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Focusing on the Whole Student:

Final Report on the Massachusetts Wraparound Zones

Submitted to

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Focusing on the Whole Student: Final Report on the Massachusetts Wraparound Zones

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Note:

This version replaces a version previously placed on the websites for both American Institutes for Research and Massachusetts Department of Elementary and Secondary Education. Additional analysis has been conducted and the primary difference between this report and the previous report is a change in the statistical significance of the Year 2 effect for English language arts achievement and the Year 2 and Year 3 effect for mathematics achievement.

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Executive Summary

The Massachusetts Department of Elementary and Secondary Education (ESE) Wraparound Zones (WAZ) Initiative is designed to create coordinated district systems that allow schools to proactively and systematically address students' nonacademic needs. The four WAZ priority improvement areas follow:

- **Climate and Culture.** Each participating school creates a climate and a culture that promote mental health and positive social, emotional, and intellectual growth for students, resulting in a new standard of practice understood and practiced by every member of the school community.
- **Identification of Student Needs and Efforts to Address Them.** Each participating school implements a proactive system of identifying student needs in key academic and nonacademic areas, leading to both universal supports and targeted interventions.
- **Community Coalitions.** Each participating school integrates a range of resources to tailor student services from within both the school and the larger community. The range of services includes prevention, enrichment, early intervention, and intensive crisis response services.
- **District Systems of Support.** Each participating district develops district-level systems to support the communication, collaboration, evaluation, and continuous improvement of the WAZ initiative.

American Institutes for Research (AIR)[1] has conducted an evaluation of how well the WAZ initiative has achieved these goals. AIR's research assessed progress on planning, implementation, outcomes, sustainability, and replication related to the initiative's four priority improvement areas. This evaluation report provides results from an impact analysis focused on answering the following research question:

> *What are the outcomes associated with WAZ implementation?*

Using a comparative interrupted time series (CITS) design, AIR researchers examined whether, when compared to non-WAZ schools and controlling for selected background characteristics, students in WAZ schools experienced better academic outcomes, attendance, retention rates, and suspension rates.

Methods

AIR used a CITS design to measure the impact of receiving a WAZ grant on student outcomes, including student achievement, attendance, retention, and suspension. The basic principle of using CITS was to detect an effect of WAZ by comparing changes in the outcomes of the WAZ schools to changes in the outcomes in a matched comparison group over the same time period.

[1] AIR (www.air.org) is a behavioral and social science research organization founded in 1946. AIR carries out its work with strict independence, objectivity, and nonpartisanship. AIR's mission is to conduct and apply the best behavioral and social science research and evaluation to improve people's lives, with a special emphasis on the disadvantaged.

This approach draws on information from both the treated and comparison schools to estimate what performance in WAZ schools would have been absent the program. The deviation from this prediction is the estimated treatment effect of the WAZ program.

The sample for this study included all students in Cohort 1 and Cohort 2 WAZ schools serving elementary and/or middle grades, plus students in a set of matched non-WAZ comparison schools. Comparison schools were selected through a widely used matching technique—the Mahalanobis matching method (Mahalanobis D)—which seeks to identify the optimal matched comparison school for each school based on a select set of key school-level indicators. This study used multilevel regression models to control for confounding factors (e.g., student body characteristics), nesting of students within schools, and any changes in the given indicator over time not due to the intervention itself. In all models, the study accounted for the nesting of students in schools, the nesting of schools in matched comparison pairs, and the effect of attending a particular school nested in a particular matched pair in a given year (i.e., the impact of time). In addition, the study controlled for student-level covariates (gender, income, special education and ELL status, and race), school-level factors (year of implementation, whether the school received a planning grant), and allowed for baseline differences between schools.

Findings

The study found the following:

- Students in WAZ schools performed better on the Massachusetts Comprehensive Assessment System (MCAS) English language arts (ELA) and mathematics assessments as compared to students in comparison schools, when considering prior achievement trends. Effects were statistically significant in the third year of WAZ implementation.
- The impact of receiving a WAZ grant on academic achievement was greatest for third- and fourth-grade students.
- For students with limited English proficiency, the impact of WAZ on academic performance was particularly strong in Year 3.
- There was no overall statistically significant impact of WAZ on attendance, retention, or suspension.

