is equivalent

to a 1.7-point improvement at the mean scaled score of 1406. The coefficients on the covariates

all take the expected signs, and are in line with estimates from previous studies (Krueger 1999;

Hanushek 1986). Column (5) adds teachers' average Praxis scores, with a significant positive

coefficient on teachers' writing scores, and significant negative coefficient on teachers' math

scores. Column (6) adds teachers' average NTE scores, with significant, positive coefficients on

professional and common knowledge scores, and a significant, negative coefficient on general knowledge scores.[22]

Table 11 presents results for the PSSA reading scaled scores. Again, the first row of coefficients can be interpreted as elasticities of student reading performance in 2006 given performance in 2005. Column (1) shows that in the absence of covariates, a 10% increase in 2005 scaled score implies a 7.3% increase in 2006 scaled score, which is lower than in the case of the math scaled scores. This elasticity does not change in column (2), when the use of 4Sight is added to the regression. The coefficient on 4Sight is negative and significant; a 0.26% change is equivalent to a 3.5-point decrease at the mean scaled score of 1343. This coefficient remains negative and significant in all specifications of the model. Column (3) adds individual-level covariates to the regression, all of which are significant. The coefficients on the covariates all take the expected signs. Column (4) adds school-level covariates to the regression, all of which are significant. The coefficients on the covariates all take the expected signs. Column (5) adds teachers' average Praxis scores, with a significant positive coefficient on teachers' writing scores, and significant negative coefficient on teachers' math scores. Column (6) adds teachers' average NTE scores, with significant, positive coefficients on professional and common knowledge scores, and an insignificant coefficient on general knowledge scores.

Tables 12 and 13 present coefficients from quartile regressions with specifications analogous to those in columns (1) through (4) in the OLS regressions. The quartile regressions examine the impact of the covariates on students at the 25th, 50th, and 75th percentiles of performance on the 2006 6th grade PSSA. Table 12 presents results for the PSSA math. Column (1) shows what can again be interpreted as an elasticity of student performance in 2006 given

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[22] See Strauss and Vogt (2007) for somewhat different, district-level results that take into account teacher selection effects.

performance in 2005 in the absence of the covariates. These coefficients show that elasticity is nearly invariant across the quartiles of performance, with performance in 2005 predicting 84-85% of performance in 2006. Column (2) introduces a dummy variable for the use of 4Sight math, and across all quartiles, there is a very small and insignificant positive or zero effect of 4Sight on PSSA score. Column (3) introduces individual-level covariates to the regression, all of which are significant, with the exception of tutoring eligibility at the median, and gender at the 25th percentile. Race, homelessness, and IEP-status have increasing, negative effects moving from the top of the distribution downward. Title I status has a fairly constant negative effect, between 1-2%, across all quartiles, and gifted-status has a fairly constant positive effect, around 5%, across all quartiles. Title III status has a small, positive effect on performance which increases from the top of the distribution downward. Column (4) introduces school-level covariates to the regression, all of which are significant with the exception of the white-student ratio (at all quartiles) and the student-teacher ratio at the median. These coefficients show that mean teacher experience, free and reduced lunch ratio, weapons violations per student, and the ratio of teachers with a Master's degree all have the expected signs, with larger effects on the lower quartiles of performance than the higher. Student-teacher ratio shows a negative effect on the 25th percentile of performance, and a positive effect on the 75th percentile of performance.

Table 13 presents quartile results for PSSA reading. Column (1) shows that, unlike for math scores, the prior year's performance on PSSA reading has a differing and decreasing effect across quartiles. Column (2) adds a dummy variable for the use of 4Sight reading. The coefficients are small, negative, and significant for the 25th and 50th percentiles of performance. Column (3) introduces individual-level covariates to the regression, all of which are significant, with the exception of homelessness, which is only significant at the bottom quartile, and Title III

status, which is not significant in any quartile. Eligibility for tutoring has a negative effect across quartiles, larger in magnitude at the bottom of the distribution; receiving tutoring has a negative and constant effect of about 1% across all quartiles. Gender has a constant effect across quartiles, with females performing a little bit less than 1% better than males. Race, homelessness, Title I status, and IEP status have the expected signs, and show a larger effect toward the bottom of the distribution of performance, as in the math results. Gifted status remains constant across all quartiles, with these students performing about 4% better than their peers. Column (4) adds school-level covariates. Mean teacher experience is insignificant and near zero across the distribution, while the remaining school-level variables all have the expected signs and show larger effects towards the bottom of the distribution.

Individual Student Results: Probit Regressions

Tables 10-13 presented the effects of 4Sight use and other covariates on the log of student scores on the PSSA, however, the policy-relevant outcome in terms of NCLB is whether or not a student performs at or above proficiency on the test. For Tables 14 and 15, the dependent variable is categorical, taking a value of one if the student performed at or above proficiency, as defined by the PDE, on the 2006 PSSA, and zero otherwise. Probit regressions were performed, and marginal effects are reported. Table 14 presents the results for PSSA math. In column (1), we see that, in the absence of covariates, performing at or above proficiency in 2005 meant the student had a 67% chance of performing at or above proficiency in 2006. Column (2) adds a dummy variable for use of 4Sight math, which has a small positive but insignificant effect on student proficiency. Column (3) includes dummy variables for whether the student was eligible and/or received NCLB-mandated tutoring. Even after controlling for eligibility, students had a 9% lower chance of performing at proficiency if they did receive

tutoring. This is a surprising result, given that tutoring is a federally-mandated program intended to improve a student's chance of performing well on the exam. Column (4) adds student-level covariates, all of which are significant with the exception of tutoring eligibility, homelessness, and Title III status. These coefficients all take the expected signs. Race and gifted/IEP status all have effects greater than 10% on student proficiency. Column (5) adds school-level covariates. Student-teacher ratio and white student ratio have insignificant effects on proficiency level. Mean teacher experience and the ratio of teachers with Master's degrees both have positive and significant effects on student proficiency. Weapons violations per student and the free-and-reduced lunch ratio both have large, negative, and significant effect on student proficiency. 4Sight math does not have a significant effect in any specification.

Table 14 presents the results for PSSA reading. In column (1), we see that, in the absence of covariates, performing at or above proficiency in 2005 meant the student had a 65% chance of performing at or above proficiency in 2006. Column (2) adds a dummy variable for use of 4Sight reading, which has a small negative but insignificant effect on student proficiency. Column (3) includes dummy variables for whether the student was eligible and/or received NCLB-mandated tutoring. Again, even after controlling for eligibility, students had a 6% lower chance of performing at proficiency if they did receive tutoring. Column (4) adds student-level covariates, tutoring eligibility, receipt of tutoring, and homelessness have insignificant impacts on student proficiency level. The remaining coefficients take the expected signs, with females performing at proficiency 3% more often than males, black students about 2% less often and Hispanic student about 13% less often than white students. Title III status has a negative effect of about 2% on proficiency, and gifted/IEP status all have effects of the expected sign around 25% on student proficiency. Column (5) adds school-level covariates. Mean teacher experience,

student-teacher ratio, and white student ratio have insignificant effects on proficiency level. The ratio of teachers with Master's degrees has a positive and significant effects on student proficiency. Weapons violations per student and the free-and-reduced lunch ratio both have large, negative, and significant effect on student proficiency. 4Sight math has a negative effect of 1-2% on proficiency level across all specifications, though the coefficient is only significant in column (4).

Individual Student Results: Reporting Categories

Tables 16-19 present OLS regressions of student performance within reporting categories which are measured as percent correct. Tables 16-17 are simple regressions of student performance in 2005 on performance in 2006 within each reporting category. Table 16 shows that a student's math performance within a reporting category does predict their performance the following year; the coefficients are all positive and significant, ranging from 0.90 in Category A (Numbers and Operations) to 0.56 in Category B (Measurement). Table 17 shows that a student's reading performance within a reporting category predicts their performance the following year. The coefficients are positive and significant.

Tables 18-19 add covariates to the regressions performed in Tables 16-17. Table 18 presents results for PSSA math by reporting category. The coefficient on 4Sight is positive and significant in category A, negative and significant in category E, and insignificant and near zero in categories B, C, and D. The coefficients on the covariates are significant and have the expected signs, with the exception of gender, whose sign varies between reporting categories. The coefficient on black varies in magnitude between reporting categories. Table 19 presents results for PSSA reading by reporting category. The coefficients on 4Sight are negative,

significant, and larger in category A than in category B. The coefficients on the covariates have the expected signs.

School-Level Results: OLS

School-level OLS estimates of equation (1) were estimated with and without the control variables, and are presented in Tables 20 and 21. These regressions are identical to those run at the individual-level (Tables 10 and 11), but use mean aggregated data in place of individual data.

Table 20 presents results for the PSSA math scaled scores. The first row of coefficients can be interpreted as elasticities of student performance in 2006 given performance in 2005. Column (1) shows that in the absence of covariates, a 10% increase in 2005 scaled score implies a 9.7% increase in 2006 scaled score. This elasticity is noticeably larger than the elasticities from the individual-level analysis. The coefficients on 4Sight are small and insignificant in all specifications of the model. Column (3) adds individual-level covariates to the regression, all of which have the expected signs. Column (4) adds teachers' average Praxis scores, with a significant positive coefficient on teachers' writing scores, and significant negative coefficient on teachers' math scores. Column (5) adds teachers' average NTE scores, with insignificant coefficients on professional and common knowledge scores, and a significant, negative coefficient on general knowledge scores.

Table 21 presents results for the PSSA reading scaled scores. Again, the first row of coefficients can be interpreted as elasticities of student performance in 2006 given performance in 2005. Column (1) shows that in the absence of covariates, a 10% increase in 2005 scaled score implies an 8.7% increase in 2006 scaled score, which is again lower than in the case of the math scaled scores at the school-level, and higher than the reading scaled scores at the individual-level. The coefficients on 4Sight are small and insignificant in all specifications of

the model. Column (3) adds individual-level covariates to the regression, all of which have the expected signs. Column (4) adds teachers' average Praxis scores, with a significant positive coefficient on teachers' writing scores. Column (5) adds teachers' average NTE scores, with insignificant coefficients on professional and common knowledge scores, and a significant, negative coefficient on general knowledge scores.

School-Level Results: Matching Models

Propensity scores were estimated using a probit model regressing 4Sight use on the school-level covariates that were significantly different in Tables 5 and 7, and both the mean math and mean reading scaled scores from 2005. Histograms of propensity scores for schools using and not using 4Sight are presented in Figures 1 and 2. A two-sample Kolmogorov-Smirnov test for distributional equality was performed to compare the distributions of propensity scores for schools using and not using 4Sight, and for both reading and math these distributions were found to be statistically different at the 1%-level. This is further evidence that there are in fact differences between the treated and untreated groups. There is a large area of overlap over the support for treated and non-treated districts for both 4Sight tests. Treated schools were matched to their nearest-neighbor based on propensity score to calculate the ATT and the standard errors were evaluated using the population variance estimator proposed in Abadie and Imbens (2006). Estimates of the ATT are presented in Tables 22 and 23. The estimates are negative. The estimate of -19.013 for reading is significant at the 5%-level.

Summary and Discussion

The coefficients on 4Sight vary in level of significance and in sign across the many specifications. At the individual level, 4Sight has a small positive effect (one- to two-tenths of a percentage point) in some specifications of the math model, and has a negative effect of slightly

larger magnitude in all specifications of the reading model. There does not appear to be a large difference in the effect of 4Sight across the distribution of student performance. Similarly, the probit regressions show that 4Sight does not have a significant effect on student proficiency level in math, and has a small negative effect on student proficiency level in reading. When broken down by reporting category, 4Sight math seems to have a positive effect in category A (Numbers and Operations), and a slightly smaller negative effect in category E (Data and Probability). In reading, 4Sight has a negative effect on both reporting categories. There is no clear pattern between the coefficients on 4Sight use and the percentage of eligible content that is covered by 4Sight within each reporting category.[23] This evidence suggests that in its first year 4Sight did not improve student performance on the PSSA and in fact negatively affected reading scores.

The descriptive statistics show that the group of schools using 4Sight in 2005-06 is rich and white compared to schools not using 4Sight. In addition, these schools have significantly smaller class sizes. This suggests that the effect of 4Sight use that we have measured, the "treatment on the treated," is not necessarily accurate in terms of inference. In other words, we cannot predict the effect of 4Sight on schools significantly different than those currently using 4Sight.

Some caution should be used in interpreting these results. OLS and matching estimators do a good job of controlling for observed differences between treated and untreated students and schools, but there is reason to suspect that some endogeneity remains in the model. If there is an unobserved factor that both increases the likelihood that a school uses 4Sight and affects PSSA scores, this can cause our estimates of the effect of 4Sight to be biased. The descriptive statistics suggest that relatively wealthy schools that are more active in seeking additional help for their

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[23] A scatter plot comparing the percentage of coverage to the 4Sight coefficient within math reporting categories is presented in the appendix. No clear pattern emerges in this figure.

students are using 4Sight than those not using 4Sight; if we believe that an unobserved factor common to these schools but not the others contributes to the school's decision to use 4Sight, then we might expect this factor also to cause treated students to have higher PSSA scores regardless of 4Sight treatment. If this is the case, then our estimates of the 4Sight treatment effect are upwardly biased, and 4Sight actually has more of a negative effect than the coefficients convey.

An interesting outcome of the reporting category analysis is the emergence of differences among demographic groups within certain reporting categories. Specifically, girls perform significantly better than boys on reporting categories A (Numbers and Operations) and C (Geometry) and significantly worse than boys on reporting categories B (Measurement) and E (Data Analysis and Probability). Also, black students perform significantly worse than white students in all math reporting categories, but the coefficient has twice the magnitude in reporting category B (Measurement). The quartile regressions also reflect several interesting findings that the authors have not seen reported in the literature.[24] Minority status and poverty seem to have larger effects on students towards the bottom of the distribution. Also, the elasticity of reading test performance from year to year is much higher at lower percentiles of the distribution than higher. Finally, probit regressions show that scoring at proficiency last year has surprisingly low predictive power for scoring at proficiency level this year, and in addition, reveal that students receiving tutoring under NCLB are significantly and between four and nine percent less likely to pass their exams, even after controlling for all covariates, including eligibility for tutoring. This is a surprising negative result, implying that this publicly-funded tutoring is actually hurting those students who receive it.

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[24] Sudies such as Levin (2001) and Eide and Showalter (1998) have used quantile regression to analyze education production, but have not reported coefficients for individual student characteristics such as gender, race, or enrollment in various educational programs.

6. Conclusions, Implications, and Future Research

Our analysis of the alignment of the 6th grade Pennsylvania 4Sight exams has revealed coverage of 40% of the eligible content on the reading exam and 80% of the eligible content on the math exam. The failure of 4Sight to have a significant or positive effect on PSSA scores might be caused in part by its incomplete coverage. We suggest that the coverage of 4Sight be expanded to become fully aligned with the Pennsylvania state standards in math and reading. This is feasible at the 6th grade level without lengthening the 4Sight exams. Our analysis of the current training for and usage of 4Sight show that the assessment provides direct feedback to teachers but not to students. We suggest that Success for All and the PDE include additional tools and training with 4Sight to allow both teachers and students to receive formal feedback from each test so that it becomes a true formative assessment as defined by the National Research Council.

Our estimates of OLS and matching models of the education production function reveal that 4Sight has a small and indeterminate effect on student performance on the math PSSA in its pilot year and a small and negative effect on student performance on the reading PSSA.[25] Despite this evidence, careful and thorough statistical analysis of PSSA performance with regard to 4Sight should be performed to establish a reliable pattern of the effects of the intervention. It is clear from the initial results, however, that widespread use of 4Sight should be put off until it can be improved as an effective tool for improving student performance. In light of these results, policy-makers at the school, district, and state levels should be wary when committing to

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[25] These findings, in effect an evaluation of an intervention intended to boost student test scores, are not dissimilar to results from Bifulco, Duncombe, and Yinger (2005), in which the authors evaluated programs of whole-school reform, including one offered by Success for All, and found that these programs did not effect student reading outcomes.

interventions intended to improve student test scores in response to NCLB, especially when choosing to use these interventions on a large scale.

In addition to our findings regarding school-level interventions designed to help raise student performance on standardized tests, our analysis joins a rich literature which provides estimates of the education production function. The coefficients on covariates in the individual and school-level OLS models are within the range of coefficients commonly found in the literature. In addition, we have provided coefficients on teacher test scores; Wayne and Youngs (2003) survey the studies including teacher test scores in education production functions, and our estimates on the National Teacher Examination (NTE) and Praxis tests confirm a finding summarized in their paper: "test scores matter, if college ratings have not already been taken into account" (Wayne and Youngs 2003, p.100). Perhaps the most surprising finding of this paper is that while 4Sight has a little or no effect on student outcomes, students receiving tutoring under NCLB are significantly and between four and nine percent less likely to pass their exams, even after controlling for all covariates, including eligibility for tutoring. This implies that the publicly-funded tutoring is actually hurting those students who receive it.

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7. Tables & Figures

Table 1: Student-Level Descriptive Statistics by 4Sight Math Use

		Do Not Use 4Sight Math	Use 4Sight Math	Difference of Means Test[1]
Student Characteristics	**Female**	.491 (.500)	.496 (.500)	
	White	.745 (.436)	.782 (.413)	
	Black	.168 (.374)	.126 (.332)	
	Hispanic	.055 (.228)	.072 (.259)	
	Other	.028 (.166)	.015 (.120)	
	Eligible for Tutoring	.025 (.155)	.023 (.150)	86.123***
	Received Tutoring	.006 (.079)	.009 (.094)	
	Homeless	.001 (.031)	.001 (.029)	
	Title I	.258 (.437)	.209 (.406)	
	Title III	.075 (.263)	.093 (.291)	
	Gifted	.063 (.243)	.048 (.214)	
	IEP	.146 (.353)	.159 (.365)	
Student's School Characteristics	**Mean Teacher Experience**	13.7 (3.5)	14.1 (3.3)	-16.6***
	Student-Teacher Ratio	15.7 (3.3)	15.2 (2.0)	25.4***
	Students on Free and Reduced Lunch	.317 (.272)	.353 (.237)	-20.0***
	Percentage of White Students	.742 (.326)	.780 (.261)	-18.2***
	Weapons Violations Per Student	.002 (.003)	.002 (.003)	3.9***
	Teachers With Master's Degrees	.4421	.415 (.155)	24.1***
	Average Praxis I: Reading Percent Correct[†]	.757 (.055)	.754 (.055)	9.6***
	Average Praxis I: Writing Percent Correct[††]	.677 (.044)	.676 (.044)	3.7***
	Average Praxis I: Math Percent Correct[†††]	.771 (.070)	.768 (.073)	6.4***
	Average NTE: Common Knowledge Percent Correct[‡]	.652 (.045)	.650 (.041)	6.3***
	Average NTE: General Knowledge Percent Correct[‡‡]	.625 (.049)	.627 (.042)	-6.8***
	Average NTE: Professional Knowledge Percent Correct[‡‡‡]	.654 (.060)	.660 (.051)	-16.6***
	N	*89,153*	*29,367*	

[1]For the set of binary variables, an F-statistic reflects the Hotelling generalized means test. For each continuous variable, a t-statistic reflects a simple difference in means test. [†]*N* is 86,468 (non-users) and 27,744 (users). [††]*N* is 86,386 (non-users) and 27,744 (users). [†††]*N* is 86,541(non-users) and 27,982 (users). [‡]*N* is 88,475 (non-users) and 29,046 (users). [‡‡]*N* is 88,595 (non-users) and 28,982 (users). [‡‡‡]*N* is 84,089 (non-users) and 27,642 (users). *Statistically different at the 10% level. **Statistically different at the 5% level. ***Statistically different at the 1% level.

Table 2: Mean Student-Level 2005-06 PSSA Scaled Scores by 4Sight Math Use

	All Students	Do Not Use 4Sight Math	Use 4Sight Math	Difference of Means Test: t-value
6th Grade Math	1406 (226)	1411 (226)	1402 (223)	6.3***
6th Grade Reading	1341 (208)	1346 (207)	1335 (207)	7.6***
N	*119,778*	*89,153*	*29,367*	

***Statistically different at the 1% level.

Table 3: Student Descriptive Statistics by 4Sight Reading Use

		Do Not Use 4Sight Reading	Use 4Sight Reading	Difference of Means Test[1]
Student Characteristics	**Female**	.491 (.500)	.496 (.500)	
	White	.744 (.436)	.784 (.411)	
	Black	.168 (.374)	.126 (.332)	
	Hispanic	.055 (.228)	.071 (.257)	
	Other	.028 (.166)	.015 (.121)	
	Eligible for Tutoring	.024 (.152)	.026 (.158)	94.796***
	Received Tutoring	.006 (.077)	.010 (.100)	
	Homeless	.001 (.032)	.001 (.028)	
	Title I	.260 (.439)	.203 (.402)	
	Title III	.075 (.264)	.091 (.288)	
	Gifted	.064 (.244)	.047 (.211)	
	IEP	.147 (.353)	.157 (.364)	
Student's School Characteristics	**Mean Teacher Experience**	13.7 (3.5)	14.0 (3.3)	-15.1***
	Student-Teacher Ratio	15.7 (3.3)	15.2 (1.9)	27.0***
	Students on Free and Reduced Lunch	.317 (.273)	.354 (.233)	-21.0***
	Percentage of White Students	.742 (.326)	.782 (.260)	-19.3***
	Weapons Violations Per Student	.002 (.003)	.002 (.003)	5.3***
	Teachers With Master's Degrees	.444 (.171)	.409 (.156)	31.8***
	Average Praxis I: Reading Percent Correct[†]	.757 (.055)	.753 (.055)	8.9***
	Average Praxis I: Writing Percent Correct[††]	.677 (.044)	.676 (.043)	2.5**
	Average Praxis I: Math Percent Correct[†††]	.771 (.070)	.769 (.072)	3.8***
	Average NTE: Common Knowledge Percent Correct[‡]	.652 (.045)	.651 (.041)	4.2***
	Average NTE: General Knowledge Percent Correct[‡‡]	.625 (.049)	.627 (.042)	-7.3***
	Average NTE: Professional Knowledge Percent Correct[‡‡‡]	.655 (.060)	.660 (.052)	-12.9***
	N	*88,626*	*29,894*	

[1]For the set of binary variables, an F-statistic reflects the Hotelling generalized means test. For each continuous variable, a t-statistic reflects a simple difference in means test. [†]*N* is 85,941 (non-users) and 27,744 (users). [††]*N* is 85,859 (non-users) and 27,744 (users). [†††]*N* is 86,014 (non-users) and 27,982 (users). [‡]*N* is 87,948 (non-users) and 29,046 (users). [‡‡]*N* is 88,068 (non-users) and 28,982 (users). [‡‡‡]*N* is 83,560 (non-users) and 27,642 (users). *Statistically different at the 10% level. **Statistically different at the 5% level. ***Statistically different at the 1% level.