Conclusion

Results from this evaluation add to a small but growing body of literature demonstrating a link between programs that provide wraparound-like supports and student academic outcomes. For example, Child Trends conducted a review of the literature on integrated student support (ISS) models and reported that most rigorous quasi-experimental studies showed an impact of ISS approaches on student achievement (Moore, Terzian, & Stratford, 2014). Reviews on aspects of school climate have also shown that programs that focus on school safety; relationships among students, staff and families; and a culture that promotes strong social–emotional skills are associated with improvements in teaching and learning (Thapa, Cohen, Guffy, & Higgins-d'Alessandro, 2013). The success of the WAZ initiative, which includes a focus on both overall school climate and elements of the integrated student support model (e.g., targeted supports for students, community partnerships), aligns well with the findings from these overall bodies of

literature. Evidence from within Massachusetts lends even further support to these findings. For example, 10 WAZ schools that began the initiative as Level 4 schools, generally the lowest performing 2 percent schools in the state,[2] had exited Level 4 status by the time the grant was over. In fact, among the full 2010 cohort of Level 4 schools, those that were WAZ schools were more likely than non-WAZ schools to exit Level 4 status by 2014 (66 percent and 40 percent, respectively). These data point to the success of WAZ as a component of a school turnaround strategy.

Together, the findings from all five of AIR's evaluation reports generated for this study suggest that WAZ has been successful in meeting its goals. In addition to analyses of qualitative data that illustrate the ways in which WAZ has supported progress in the areas of student behavior, family engagement, student referral systems, and community partnerships, analysis of the quantitative extant data shows that the program has had an impact on student achievement. What is not clear, however, are the reasons why WAZ affected student achievement. Further analyses could potentially examine the link between the implementation data and outcome data.

The findings presented in this report raise a number of questions for further study that could be useful in informing policy decisions related to WAZ and other strategies for supporting low-performing schools. These include:

- Which factors associated with WAZ implementation contributed the most to achievement gains, such as strong school climate and strong community partnerships?
- Will student achievement gains in WAZ schools be sustained over time when the grant funding ends? If so, which factors contribute to this sustainability and which act as barriers?
- What is the combined impact of WAZ with other funding streams that target low-performing schools?

Research that answers these questions will add to the growing body of knowledge on the connection between comprehensive student supports and academic outcomes, both nationally and in Massachusetts. More research that demonstrates how and why this connection exists will have important implications for policymakers as they continue to develop and implement systems that support school improvement and reduce persistent achievement gaps.

[2] ESE ranks all districts and schools on a five-level scale, with 1 indicating the highest and 5 indicating the lowest performing districts or schools. Schools and districts are subject to increasing levels of accountability and receive increasing levels of state assistance, according to their rank. More information about ESE's framework for accountability and assistance can be found at http://www.doe.mass.edu/apa/general/.

I. Introduction

The Massachusetts Department of Elementary and Secondary Education (ESE) Wraparound Zones (WAZ) Initiative is designed to create coordinated district systems that allow schools to proactively and systematically address students' nonacademic needs. The four WAZ priority improvement areas follow:

- **Climate and Culture.** Each participating school creates a climate and a culture that promote mental health and positive social, emotional, and intellectual growth for students, resulting in a new standard of practice understood and practiced by every member of the school community.
- **Identification of Student Needs and Efforts to Address Them.** Each participating school implements a proactive system of identifying student needs in key academic and nonacademic areas, leading to both universal supports and targeted interventions.
- **Community Coalitions.** Each participating school integrates a range of resources to tailor student services from both within the school and the larger community. The range of services includes prevention, enrichment, early intervention, and intensive crisis response services.
- **District Systems of Support.** Each participating district develops district-level systems to support the communication, collaboration, evaluation, and continuous improvement of the WAZ initiative.

American Institutes for Research (AIR)[3] has conducted an evaluation of how well the WAZ initiative has achieved these goals. AIR's research assessed progress on planning, implementation, outcomes, sustainability, and replication related to the initiative's four priority improvement areas. AIR completed a first evaluation report in fall 2012 that described the 2011–12 WAZ plans, summarized student survey results on school climate, and reported school and district coordinator perspectives on strengths and challenges experienced during Year 1 (http://www.doe.mass.edu/research/reports/2013/03WZI-ReportOne.pdf). A second evaluation report in fall 2013 provided a more comprehensive analysis of data collected during Year 1 (http://www.doe.mass.edu/research/reports/2013/10WZI-ReportTwo.pdf). The third evaluation report built on the second report by adding an analysis of data from Year 2 of WAZ implementation (http://www.doe.mass.edu/research/reports/2014/01WZI-ReportThree.pdf). The fourth report reported on analysis of data collected during the third (final) year of WAZ implementation (http://www.doe.mass.edu/research/reports/2014/10WZI-ReportFour.pdf).

This supplement to the fourth report provides results from a quasi-experimental impact analysis conducted across all three years of WAZ implementation. The purpose of this analysis was to examine the extent to which student outcomes were associated with WAZ implementation. Using a comparative interrupted time series (CITS) design, AIR researchers examined whether, when compared to non-WAZ schools and controlling for selected background characteristics and

[3] AIR (www.air.org) is a behavioral and social science research organization founded in 1946. AIR carries out its work with strict independence, objectivity, and nonpartisanship. AIR's mission is to conduct and apply the best behavioral and social science research and evaluation to improve people's lives, with a special emphasis on the disadvantaged.

time trends in outcomes, students in WAZ schools experienced better academic outcomes, attendance, retention rates, and suspension rates.

The first part of this report describes the methodology used to conduct this analysis. Next, the findings are presented, organized by outcome type. The report concludes with a discussion section focused on the implications of these findings and on issues that may warrant further study and attention.

II. Methods

American Institutes for Research (AIR) used a comparative interrupted time series (CITS) design to measure the impact of receiving a Wraparound Zones (WAZ) grant on student outcomes. The causal hypothesis in a traditional interrupted time series analysis is that if, in this case, WAZ did indeed impact how students fared academically and nonacademically, it would be expected that observations of these indicators after WAZ implementation to be different than those prior to the start of the initiative. However it would not be known if the changes observed were due to other factors such as the mere passage of time, other school or districtwide initiatives, or a change in the population of students served. By using CITS, it was possible to detect an effect of WAZ by comparing observed changes in the outcomes of the WAZ schools to changes in the outcomes in a matched comparison group over the same time period. This approach draws on information from both the treated and comparison schools to estimate what performance in WAZ schools would have been absent the program. Accordingly, this design relies on two sources of variation to inform the analyses: comparisons across individual schools and comparisons over time. This reliance on individual schools and the examination of trends with respect to a comparison group over time makes for a more robust impact analysis than one that merely examines change over time (e.g., the interrupted time series framework) or comparisons across individuals (e.g., a propensity score analysis).

CITS is highly regarded as one of the strongest quasi-experimental designs that can be used to measure program impacts in the absence of random assignment of students to a treatment (e.g., Bloom, 2003; Glass, 1999; Shadish, Cook, & Campbell, 2002). For this particular study, the CITS method treats the start of the WAZ initiative as an "interruption" in the day-to-day operations of the school that is hypothesized to lead to an improvement in the identified indicators. Technically, AIR computed the deviation from the trend that occurred for WAZ schools upon program implementation and subtracted out any deviation from the trend that occurred at the same time for comparison schools. This difference in the deviation is the estimated treatment effect of the WAZ program.

Sample

The sample for this study included all students in Cohort 1 and Cohort 2 WAZ schools serving elementary and/or middle grades, [4] plus students in a set of matched non-WAZ comparison schools. Table 1 includes the full list of WAZ schools that comprise the sample for this analysis. Cohort 1 schools began implementation in 2011–12, and Cohort 2 schools began implementation in 2012–13.

[4] Because only one WAZ school in the study was a traditional high school (Grades 9–12), AIR's analysis for high schools outcomes would have relied on only one matched pair. Therefore, it was decided to remove the high school from the analysis and focus on elementary and middle schools only.