Table 4: Mean Student-Level 2005-06 PSSA Scaled Scores by 4Sight Reading Use

	All Students	Do Not Use 4Sight Math	Use 4Sight Math	Difference of Means Test: t-value
6th Grade Math	1409 (225)	1411 (227)	1402 (222)	6.2***
6th Grade Reading	1343 (207)	1346 (207)	1335 (206)	7.4***
N	*118,520*	*88,626*	*29,894*	

***Statistically different at the 1% level.

Table 5: School-Level Descriptive Statistics by 4Sight Math Use

	Do Not Use 4Sight Math	Use 4Sight Math	Difference of Means Test: t-value
Mean % Female	.487 (.093)	.494 (.112)	-1.1
Mean % White	.684 (.381)	.767 (.308)	-3.3***
Mean % Black	.234 (.346)	.160 (.263)	3.3***
Mean % Hispanic	.050 (.129)	.054 (.112)	-0.4
Mean % Other	.023 (.047)	.014 (.027)	3.0***
Mean % Eligible for Tutoring	.022 (.095)	.040 (.139)	-2.4**
Mean % Received Tutoring	.006 (.039)	.016 (.080)	-2.7***
Mean % Homeless	.001 (.008)	.001 (.006)	0.6
Mean % Title I	.354 (.446)	.263 (.396)	3.0***
Mean % Title III	.088 (.251)	.078 (.240)	0.6
Mean % Gifted	.051 (.058)	.041 (.049)	2.6***
Mean % IEP	.165 (.111)	.179 (.104)	-2.2**
Mean Teacher Experience	13.5 (4.19)	14.4 (3.69)	-3.7***
Student-Teacher Ratio	15.7 (4.17)	15.0 (2.32)	2.7***
Students on Free and Reduced Lunch	.383 (.292)	.389 (.249)	-0.4
Weapons Violations Per Student	.002 (.007)	.002 (.003)	1.1
Teachers With Master's Degrees	.409 (.177)	.412 (.163)	-0.4
Average Praxis I: Reading Percent Correct[†]	.753 (.061)	.747 (.063)	1.3
Average Praxis I: Writing Percent Correct[††]	.674 (.047)	.671 (.051)	0.8
Average Praxis I: Math Percent Correct[†††]	.761 (.077)	.759 (.083)	0.2
Average NTE: Common Knowledge Percent Correct[‡]	.645 (.053)	.647 (.048)	-0.6
Average NTE: General Knowledge Percent Correct[‡‡]	.615 (.057)	.620 (.048)	-1.3
Average NTE: Professional Knowledge Percent Correct[‡‡‡]	.652 (.068)	.659 (.060)	-1.4
N	*880*	*279*	

[†]*N* is 822 (non-users) and 248 (users). [††]*N* is 821 (non-users) and 248 (users). [†††]*N* is 823(non-users) and 251 (users). [‡]*N* is 858 (non-users) and 270 (users). [‡‡]*N* is 861 (non-users) and 268 (users). [‡‡‡]*N* is 767 (non-users) and 246 (users). *Statistically different at the 10% level. **Statistically different at the 5% level. ***Statistically different at the 1% level.

Table 6: Mean School-Level 2005-06 PSSA Scaled Scores by 4Sight Math Use

	All Students	Do Not Use 4Sight Math	Use 4Sight Math	Difference of Means Test: t-value
6th Grade Math	1387 (122)	1388 (124)	1385 (113)	0.3
6th Grade Reading	1320 (112)	1320 (115)	1322 (100)	-0.2
N	*1159*	*880*	*279*	

***Statistically different at the 1% level.

Table 7: School-Level Descriptive Statistics by 4Sight Reading Use

	Do Not Use 4Sight Reading	Use 4Sight Reading	Difference of Means Test: t-value
% Female	.487 (.091)	.493 (.112)	-0.9
% White	.682 (.382)	.773 (.305)	-3.6***
% Black	.235 (.346)	.155 (.259)	3.6***
% Hispanic	.050 (.129)	.052 (.111)	-0.2
% Other	.023 (.046)	.014 (.027)	3.1***
% Eligible for Tutoring	.021 (.092)	.044 (.143)	-3.1***
% Received Tutoring	.006 (.038)	.018 (.081)	-3.5***
% Homeless	.001 (.008)	.001 (.006)	0.6
% Title I	.355 (.447)	.258 (.391)	3.3***
% Title III	.089 (.252)	.076 (.237)	0.7
% Gifted	.051 (.058)	.040 (.049)	3.0***
% IEP	.164 (.104)	.176 (.105)	-1.7*
Mean Teacher Experience	13.5 (4.18)	14.5 (3.69)	-3.7***
Student-Teacher Ratio	15.8 (4.16)	15.0 (2.29)	2.9***
Students on Free and Reduced Lunch	.382 (.294)	.391 (.245)	-0.5
Weapons Violations Per Student	.002 (.008)	.002 (.003)	1.2
Teachers With Master's Degrees	.410 (.177)	.407 (.163)	0.3
Average Praxis I: Reading Percent Correct[†]	.752 (.062)	.747 (.063)	1.2
Average Praxis I: Writing Percent Correct[††]	.674 (.048)	.672 (.050)	0.5
Average Praxis I: Math Percent Correct[†††]	.760 (.077)	.761 (.082)	-0.1
Average NTE: Common Knowledge Percent Correct[‡]	.644 (.053)	.647 (.047)	-0.8
Average NTE: General Knowledge Percent Correct[‡‡]	.615 (.057)	.620 (.049)	-1.4
Average NTE: Professional Knowledge Percent Correct[‡‡‡]	.652 (.068)	.658 (.062)	-1.2
N	*874*	*285*	

[†]*N* is 816 (non-users) and 254 (users). [††]*N* is 815 (non-users) and 254 (users). [†††]*N* is 817 (non-users) and 257 (users). [‡]*N* is 852 (non-users) and 276 (users). [‡‡]*N* is 855 (non-users) and 274 (users). [‡‡‡]*N* is 763 (non-users) and 250 (users). *Statistically different at the 10% level. **Statistically different at the 5% level. ***Statistically different at the 1% level.

Table 8: Mean School-Level 2005-06 PSSA Scaled Scores by 4Sight Reading Use

	All Students	Do Not Use 4Sight Math	Use 4Sight Math	Difference of Means Test: t-value
6th Grade Math	1387 (122)	1388 (125)	1386 (112)	0.3
6th Grade Reading	1320 (112)	1320 (115)	1322 (99)	-0.3
N	*1159*	*874*	*285*	

***Statistically different at the 1% level.

Table 9: Stochastic Specifications

Individual-Level OLS

$$\log\left(PSSA06\right)_{is} = \beta_0 + \beta_1 \log\left(PSSA05\right)_{is}$$

$$(2) + \beta_2 4Sight_s$$

$$(3) + \beta_3 TutorElig_{is} + \beta_4 Tutor_{is} + \beta_5 Female_{is} + \beta_6 RaceDummies_{is} + \beta_7 Homeless_{is} + \beta_8 TitleI_{is} + \beta_9 TitleIII_{is} + \beta_{10} Gifted_{is} + \beta_{11} IEP_{is}$$

$$(4) + \beta_{12} TeachExp_s + \beta_{13} StuTeachRat_s + \beta_{14} FRL_s + \beta_{15} WhiteStuRat_s + \beta_{16} Weapons / Stu_s + \beta_{17} Masters_s$$

$$(5) + \beta_{18} Praxis_s$$

$$(6) + \beta_{29} NTE_s$$

$$+ \varepsilon_{is}$$

Individual-Level Quantile Regressions (25%, 50%, 75%)

$$\log\left(PSSA06\right)_{is} = \beta_0 + \beta_1 \log\left(PSSA05\right)_{is}$$

$$(2) + \beta_2 4Sight_s$$

$$(3) + \beta_3 TutorElig_{is} + \beta_4 Tutor_{is} + \beta_5 Female_{is} + \beta_6 RaceDummies_{is} + \beta_7 Homeless_{is} + \beta_8 TitleI_{is} + \beta_9 TitleIII_{is} + \beta_{10} Gifted_{is} + \beta_{11} IEP_{is}$$

$$(4) + \beta_{12} TeachExp_s + \beta_{13} StuTeachRat_s + \beta_{14} FRL_s + \beta_{15} WhiteStuRat_s + \beta_{16} Weapons / Stu_s + \beta_{17} Masters_s$$

$$+ \varepsilon_{is}$$

Individual-Level Probit: Proficiency

$$proficient06_{is} = \beta_0 + \beta_1 proficient05_{is}$$

$$(2) + \beta_2 4Sight_s$$

$$(3) + \beta_3 TutorElig_{is} + \beta_4 Tutor_{is} + \beta_5 Female_{is} + \beta_6 RaceDummies_{is} + \beta_7 Homeless_{is} + \beta_8 TitleI_{is} + \beta_9 TitleIII_{is} + \beta_{10} Gifted_{is} + \beta_{11} IEP_{is}$$

$$(4) + \beta_{12} TeachExp_s + \beta_{13} StuTeachRat_s + \beta_{14} FRL_s + \beta_{15} WhiteStuRat_s + \beta_{16} Weapons / Stu_s + \beta_{17} Masters_s$$

$$+ \varepsilon_{is}$$

Individual-Level Tobit: Reporting Category

$$Category\%Correct_{is} = \beta_0 + \beta_1 Category\%Correct_{is}$$

$$(2) + \beta_2 4Sight_s + \beta_3 TutorElig_{is} + \beta_4 Tutor_{is} + \beta_5 Female_{is} + \beta_6 RaceDummies_{is} + \beta_7 Homeless_{is} + \beta_8 TitleI_{is} + \beta_9 TitleIII_{is} + \beta_{10} Gifted_{is} + \beta_{11} IEP_{is}$$

$$+ \beta_{12} TeachExp_s + \beta_{13} StuTeachRat_s + \beta_{14} FRL_s + \beta_{15} WhiteStuRat_s + \beta_{16} Weapons / Stu_s + \beta_{17} Masters_s$$

$$+ \varepsilon_{is}$$

Table 9 (continued): Stochastic Specifications

School-Level OLS

$$\log\left(meanPSSA06\right)_s = \beta_0 + \beta_1 \log\left(meanPSSA05\right)_s$$

$$(2) + \beta_2 4Sight_s$$

$$(3) + \beta_3 \%TutorElig_s + \beta_4 \%Tutor_s + \beta_5 \%Female_s + \beta_6 \%Race_s + \beta_7 \%Homeless_s + \beta_8 \%TitleI_s + \beta_9 \%TitleIII_s + \beta_{10} \%Gifted_s + \beta_{11} \%IEP_s$$

$$+ \beta_{12} TeachExp_s + \beta_{13} StuTeachRat_s + \beta_{14} FRL_s + \beta_{15} Weapons/Stu_s + \beta_{16} Masters$$

$$(5) + \beta_{17} Praxis_s$$

$$(6) + \beta_{18} NTE_s$$

$$+ \varepsilon_s$$

Propensity Scores for Matching Models: Probit

$$4Sight_s = \beta_0 + \beta_1 PSSA05_s + \beta_2 tutor_s + \beta_3 tutorelig_s + \beta_4 \%white_s + \beta_5 \%black_s + \beta_6 \%TitleI_s + \beta_7 \%GIEP_s + \beta_8 \%IEP_s + \beta_9 TeachExp_s + \beta_{10} StuTeachRat_s + \varepsilon_s$$

Table 10: Individual-level OLS Results: Math

	(1)	(2)	(3)	(4)	(4a) Elasticities	(5)	(6)
	Log of 2006 6th Grade Math Scaled Score						
Log of 2005 5th Grade Math Scaled Score	0.8473 (0.0040)***	0.8473 (0.0039)***	0.7415 (0.0046)***	0.7361 (0.0045)***		0.7344 (0.0046)***	0.7355 (0.0047)***
4Sight Math		0.0001 (0.0031)	-0.0008 (0.0028)	0.0012 (0.0028)		0.0008 (0.0028)	0.0016 (0.0028)
Eligible for Tutoring			-0.0077 (0.006)	-0.0067 (0.0058)		-0.0074 (0.0062)	-0.0062 (0.0062)
Receiving Tutoring			-0.0105 (0.0072)	-0.0145 (0.0069)**		-0.0142 (0.0073)**	-0.0152 (0.0073)**
Female			-0.0013 (0.0006)**	-0.0015 (0.0006)***		-0.0015 (0.0006)**	-0.0015 (0.0006)***
Black			-0.0327 (0.0021)***	-0.0245 (0.0015)***		-0.0249 (0.0016)***	-0.024 (0.0016)***
Hispanic			-0.0226 (0.0029)***	-0.0147 (0.0026)***		-0.0148 (0.0026)***	-0.0156 (0.0026)***
Other			0.0165 (0.0024)***	0.0172 (0.0022)***		0.0169 (0.0021)***	0.0171 (0.0022)***
Homeless			-0.0227 (0.0098)**	-0.0177 (0.0095)*		-0.0182 (0.0095)*	-0.0135 (0.0103)
Title I			-0.017 (0.0024)***	-0.0027 (0.0031)		-0.0019 (0.0032)	-0.0033 (0.0032)
Title III			0.0037 (0.0041)	0.0038 (0.004)		0.0033 (0.0042)	0.004 (0.0042)
Gifted			0.054 (0.0017)***	0.053 (0.0018)***		0.0534 (0.0018)***	0.0533 (0.0018)***
IEP			-0.047 (0.0015)***	-0.0476 (0.0015)***		-0.048 (0.0015)***	-0.0479 (0.0016)***
Mean Teacher Experience				0.0005 (0.0004)	0.0073	0.0005 (0.0004)	0.0003 (0.0004)
Student-Teacher Ratio				-0.0001 (0.0004)	-0.0013	0 (0.0004)	0.0002 (0.0004)
Free and Reduced Lunch Ratio				-0.0321 (0.0059)***	-0.0105	-0.0322 (0.0060)***	-0.0324 (0.0061)***
White Student Ratio				0.0022 (0.006)	0.0017	0.0036 (0.0062)	0.0015 (0.0063)
Weapons Violations Per Student				-0.8781 (0.3727)**	-0.0018	-0.73 (0.3950)*	-0.9287 (0.4260)**
Ratio of Teachers with Master's Degree				0.0153 (0.0066)**	0.0067	0.0123 (0.0071)*	0.0179 (0.0070)**
Mean Praxis Reading Percent Correct						-0.0057 (0.0258)	
Mean Praxis Writing Percent Correct						0.0791 (0.0324)**	
Mean Praxis Math Percent Correct						-0.0324 (0.0190)*	
Mean NTE Common Knowledge Percent Correct							0.0354 (0.0414)
Mean NTE General Knowledge Percent Correct							-0.0532 (0.0349)
Mean NTE Professional Knowledge Percent Correct							0.022 (0.0224)
Constant	1.0938 (0.0285)***	1.0937 (0.0283)***	1.8754 (0.0335)***	1.9075 (0.0338)***		1.8934 (0.0386)***	1.9084 (0.0393)***
Observations	118,391	118,391	118,391	118,391		113,878	111,626
Adjusted R-squared	0.6867	0.6867	0.7091	0.7117		0.7119	0.7120

Robust, clustered (by school) standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

Table 11: Individual-level OLS Results: Reading

	(1)	(2)	(3)	(4)	(4a) Elasticities	(5)	(6)
	Log of 2006 6th Grade Reading Scaled Score						
Log of 2005 5th Grade Reading Scaled Score	0.7291 (0.0032)***	0.7290 (0.0032)***	0.6275 (0.0033)***	0.6204 (0.0032)***		0.6201 (0.0033)***	0.6185 (0.0033)***
4Sight Reading		-0.0027 (0.0022)	-0.0039 (0.0020)*	-0.0017 (0.002)		-0.0017 (0.0021)	-0.0016 (0.0021)
Eligible for Tutoring			-0.0045 (0.0053)	-0.0037 (0.0046)		-0.0024 (0.0047)	-0.0025 (0.0047)
Receiving Tutoring			-0.011 (0.0072)	-0.015 (0.0062)**		-0.0165 (0.0062)***	-0.015 (0.0063)**
Female			0.0095 (0.0006)***	0.0095 (0.0006)***		0.0094 (0.0006)***	0.0095 (0.0006)***
Black			-0.0309 (0.0020)***	-0.0229 (0.0016)***		-0.0228 (0.0016)***	-0.0229 (0.0016)***
Hispanic			-0.0229 (0.0030)***	-0.0157 (0.0027)***		-0.0154 (0.0027)***	-0.0169 (0.0027)***
Other			0.0074 (0.0020)***	0.0079 (0.0020)***		0.0077 (0.0020)***	0.0068 (0.0020)***
Homeless			-0.0249 (0.0119)**	-0.0199 (0.0114)*		-0.0203 (0.0115)***	-0.0085 (0.0108)
Title I			-0.0185 (0.0021)***	-0.0052 (0.0025)**		-0.0044 (0.0026)*	-0.0061 (0.0026)**
Title III			0.0009 (0.0027)	0.0009 (0.0027)		-0.0001 (0.0027)	0.0007 (0.0028)
Gifted			0.0473 (0.0013)***	0.0465 (0.0013)***		0.0467 (0.0013)***	0.0465 (0.0013)***
IEP			-0.0534 (0.0015)***	-0.0547 (0.0015)***		-0.0548 (0.0015)***	-0.0551 (0.0015)***
Mean Teacher Experience				0.0001 (0.0003)	0.0017	0.0003 (0.0003)	0.0002 (0.0003)
Student-Teacher Ratio				-0.0004 (0.0003)	-0.0064	-0.0003 (0.0003)	-0.0001 (0.0003)
Free and Reduced Lunch Ratio				-0.0236 (0.0048)***	-0.0077	-0.0234 (0.0051)***	-0.0235 (0.0051)***
White Student Ratio				0.0047 (0.0047)	0.0035	0.0046 (0.0049)	0.0014 (0.0049)
Weapons Violations Per Student				-1.2875 (0.3053)***	-0.0027	-1.2953 (0.3267)***	-1.4479 (0.3377)***
Ratio of Teachers with Master's Degree				0.0241 (0.0049)***	0.0105	0.0227 (0.0051)***	0.0228 (0.0051)***
Mean Praxis Reading Percent Correct						-0.0074 (0.0173)	
Mean Praxis Writing Percent Correct						0.0704 (0.0217)***	
Mean Praxis Math Percent Correct						-0.0127 (0.0139)	
Mean NTE Common Knowledge Percent Correct							0.0303 (0.0299)
Mean NTE General Knowledge Percent Correct							-0.0015 (0.0264)
Mean NTE Professional Knowledge Percent Correct							0.0207 (0.0165)
Constant	1.9508 (0.0232)***	1.9523 (0.0233)***	2.6928 (0.0239)***	2.7401 (0.0249)***		2.7064 (0.0286)***	2.7186 (0.0300)***
Observations	117,974	117,974	117,974	117,974		113,475	111,225
Adjusted R-squared	0.6691	0.6692	0.6916	0.6942		0.6944	0.6945

Robust, clustered (by school) standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

Table 12: Individual-Level Quartile Regressions: Math

	(1)	(2)	(3)	(3a) Elasticities	(1)	(2)	(3)	(3a) Elasticities	(1)	(2)	(3)	(3a) Elasticities
	Log of 2006 6th Grade Math Scaled Score											
	25% Quantile				50% Quantile				75% Quantile			
Log of 2005 5th Grade Math Scaled Score[2,3]	0.8410 (0.0033)***	0.7362 (0.0025)***	0.731 (0.0024)***		0.8384 (0.0018)***	0.7362 (0.0025)***	0.7448 (0.0026)***		0.8456 (0.0032)***	0.7488 (0.0018)***	0.7429 (0.0033)***	
4Sight Math	0.0006 (0.0008)	-0.0005 (0.0007)	0.0016 (0.0007)*		0 (0.0007)	-0.0006 (0.0009)	0.0011 (0.0007)		0 (0.0004)	-0.0008 (0.0101)	0.0011 (0.0007)**	
Eligible for Tutoring[2]		-0.0101 (0.0021)***	-0.0073 (0.0022)***			-0.0033 (0.0021)	-0.0085 (0.0024)			-0.0068 (0.0017)***	-0.0028 (0.0029)***	
Receiving Tutoring[2]		-0.0125 (0.0041)***	-0.009 (0.0052)*			-0.0179 (0.0051)***	-0.0171 (0.0047)***			-0.0076 (0.0049)	-0.0171 (0.0047)***	
Female		-0.0007 (0.0007)	-0.0017 (0.0006)**			-0.0019 (0.0007)***	-0.0016 (0.0007)**			-0.0022 (0.0010)***	-0.0013 (0.0006)***	
Black[2]		-0.0337 (0.0012)***	-0.022 (0.0015)***			-0.0315 (0.0008)***	-0.0253 (0.0010)***			-0.0282 (0.0010)***	-0.0239 (0.0016)***	
Hispanic[2,3]		-0.0269 (0.0023)***	-0.0186 (0.0014)***			-0.0212 (0.0014)***	-0.0144 (0.0015)***			-0.0175 (0.0016)***	-0.0113 (0.0013)***	
Other		0.0125 (0.0018)***	0.0147 (0.0013)***			0.0156 (0.0015)***	0.0154 (0.0014)***			0.0155 (0.0022)***	0.0152 (0.0016)***	
Homeless[2]		-0.0418 (0.0093)***	-0.011 (0.0118)*			-0.0273 (0.0124)**	-0.0219 (0.0133)**			-0.0081 (0.0123)	-0.0282 (0.0071)	
Title I[2]		-0.0190 (0.0012)***	-0.0041 (0.0011)***			-0.0154 (0.0008)***	-0.0029 (0.0009)***			-0.0153 (0.0007)***	-0.0035 (0.0014)***	
Title III		0.0052 (0.0014)***	0.0046 (0.0009)***			0.0042 (0.0009)***	0.0049 (0.0011)***			0.0035 (0.0018)*	0.0035 (0.0012)***	
Gifted[2,3]		0.0476 (0.0015)***	0.0471 (0.0014)***			0.0466 (0.0007)***	0.0551 (0.0013)***			0.0559 (0.0015)***	0.0463 (0.0014)***	
IEP[2,3]		-0.0548 (0.0013)***	-0.0559 (0.0010)***			-0.0409 (0.0008)***	-0.0334 (0.0011)***			-0.0329 (0.0015)***	-0.0408 (0.0013)***	
Mean Teacher Experience			0.0006 (0.0001)***	0.0081			0.0005 (0.0001)***	0.0063			0.0004 (0.0001)***	0.0061
Student-Teacher Ratio[3]			-0.0004 (0.0001)***	-0.0069			0.0001 (0.0001)	0.0017			0.0006 (0.0001)***	0.0091
Free and Reduced Lunch Ratio[3]			-0.0369 (0.0014)***	-0.0120			-0.0285 (0.0020)***	-0.0093			-0.0243 (0.0022)***	-0.0079
White Student Ratio			-0.0001 (0.002)	-0.0000			0.0029 (0.0021)	0.0022			0.0022 (0.0026)	0.0017
Weapons Violations Per Student			-1.0072 (0.1632)***	-0.0021			-0.7455 (0.1705)***	-0.0016			-0.8002 (0.0986)***	-0.0017
Ratio of Teachers with Master's Degree			0.0165 (0.0024)***	0.0072			0.0137 (0.0025)***	0.0060			0.0129 (0.0025)***	0.0056
Constant	1.0826 (0.0132)***	1.8230 (0.0287)***	1.8548 (0.0251)***		1.1601 (0.0237)***	1.8821 (0.0130)***	1.886 (0.0182)***		1.1641 (0.0232)***	1.8612 (0.0177)***	1.8993 (0.0183)***	
Observations	118,391	118,391	118,391		118,391	118,391	118,391		118,391	118,391	118,391	