Table 1. Sample of WAZ Schools for CITS Analysis

District	School	Grade Level	Cohort
Fall River	Carlton M. Viveiros Elementary School	K–5	1
Fall River	Edmond P. Talbot Middle School	6–8	2
Fall River	John J. Doran Elementary School	PK–8	1
Fall River	Mary Fonseca Elementary School	K–5	2
Fall River	Matthew J. Kuss Middle School	6–8	1
Holyoke	Kelly Elementary School (2011–12 planning grant)	K–8	2
Holyoke	Morgan Elementary School	K–8	1
Holyoke	William R. Peck	K–8	1
Lynn	Cobbet Elementary (2011–12 planning grant)	K–5	2
Lynn	E. J. Harrington School (2011–12 planning grant)	PK–5	2
Lynn	Thurgood Marshall Middle School (2011–12 planning grant)	6–8	2
Lynn	William P. Connery (2011–12 planning grant)	K–5	2
Springfield	Alfred G. Zanetti School	PK–8	1
Springfield	Brightwood School	K–5	1
Springfield	Chestnut Accelerated Middle School	6–8	2
Springfield	Elias Brookings School	PK–8	1
Springfield	Gerena School	PK–5	1
Springfield	John F. Kennedy Middle School	6–8	2
Springfield	M. Marcus Kiley Middle School	6–8	2
Springfield	White Street	K–5	1
Worcester	Burncoat Street Preparatory School	K–6	2
Worcester	Chandler Elementary Community School	K–6	1
Worcester	Chandler Magnet	PK–6	1
Worcester	Goddard School of Science and Technology	PK–6	1
Worcester	Goddard Scholars Academy (at Sullivan Middle School)	5–8	1
Worcester	University Park Campus School	7–12	1
Worcester	Union Hill School	PK–6	1
Worcester	Woodland Academy	PK–6	1

Comparison schools were selected through a widely used matching technique: the Mahalanobis matching method (Mahalanobis D). This method seeks to identify the optimal matched comparison school for each school based on a select set of key school-level indicators. It is particularly appropriate when dealing with small sample sizes, which is the case with AIR's sample of 28 Year 1 and Year 2 WAZ schools (Rubin, 1979, 1980). The sampling pool from which comparison schools were selected consisted of all schools across the non-WAZ

Massachusetts Commissioner's Districts: Boston, Brockton, Lowell, and New Bedford. This approach capitalized on a source of randomness, or exogeneity, in the nature of district-level WAZ selection. All Commissioner's Districts were eligible to apply for WAZ funding. Specifically, limiting the pool of comparison districts to the Commissioner's Districts increased the overlap in observable and unobservable pretreatment characteristics. Moreover, by eliminating schools in WAZ districts from the pool, the problem of within-district contamination was avoided. In other words, non-WAZ schools in WAZ districts were likely to be implementing similar strategies or receiving similar district support as the WAZ schools, and therefore could not serve as sensible comparison schools. Further detail on the matching procedure and the comparison schools can be found in Appendix A.

Outcome Measures

AIR examined the impact of WAZ on four outcomes:

- Student achievement, as measured by standardized raw scores on the English language arts (ELA) and mathematics sections of the Massachusetts Comprehensive Assessment System (MCAS)
- Student attendance rate, calculated as number of days in attendance divided by the number of days enrolled
- Student retention, calculated as whether the grade a student was enrolled in during the fall was the same grade the student was enrolled in the fall of the previous academic year
- Suspension, calculated as whether a student received an in-school or out-of-school suspension during the school year

Analysis

AIR employed a CITS model to evaluate the impact of WAZ on select academic (e.g., MCAS scores) and nonacademic (e.g., attendance, suspension rates) indicators. Specifically, AIR examined the change in WAZ schools' performance when WAZ was implemented relative to the change for a similar set of comparison schools (selected using the matching procedures described earlier). For outcomes in which more positive values indicate school improvement (e.g., achievement, attendance), a larger positive change in a given indicator for WAZ schools over the matched comparison schools would indicate that WAZ had a positive impact on the outcome of interest. No change in outcomes or a smaller change in outcome with respect to comparison schools would indicate that WAZ had no effect or a negative effect, respectively, on the outcome of interest. For outcomes in which larger values indicate an undesirable outcome (e.g., suspension rates, retention), the opposite would hold true.

In all models, the study controlled for confounding factors (e.g., student body characteristics) and any changes in the given indicator over time not due to the intervention itself. The study also accounted for the nesting of students in schools, the nesting of schools in matched comparison pairs, and the effect of attending a particular school nested in a particular matched pair in a given year (i.e., the impact of time). In addition, the study controlled for student-level covariates (gender, income, special education and ELL status, and race) and school-level factors (year of implementation, whether the school received a planning grant) and allowed for baseline

differences between schools. Details regarding the model specifications are included in Appendix B.