* significant at 10%; ** significant at 5%; *** significant at 1%; [1,2,3] coefficients for the three quartiles are statistically different at the 5% level in columns (1), (2) or (3) respectively

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Table 13: Individual-Level Quartile Regressions: Reading

	(1)	(2)	(3)	(3a) Elasticities	(1)	(2)	(3)	(3a) Elasticities	(1)	(2)	(3)	(3a) Elasticities
	Log of 2006 6th Grade Reading Scaled Score											
	25% Quantile				50% Quantile				75% Quantile			
Log of 2005 5th Grade Reading Scaled Score[1,2,3]	0.7672 (0.0020)***	0.6522 (0.0028)***	0.6449 (0.0033)***		0.7170 (0.0023)***	0.6277 (0.0032)***	0.6190 (0.0028)***		0.6641 (0.0031)***	0.5979 (0.0026)***	0.5915 (0.0030)***	
4Sight Reading	-0.0019 (0.0008)**	-0.0047 (0.0009)***	-0.0022 (0.0008)**		-0.0015 (0.0004)***	-0.0033 (0.0008)***	-0.0008 (0.0007)		-0.0011 (0.0008)	-0.0022 (0.0011)**	-0.0009 (0.0008)	
Eligible for Tutoring		-0.0056 (0.0021)***	-0.0042 (0.0025)*			-0.0042 (0.0022)*	-0.0053 (0.0018)*			-0.0034 (0.0023)	-0.0031 (0.0035)	
Receiving Tutoring		-0.0148 (0.0048)***	-0.0124 (0.0035)***			-0.0096 (0.0026)***	-0.0162 (0.0041)***			-0.0154 (0.0039)***	-0.0162 (0.0075)**	
Female[3]		0.0073 (0.0008)***	0.007 (0.0007)***			0.0070 (0.0005)***	0.0075 (0.0006)***			0.0070 (0.0009)***	0.0084 (0.0008)***	
Black[2]		-0.0346 (0.0015)***	-0.0194 (0.0018)***			-0.0273 (0.0010)***	-0.0212 (0.0012)***			-0.0239 (0.0011)***	-0.0242 (0.0011)***	
Hispanic[2]		-0.0226 (0.0017)***	-0.0149 (0.0018)***			-0.0200 (0.0016)***	-0.0142 (0.0015)***			-0.0188 (0.0022)***	-0.0143 (0.0016)***	
Other		0.0094 (0.0016)***	0.0103 (0.0015)***			0.0066 (0.0018)***	0.0063 (0.0021)***			0.0071 (0.0023)***	0.0061 (0.0018)***	
Homeless		-0.0350 (0.0165)**	-0.0333 (0.0150)**			-0.0184 (0.0162)	-0.0009 (0.0181)			-0.0073 (0.0141)	-0.0082 (0.0136)	
Title I[2,3]		-0.0225 (0.0006)***	-0.0078 (0.0008)***			-0.0172 (0.0009)***	-0.0036 (0.0012)***			-0.0130 (0.0012)***	-0.005 (0.0014)***	
Title III		0.0007 (0.0014)	0.0011 (0.0014)			0.0003 (0.0012)	0.0022 (0.0019)			0.0014 (0.0011)	0.001 (0.0013)	
Gifted		0.0435 (0.0019)***	0.0428 (0.0016)***			0.0444 (0.0014)***	0.0427 (0.0017)***			0.0430 (0.0010)***	0.0433 (0.0012)***	
IEP[2,3]		-0.0616 (0.0017)***	-0.0417 (0.0010)***			-0.0488 (0.0013)***	-0.0634 (0.0015)***			-0.0402 (0.0011)***	-0.05 (0.0012)***	
Mean Teacher Experience			0 (0.0001)	0.0016			0 (0.0001)	0.0007			0.0001 (0.0001)	-0.0003
Student-Teacher Ratio[3]			-0.0002 (0.0001)**	-0.0069			-0.0001 (0.0001)	-0.0034			-0.0004 (0.0001)***	-0.0015
Free and Reduced Lunch Ratio[3]			-0.022 (0.0020)***	-0.0083			-0.0172 (0.0020)***	-0.0072			-0.0256 (0.0029)***	-0.0056
White Student Ratio			0.0045 (0.0017)***	0.0055			0.0014 (0.0023)	0.0034			0.0073 (0.0019)***	0.0011
Weapons Violations Per Student[3]			-1.2103 (0.1338)***	-0.0032			-1.1422 (0.1089)***	-0.0025			-1.5114 (0.1676)***	-0.0024
Ratio of Teachers with Master's Degree[3]			0.0195 (0.0019)***	0.0111			0.0205 (0.0021)***	0.0085			0.0255 (0.0028)***	0.0089
Constant	1.6239 (0.0145)***	2.9618 (0.0173)***	2.7542 (0.0255)***		2.0434 (0.0168)***	2.4667 (0.0201)***	3.0035 (0.0228)***		2.4793 (0.0226)***	2.4793 (0.0135)***	2.5120 (0.0200)***	
Observations	117,974	117,974	117,974		117,974	117,974	117,974		117,974	117,974	117,974	

* significant at 10%; ** significant at 5%; *** significant at 1%; [1,2,3] coefficients for the three quartiles are statistically different at the 5% level in columns (1), (2) or (3) respectively

Table 14: Individual-level Probit Results[†]: Math

	(1)	(2)	(3)	(4)	(5)
	At or Above Proficiency: 2006 6th Grade Math				
At or Above Proficiency: 2005 5th Grade Math	0.6706 (0.0043)***	0.6706 (0.0043)***	0.6689 (0.0044)***	0.5260 (0.0052)***	0.5195 (0.0052)***
4Sight Math		0.0020 (0.0077)		-0.0022 (0.0063)	0.0018 (0.0061)
Eligible for Tutoring			-0.0133 (0.0196)	-0.0154 (0.0160)	-0.0126 (0.0165)
Receiving Tutoring			-0.09 (0.0261)***	-0.0559 (0.0199)***	-0.0685 (0.0203)***
Female				-0.0108 (0.0020)***	-0.0114 (0.0020)***
Black				-0.1213 (0.0066)***	-0.0969 (0.0054)***
Hispanic				-0.0804 (0.0081)***	-0.057 (0.0076)***
Other				0.033 (0.0069)***	0.0359 (0.0066)***
Homeless				-0.0851 (0.0418)**	-0.0736 (0.0397)*
Title I				-0.0627 (0.0064)***	-0.0248 (0.0075)***
Title III				-0.0084 (0.0099)	-0.0093 (0.0100)
Gifted				0.1794 (0.0058)***	0.176 (0.0057)***
IEP				-0.1957 (0.0056)***	-0.1978 (0.0054)***
Mean Teacher Experience					0.0017 (0.0009)**
Student-Teacher Ratio					-0.0015 (0.0009)*
Free and Reduced Lunch Ratio					-0.0814 (0.0131)***
White Student Ratio					-0.0087 (0.0139)
Weapons Violations Per Student					-3.1355 (0.9268)***
Ratio of Teachers with Master's Degree					0.0568 (0.0156)***
Observations	118,569	118,569	118,569	118,569	118,569
Pseudo R-squared	0.3577	0.3577	0.3583	0.4172	0.4218

[†]Average marginal effects are reported;
clustered (by school) standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 15: Individual-level Probit Results[†]: Reading

	(1)	(2)	(3)	(4)	(5)
	At or Above Proficiency: 2006 6th Grade Reading				
At or Above Proficiency: 2005 5th Grade Reading	0.6511 (0.0038)***	0.651 (0.0038)***	0.6499 (0.0039)***	0.4993 (0.0044)***	0.4909 (0.0043)***
4Sight Reading		-0.0083 (0.0065)		-0.0138 (0.0054)**	-0.0081 (0.0051)
Eligible for Tutoring			-0.0104 (0.0175)	-0.0174 (0.0131)	-0.0145 (0.0128)
Receiving Tutoring			-0.0574 (0.0264)**	-0.0306 (0.0239)	-0.0428 (0.0203)**
Female				0.0244 (0.0020)***	0.0241 (0.0020)***
Black				-0.1036 (0.0057)***	-0.0774 (0.0046)***
Hispanic				-0.0761 (0.0074)***	-0.0525 (0.0068)***
Other				0.0132 (0.0065)**	0.0169 (0.0064)***
Homeless				-0.0413 (0.0356)	-0.0286 (0.0336)
Title I				-0.0748 (0.0058)***	-0.0325 (0.0066)***
Title III				-0.0085 (0.0080)	-0.0091 (0.0075)
Gifted				0.1859 (0.0051)***	0.1833 (0.0052)***
IEP				-0.1989 (0.0049)***	-0.2021 (0.0047)***
Mean Teacher Experience					0.0005 (0.0007)
Student-Teacher Ratio					-0.0013 (0.0007)*
Free and Reduced Lunch Ratio					-0.0792 (0.0125)***
White Student Ratio					0.0072 (0.0122)
Weapons Violations Per Student					-2.6844 (0.8266)***
Ratio of Teachers with Master's Degree					0.0710 (0.0126)***
Observations	118,148	118,148	118,148	118,148	118,148
Pseudo R-squared	0.3531	0.3532	0.3534	0.4070	0.4113

[†]Average marginal effects are reported;
clustered (by school) standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 16: Individual-Level Tobit Regression Results:[†]
Math Reporting Category without Controls

	(1)	(2)	(3)	(4)	(5)
	Reporting Category A	Reporting Category B	Reporting Category C	Reporting Category D	Reporting Category E
Reporting Category A	0.902 (0.0022)***				
Reporting Category B		0.5611 (0.0026)***			
Reporting Category C			0.6562 (0.0027)***		
Reporting Category D				0.6194 (0.0026)***	
Reporting Category E					0.6468 (0.0024)***
Constant	0.0033 (0.0016)**	0.3043 (0.0018)***	0.1779 (0.0020)***	0.1472 (0.0020)***	0.2041 (0.0019)***
Observations	119132	119132	119132	119132	119132
McFadden's Adjusted R^2	19.7888	0.9418	1.7412	-18.9595	3.3044

Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%
[†]Tobit regression bounded at 0 and 1

Table 17: Individual-Level Tobit Regression Results:[†]
Reading Reporting Category without Controls

	(1)	(2)
	2006 6th Grade Reading Percentage Correct: Reporting Category A	2006 6th Grade Reading Percentage Correct: Reporting Category B
2005 5th Grade Reading Percentage Correct: Reporting Category A	0.8099 (0.0018)***	
2005 5th Grade Reading Percentage Correct: Reporting Category B		0.6102 (0.0019)***
Constant	0.1237 (0.0013)***	0.1495 (0.0014)***
Observations	118707	118707
McFadden's Adjusted R^2	-1.8515	-1.1738

Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%
[†]Tobit regression bounded at 0 and 1

Table 18: Individual-Level Tobit Regression Results:[†]
Math Reporting Category with Controls

	(1)	(2)	(3)	(4)	(5)
	Reporting Category A	Reporting Category B	Reporting Category C	Reporting Category D	Reporting Category E
Reporting Category A	0.7769 (0.0025)***				
Reporting Category B		0.4038 (0.0027)***			
Reporting Category C			0.5021 (0.0029)***		
Reporting Category D				0.4769 (0.0029)***	
Reporting Category E					0.4824 (0.0026)***
4Sight Math	0.0038 (0.0010)***	0.0021 (0.0014)	-0.0001 (0.0013)	0.0013 (0.0012)	-0.0089 (0.0012)***
Eligible for Tutoring	-0.0151 (0.0032)***	-0.0419 (0.0045)***	-0.0337 (0.0043)***	-0.0297 (0.0039)***	-0.0353 (0.0038)***
Receiving Tutoring	-0.0129 (0.0059)**	-0.0318 (0.0082)***	-0.0238 (0.0079)***	-0.0141 (0.0073)*	-0.0218 (0.0070)***
Female	0.0039 (0.0008)***	-0.0479 (0.0012)***	0.0047 (0.0011)***	-0.0014 (0.001)	-0.0058 (0.0010)***
Black	-0.0417 (0.0017)***	-0.0696 (0.0024)***	-0.0584 (0.0023)***	-0.0427 (0.0021)***	-0.0578 (0.0020)***
Hispanic	-0.0208 (0.0020)***	-0.0453 (0.0029)***	-0.0483 (0.0027)***	-0.0182 (0.0025)***	-0.0487 (0.0024)***
Other	0.0301 (0.0027)***	0.0535 (0.0039)***	0.0219 (0.0037)***	0.0469 (0.0034)***	0.0076 (0.0033)**
Homeless	-0.0233 (0.0132)*	-0.0329 (0.0185)*	-0.0131 (0.0177)	-0.0279 (0.0163)*	-0.0244 (0.0157)
Title I	-0.0106 (0.0015)***	-0.0325 (0.0022)***	-0.0078 (0.0021)***	-0.0187 (0.0019)***	-0.0211 (0.0018)***
Title III	0.0085 (0.0016)***	-0.0112 (0.0022)***	-0.0059 (0.0021)***	-0.0032 (0.0019)*	-0.0029 (0.0019)
Gifted	0.0978 (0.0019)***	0.1693 (0.0027)***	0.1267 (0.0025)***	0.1258 (0.0023)***	0.1397 (0.0023)***
IEP	-0.0621 (0.0013)***	-0.1334 (0.0017)***	-0.1245 (0.0017)***	-0.0982 (0.0016)***	-0.1067 (0.0015)***
Mean Teacher Experience	0.0004 (0.0001)**	0.0006 (0.0002)***	0.0017 (0.0002)***	0.001 (0.0002)***	0.0004 (0.0002)**
Student-Teacher Ratio	-0.0003 (0.0001)*	-0.001 (0.0002)***	-0.0008 (0.0002)***	0.0003 (0.0002)	-0.001 (0.0002)***
Free and Reduced Lunch Ratio	-0.0372 (0.0024)***	-0.0646 (0.0034)***	-0.0476 (0.0033)***	-0.0499 (0.0030)***	-0.0563 (0.0029)***
White Student Ratio	0.0045 (0.0029)	-0.0076 (0.0041)*	-0.0003 (0.0039)	-0.0031 (0.0036)	-0.0065 (0.0035)*
Weapons Violations Per Student	-1.3403 (0.1544)***	-1.8192 (0.2170)***	-2.3229 (0.2081)***	-1.2917 (0.1915)***	-1.3112 (0.1839)***
Ratio of Teachers with Master's Degree	0.0206 (0.0028)***	0.0353 (0.0039)***	0.0313 (0.0037)***	0.0406 (0.0034)***	0.0428 (0.0033)***
Constant	0.1061 (0.0046)***	0.4835 (0.0061)***	0.3113 (0.0060)***	0.2551 (0.0056)***	0.3797 (0.0053)***
Observations	118569	118569	118569	118569	118569
McFadden's Adjusted R^2	20.0500	1.3807	2.1677	-30.7020	4.0961

Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%
[†]Tobit regression bounded at 0 and 1

Table 19: Individual-Level Tobit Regression Results:[†]
Reading Reporting Category with Controls

	(1)	(2)
	2006 6th Grade Reading Percentage Correct: Reporting Category A	2006 6th Grade Reading Percentage Correct: Reporting Category B
2005 5th Grade Reading Percentage Correct: Reporting Category A	0.6899 (0.0022)***	
2005 5th Grade Reading Percentage Correct: Reporting Category B		0.4615 (0.0022)***
4Sight Reading	-0.0032 (0.0008)***	-0.0016 (0.0009)*
Eligible for Tutoring	-0.0044 (0.0025)*	-0.0243 (0.0028)***
Receiving Tutoring	-0.0162 (0.0046)***	-0.0127 (0.0052)**
Female	0.0021 (0.0006)***	0.0226 (0.0007)***
Black	-0.0238 (0.0013)***	-0.041 (0.0015)***
Hispanic	-0.0223 (0.0016)***	-0.0228 (0.0018)***
Other	-0.0005 (0.0021)	0.0221 (0.0024)***
Homeless	-0.0205 (0.0106)*	-0.0204 (0.0122)*
Title I	-0.0072 (0.0012)***	-0.0191 (0.0014)***
Title III	-0.0006 (0.0012)	-0.0005 (0.0014)
Gifted	0.0449 (0.0014)***	0.1017 (0.0016)***
IEP	-0.06 (0.0010)***	-0.0876 (0.0011)***
Mean Teacher Experience	0.0003 (0.0001)***	0 (0.0001)
Student-Teacher Ratio	-0.0002 (0.0001)**	-0.0009 (0.0001)***
Free and Reduced Lunch Ratio	-0.0262 (0.0019)***	-0.0365 (0.0022)***
White Student Ratio	0.0133 (0.0023)***	-0.0092 (0.0026)***
Weapons Violations Per Student	-1.3463 (0.1197)***	-1.5752 (0.1378)***
Ratio of Teachers with Master's Degree	0.0182 (0.0021)***	0.0444 (0.0024)***
Constant	0.212 (0.0036)***	0.282 (0.0040)***
Observations	118148	118148
	-1.9846	-1.4247

Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%
[†]Tobit regression bounded at 0 and 1

Table 20: School-Level OLS Results: Math

	(1)	(2)	(3)	(3a) Elasticities	(4)	(5)
	Log of Mean 2006 6th Grade Math Scaled Score					
Log of Mean 2005 5th Grade Math Scaled Score	0.9704 (0.0152)***	0.9705 (0.0152)***	0.7215 (0.0219)***		0.7285 (0.0230)***	0.7125 (0.0233)***
4Sight Math		0.001 (0.0029)	-0.002 (0.0027)		-0.0019 (0.0028)	-0.0021 (0.0028)
% of Students Eligible for Tutoring			0.0121 (0.014)	0.0003	0.0084 (0.0148)	0.0085 (0.0144)
% of Students Receiving Tutoring			-0.0501 (0.0288)*	-0.0004	-0.0485 (0.0294)*	-0.0454 (0.0295)
% Female			0.0506 (0.0123)***	0.0248	0.0507 (0.0132)***	0.0572 (0.0138)***
% Black			-0.0468 (0.0064)***	-0.0100	-0.0488 (0.0067)***	-0.0446 (0.0069)***
% Hispanic			-0.0459 (0.0108)***	-0.0024	-0.0471 (0.0110)***	-0.0477 (0.0117)***
% Other			0.0501 (0.0275)*	0.0010	0.046 (0.0274)*	0.0558 (0.0280)**
% Homeless			0.0094 (0.1624)	0	-0.0100 (0.1600)	0.1714 (0.2078)
% Title I			0.0032 (0.0045)	0.0011	0.0074 (0.0048)	0.0057 (0.0048)
% Title III			0.0020 (0.0046)	0.0002	0.0018 (0.0050)	0.0036 (0.0050)
% Gifted			0.0784 (0.0232)***	0.0038	0.0753 (0.0239)***	0.0724 (0.0249)***
% IEP			-0.0372 (0.0128)***	-0.0062	-0.0544 (0.0140)***	-0.0345 (0.0141)**
Mean Teacher Experience			0.0006 (0.0003)*	0.0088	0.0008 (0.0004)**	0.0005 (0.0004)
Student-Teacher Ratio			-0.0003 (0.0003)	-0.0042	-0.0002 (0.0003)	0 (0.0004)
Free and Reduced Lunch Ratio			-0.0212 (0.0059)***	-0.0081	-0.0195 (0.0061)***	-0.0239 (0.0065)***
Weapons Violations Per Student			-0.6036 (0.1799)***	-0.0013	-0.8745 (0.4042)**	-1.2814 (0.4305)***
Ratio of Teachers with Master's Degree			0.0287 (0.0074)***	0.0118	0.0239 (0.0079)***	0.0337 (0.0079)***
Mean Praxis Reading Percentile					0.0101 (0.0247)	
Mean Praxis Writing Percentile					0.0881 (0.0316)***	
Mean Praxis Math Percentile					-0.0396 (0.0192)**	
Mean NTE Common Knowledge Percent Correct						0.0652 (0.0402)
Mean NTE General Knowledge Percent Correct						-0.0596 (0.0366)
Mean NTE Professional Knowledge Percent Correct						0.0036 (0.0210)
Constant	0.2027 (0.1099)*	0.202 (0.1099)*	1.9872 (0.1606)***		1.9013 (0.1677)***	2.0367 (0.1716)***
Observations	1159	1159	1148		1057	1002
Adjusted R-squared	0.7794	0.7793	0.8198		0.8258	0.8192

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 21: School-Level OLS Results: Reading

	(1)	(2)	(3)	(3a) Elasticities	(4)	(5)
	Log of Mean 2006 6th Grade Reading Scaled Score					
Log of Mean 2005 5th Grade Reading Scaled Score	0.8661 (0.0105)***	0.8661 (0.0105)***	0.6893 (0.0189)***		0.7006 (0.0202)***	0.7045 (0.0196)***
4Sight Reading		-0.0001 (0.0023)	-0.0006 (0.0023)		-0.0018 (0.0023)	-0.0007 (0.0023)
% of Students Eligible for Tutoring			0.0184 (0.0118)	0.0005	0.0248 (0.0121)**	0.0291 (0.0115)**
% of Students Receiving Tutoring			-0.021 (0.0243)	-0.0002	-0.0258 (0.0241)	-0.0377 (0.0235)
% Female			0.0111 (0.0103)	0.0054	0.0405 (0.0108)***	0.0303 (0.0110)***
% Black			-0.0393 (0.0055)***	-0.0084	-0.0369 (0.0057)***	-0.0358 (0.0056)***
% Hispanic			-0.0336 (0.0093)***	-0.0017	-0.0318 (0.0092)***	-0.0326 (0.0095)***
% Other			0.0546 (0.0231)**	0.0011	0.053 (0.0223)**	0.0579 (0.0223)***
% Homeless			-0.171 (0.1369)	-0.0002	-0.1766 (0.131)	0.124 (0.1657)
% Title I			0.0075 (0.0038)*	0.0025	0.0065 (0.0039)	0.0059 (0.0038)
% Title III			0.003 (0.0039)	0.0003	0.002 (0.0041)	0.0031 (0.004)
% Gifted			0.0487 (0.0197)**	0.0024	0.0547 (0.0199)***	0.057 (0.0201)***
% IEP			-0.0618 (0.0112)***	-0.0103	-0.0611 (0.0117)***	-0.0702 (0.0115)***
Mean Teacher Experience			-0.0002 (0.0003)	-0.0024	-0.0001 (0.0003)	-0.0004 (0.0003)
Student-Teacher Ratio			-0.0006 (0.0003)**	-0.0093	-0.0004 (0.0003)	-0.0001 (0.0003)
Free and Reduced Lunch Ratio			-0.0133 (0.0050)***	-0.0051	-0.0047 (0.0051)	-0.0072 (0.0052)
Weapons Violations Per Student			-0.4763 (0.1525)***	-0.0010	-1.3929 (0.3329)***	-1.4205 (0.3457)***
Ratio of Teachers with Master's Degree			0.0338 (0.0062)***	0.0138	0.0329 (0.0065)***	0.0346 (0.0063)***
Mean Praxis Reading Percentile					0.0053 (0.0202)	
Mean Praxis Writing Percentile					0.0675 (0.0259)***	
Mean Praxis Math Percentile					-0.0262 (0.0158)*	
Mean NTE Common Knowledge Percent Correct						0.0544 (0.0321)*
Mean NTE General Knowledge Percent Correct						-0.0699 (0.0292)**
Mean NTE Professional Knowledge Percent Correct						0.0182 (0.0167)
Constant	0.9655 (0.0757)***	0.9655 (0.0757)***	2.2468 (0.1372)***		2.1158 (0.1455)***	2.1185 (0.1430)***
Observations	1159	1159	1148		1057	1002
Adjusted R-squared	0.8535	0.8534	0.8705		0.8798	0.8835

Absolute value of t statistics in parentheses * significant at 5%; ** significant at 1%

Figure 3: Propensity Scores for Math 4Sight Use[†]
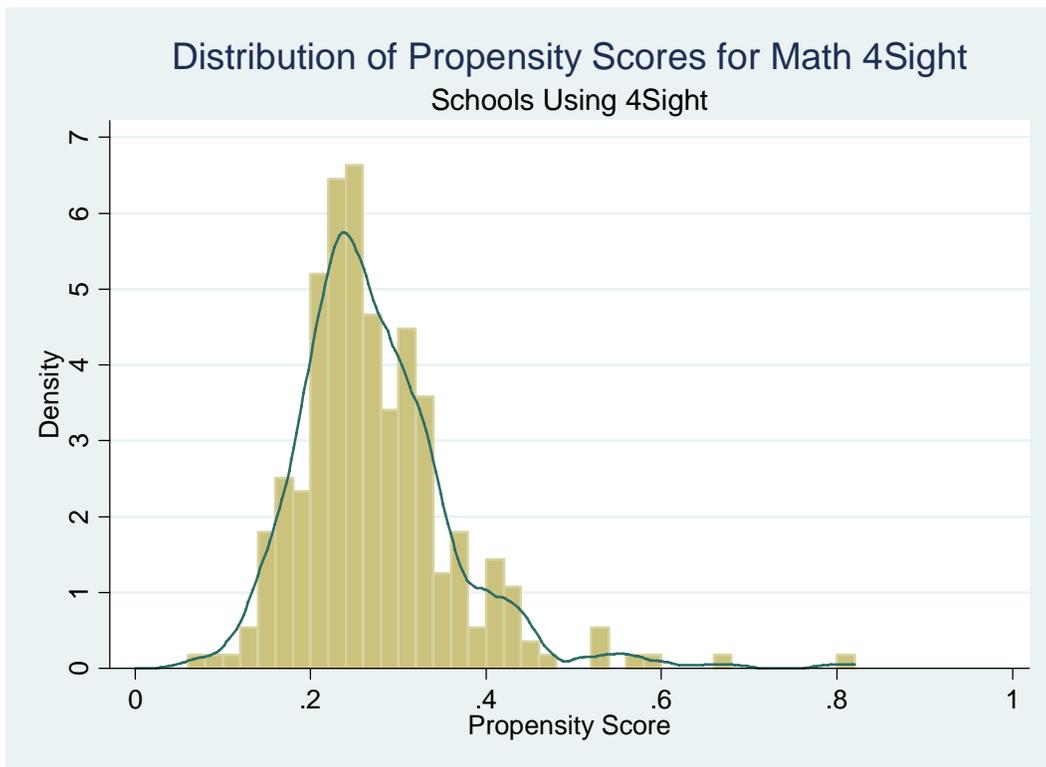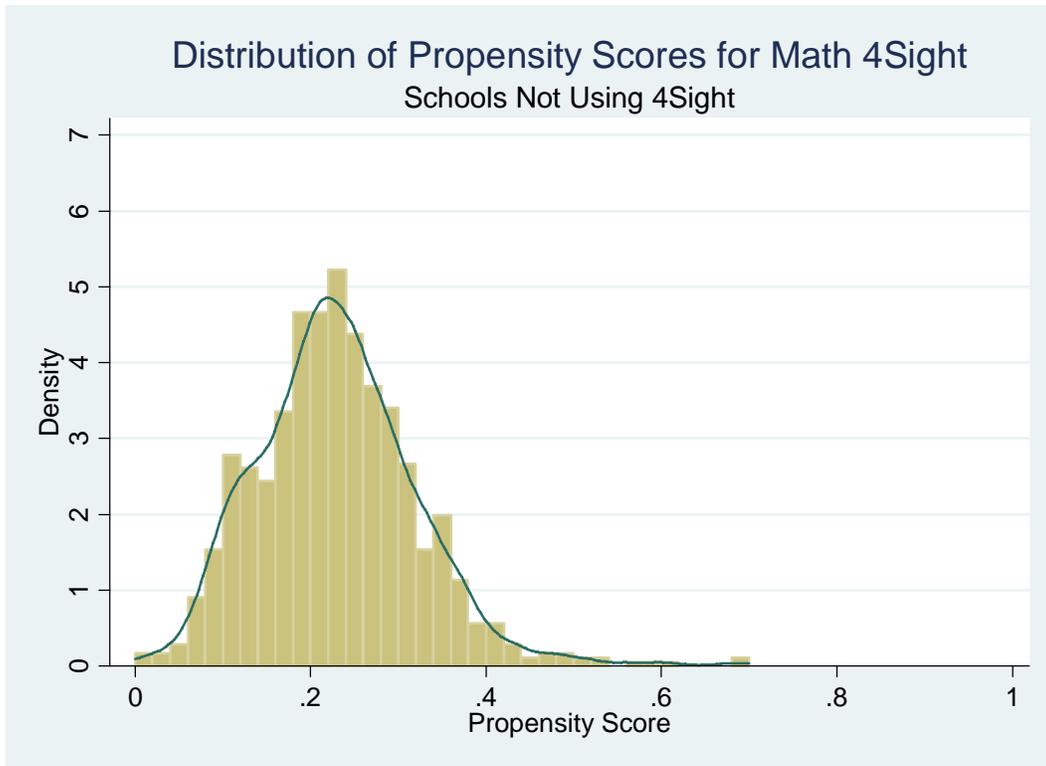
[†]The distributions of propensity scores for schools using 4Sight and schools not using 4Sight are statistically different at the 1% level. A two-sample Kolmogorov-Smirnov test was performed.

Figure 4: Propensity Scores for Reading 4Sight Use[†]
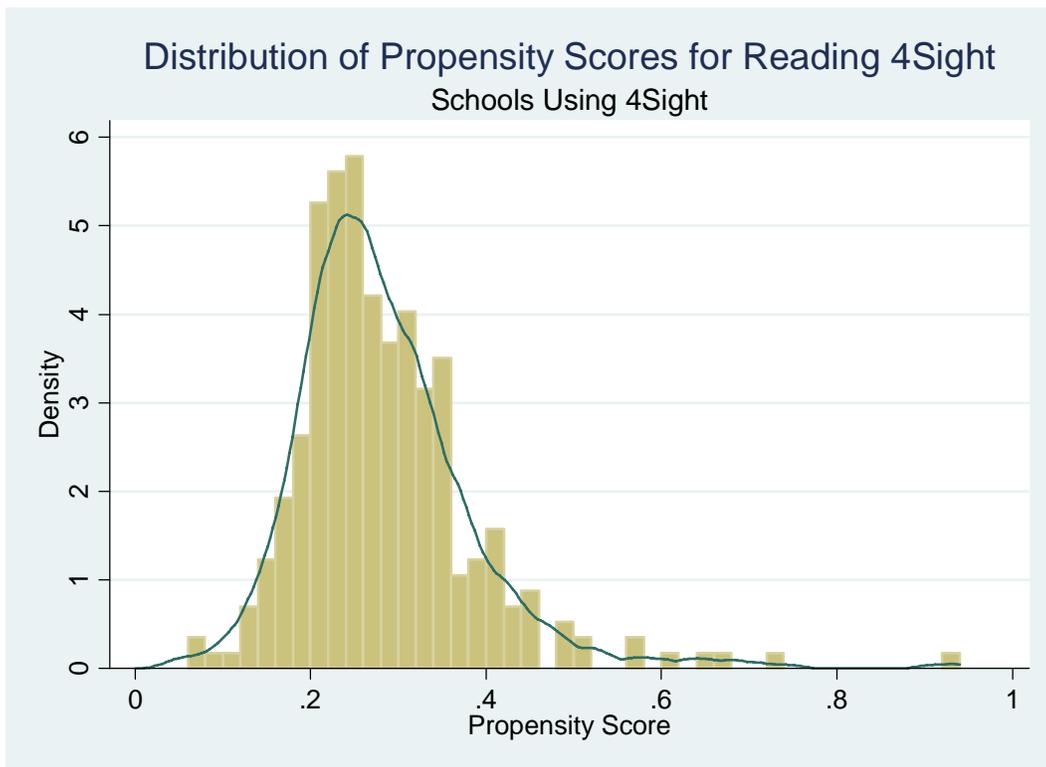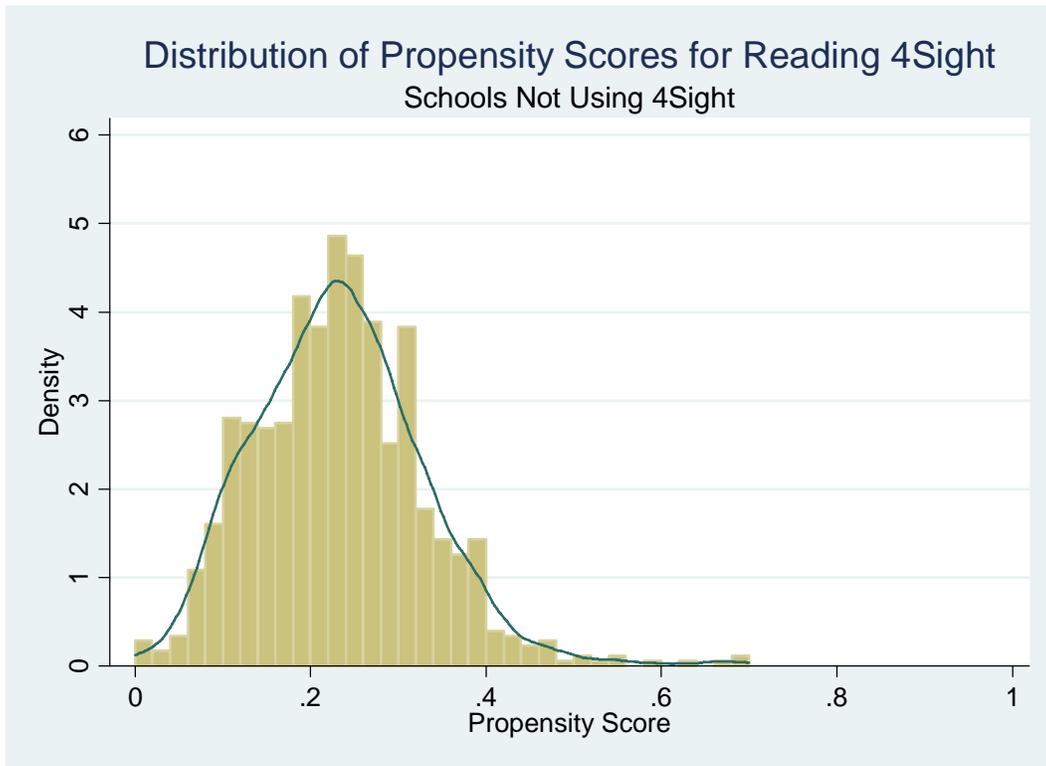
†The distributions of propensity scores for schools using 4Sight and schools not using 4Sight are statistically different at the 1% level. A two-sample Kolmogorov-Smirnov test was performed.

Table 22: School-Level Nearest-Neighbor Matching Model Results:
ATT of Math 4Sight on Mean Math PSSA Scaled Scores

ATT	Standard Error[†]	Z-Statistic	N (Treatment)	N[‡] (Control)
-12.432	9.997	-1.24	279	209

[†]Estimated using the Abadie and Imbens (2006) population variance estimator.
[‡]Actual nearest neighbor matches.

Table 23: School-Level Nearest-Neighbor Matching Model Results:
ATT of Reading 4Sight on Mean Reading PSSA Scaled Scores

ATT	Standard Error[†]	Z-Statistic	N (Treatment)	N[‡] (Control)
-19.013**	9.472	-2.01	285	214

[†]Estimated using the Abadie and Imbens (2006) population variance estimator.
[‡]Actual nearest neighbor matches.
**Statistically significant at the 5%-level.

8. Appendix

Table A.1: Table of Reporting Categories, Anchors, and Eligible Content Covered on the 6th Grade Math PSSA*

Reporting Category	Assessment Anchor	Eligible Content	% of Eligible Content in Reporting Category Covered by 4sight
Numbers and Operations (A)	Demonstrate an understanding of numbers, ways of representing numbers, relationships among numbers and number systems. (A.1)	Represent common percents as fractions and/or decimals. (A.1.1.1)	91.6%
		Convert between fractions and decimals and/or differentiate between a terminating decimal and a repeating decimal. (A.1.1.2)	
		Represent a number in exponential form. (A.1.1.3)	
		Represent a mixed number as an improper fraction. (A.1.1.4)	
		Compare and/or order whole numbers, mixed numbers, fractions and/or decimals. (A.1.2.1)	
		Find the Greatest Common Factor (GCF) of two numbers and/or use the GCF to simplify fractions (A.1.3.1)	
		Find the Least Common Multiple (LCM) of two numbers and/or use the LCM to find the common denominator of two fractions. (A.1.3.2)	
		Use divisibility rules for 2, 3, 5, and/or 10 to draw conclusions and/or solve problems. (A.1.3.3)	
		Model percents using drawings, fraphs and/or sets. (A.1.4.1)	
	Understand the meanings of operations, use operations and understand how they relate to each other. (A.2)	Complete equation by using the following properties: associative, commutative, distributive and identity. (A.2.1.1)	
	Compute accurately and fluently and make reasonable estimates. (A.3)	Use estimation to solve problems involving whole numbers and decimals. (A.3.1.1)	
		Solve problems involving operations with whole numbers, decimals and fractions. (A.3.2.1)	
Measurement (B)	Demonstrate an understanding of measurable attributes of objects and figures, and the units, systems and processes of measurement. (B.1)	Determine and/or compare elapsed time to the minute. (B.1.1.1)	60%
	Apply appropriate techniques, tools and formulas to determine measurements. (B.2)	Use or read a ruler to measure to the nearest 1/16 inch or millimeter. (B.2.1.1)	
		Choose the more precise measurement of a given object. (B.2.1.2)	
		Find the perimeter of any polygon. (B.2.2.1)	
		Define, label and/or identify right, straight, acute and obtuse angles. (B.2.3.1)	
Geometry (C)	Analyze characteristics and properties of two- and three-	*Identify, classify and/or compare polygons. (C.1.1.1)*	57.1%
		Identify and/or describe properties of all types of triangles. (C.1.1.2)	

	dimensional geometric shames and demonstrate understanding of geometric relationships. (C.1)	Identify and/or determine the measure of the diameter and/or radius of a circle. (C.1.1.3)	
		Identify and/or use the total number of degrees in a triangle, quadrilateral and/or circle. (C.1.1.4)	
		Identify, describe and/or label parallel, perpendicular or intersecting lines. (C.1.2.1)	
		Identify, draw and/or label points, planes, lines, line segments, rays angles and vertices. (C.1.2.2)	
	Locate points or describe relationships using the coordinate plane. (C.3)	Plot, locate or identify points in Quadrant I and/or on the x and y axes with intervals of 1, 2, 5 or 10 units. (C.3.1.1)	
Algebraic Concepts (D)	Demonstrate an understanding of patterns, relations and functions. (D.1)	Create, extend or find a missing element in a pattern displayed in a table, chart or graph. (D.1.1.1)	100%
		Determine a rule based on a pattern or illustrate a pattern based on a given rule. (D.1.2.1)	
	Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs. (D.2)	Identify the inverse operation needed to solve a one-step equation. (D.2.1.1)	
		Solve a one-step equation. (D.2.1.2)	
		Match an equation or expression involving one variable, to a verbal math situation. (D.2.2.1)	
Data Analysis and Probability (E)	Formulate or answer questions that can be addressed with data and/or organize, display, interpret or analyze data. (E.1)	Analyze data and/or answer questions pertaining to data represented in frequency tables, circle graphs, double bar graphs, double line graphs or line plots. (E.1.1.1)	83.3%
		Choose the appropriate representation for a specific set of data. (E.1.1.2)	
		Display data in frequency tables, circle graphs, double-bar graphs, double line graphs or line plots using a title, appropriate scale, labels and a key when needed. (E.1.1.3)	
	Select and/or use appropriate statistical methods to analyze data. (E.2)	Determine the mean, median, mode and/or range of displayed data. (E.2.1.1)	
	Understand and/or apply basic concepts of probability or outcomes. (E.3)	Define and/or find the probability of a simple event. (E.3.1.1)	
		Determine/show all possible combinations involving no more than 20 total arrangements. (E.3.1.2)	

*Eligible content italicized are not covered by 4sight

Table A.2: Table of Reporting Categories, Anchors, and Eligible Content Covered on the 6ᵗʰ Grade Reading PSSA*

Reporting Category	Assessment Anchor	Eligible Content	% of Eligible Content in Reporting Category Covered by 4sight
Comprehension and Reading Skills (A)	Understand fiction appropriate to grade level. (A.1)	*Identify and/or apply meaning of multiple-meaning words used in text. (A.1.1.1)*	35%
		Identify and/or apply a synonym or antonym of a word used in text. (A.1.1.2)	
		Identify how the meaning of a word is changed when an affix is added; identify the meaning of a word from the text with an affix. (A.1.2.1)	
		Define and/or apply how the meaning of words or phrases changes when using context clues given in explanatory sentences. (A.1.2.2)	
		Make inferences and/or draw conclusions based on information from text. (A.1.3.1)	
		Cite evidence from text to support generalizations. (A.1.3.2)	
		Identify and/or explain stated or implied main ideas and relevant supporting details from text. (A.1.4.1)	
		Summarize the key details and events of a fictional text as a whole. (A.1.5.1)	
		Identify the author's intended purpose of text. (A.1.6.1)	
		Identify, explain, and/or describe examples of text that support the author's intended purpose. (A.1.6.2)	
	Understand nonfiction appropriate to grade level. (A.2)	*Identify and apply meaning of multiple-meaning words used in text. (A.2.1.1)*	
		Identify and apply meaning of content- specific words used in text. (A.2.1.2)	
		Identify and apply how the meaning of a word is changed when an affix is added; identify and apply the meaning of a word from the text with an affix. (A.2.2.1)	
		Define and/or apply how the meaning of words or phrases changes when using context clues given in explanatory sentences. (A.2.2.2)	
		Make inferences and/or draw conclusions based on information from text. (A.2.3.1)	
		Cite evidence from text to support generalizations. (A.2.3.2)	
		Identify and/or explain stated or implied main ideas and relevant supporting details from text. (A.2.4.1)	
		Summarize the major points, processes, and/or events of a nonfictional text as a whole. (A.2.5.1)	
		Identify the author's intended purpose of text. (A.2.6.1)	
		Identify, explain, and/or describe examples of text that support the author's intended purpose. (A.2.6.2)	

Interpretation and Analysis of Fictional and Nonfictional Text (B)	Understand components within and between texts. (B.1)	Identify, explain, interpret, compare, describe, and/or analyze components of fiction and literary nonfiction. (B.1.1.1)	46.7%
		Identify, explain, interpret, compare, describe, and/or analyze connections between texts. (B.1.2.1)	
	Understand literary devices in fictional and nonfictional text. (B.2)	Identify, explain, interpret, and/or describe examples of personification in text. (B.2.1.1)	
		Identify, explain, interpret, and/or describe examples of similes in text. (B.2.1.2)	
		Identify, explain, interpret, and/or describe examples of alliteration in text when its use is presumed intentional. (B.2.1.3)	
		Identify, explain, interpret, and/or describe examples of metaphors in text. (B.2.1.4)	
		Identify, explain, and/or describe the point of view of the narrator as first person or third person point of view. (B.2.2.1)	
		Explain, interpret, and/or describe the effectiveness of the point of view used by the author. (B.2.2.2)	
	Understand concepts and organization of nonfictional text. (B.3)	Identify, explain, and/or interpret statements of fact and opinion in nonfictional text. (B.3.1.1)	
		Identify exaggeration (bias) in nonfictional text. (B.3.1.2)	
		Identify, explain, and/or interpret how the author uses exaggeration (bias) in nonfictional text. (B.3.2.1)	
		Identify, explain, and/or interpret text organization, including sequence, question/answer, comparison/contrast, cause/effect, or problem/solution. (B.3.3.1)	
		Use headings to locate information in a passage, or identify content that would best fit in a specific section of text. (B.3.3.2)	
		Interpret graphics and charts and/or make connections between text and content of graphics and charts. (B.3.3.3)	
		Identify, explain, compare, interpret, describe, and/or analyze the sequence of steps in a list of directions. (B.3.3.4)	

*Eligible content italicized are not covered by 4sight

Figure A.1: 4Sight Math Coverage vs. Regression Coefficient
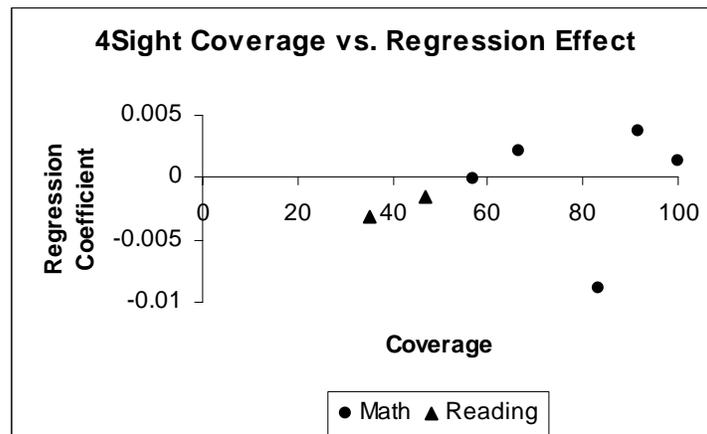
9.   Data Appendix

The data used in this paper was obtained from several sources. Final, student level PSSA test scores for school years 2004-5 (5th grade) and 2005-6 (6th grade) were provided to the project by the Data Recognition Corporation (DRC) of St. Paul, Minnesota under a signed confidentiality agreement between Strauss and the Pennsylvania Department of Education (PDE). DRC is the prime contractor for PSSA construction, distribution, scoring and reporting to PDE and local education agencies.

School-level data, including teacher experience, education level, and performance on standardized tests, student-teacher ratios, weapons violations per student, percent of students qualifying for Free and Reduced Lunch, and percent of white students, are tabulations by this project of confidential teacher level data and school level data obtained from PDE under a signed confidentiality agreement between Strauss and PDE.

Data on the use of 4Sight by school, grade, and test type (math, reading) in 2005-6 was available for a limited time from the PDE web site. It has been removed since the authors downloaded the data, and subsequent requests to PDE and its contractor, Intermediate Unit 13, and the Success for All Foundation for more recent data were declined by all parties with the explanation that such school level participation in 4Sight was confidential.