III. Findings

In this section, the overall findings and subgroup analyses[5] for each outcome is described. Descriptive data and detailed model results are included in Appendices C and D, respectively.

Student Achievement

Overall, students in Wraparound Zones (WAZ) schools performed better on the Massachusetts Comprehensive Assessment System (MCAS) English language arts (ELA) and mathematics assessments as compared with students in comparison schools, when considering prior achievement trends. Effects were statistically significant after the third year of WAZ implementation for ELA and mathematics. Specifically:

- In the third year of implementation, students in WAZ schools demonstrated ELA scores that were 0.30 standard deviations higher than what would be expected given prior performance trends and test score changes in non-WAZ comparison schools during the same time.
- In the third year of implementation, students in WAZ schools demonstrated mathematics scores that were 0.24 standard deviations higher than what would be expected given prior performance trends and test score changes in non-WAZ comparison schools during the same time.

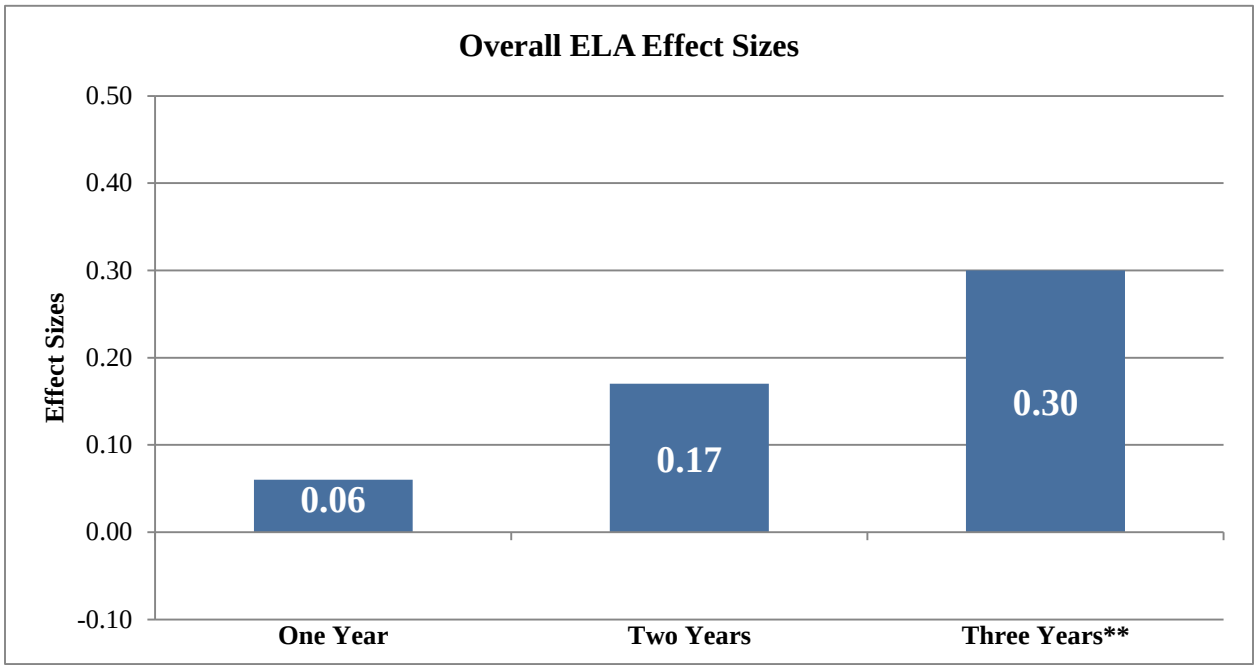
Although the effects were not statistically significant in the second year, it is notable that they were relatively high and fell very close to the threshold for statistical significance (0.17 and 0.18 standard deviations for ELA and mathematics, respectively).

Figure 1 displays the ELA effects sizes and Figure 2 displays the mathematics effect sizes for each year, with asterisks denoting effect sizes that are statistically significant (one asterisk indicates significance at the 0.05 level, two asterisks indicates significance at the 0.01 level, and three asterisks indicates significance at the 0.001 level). The third-year effect sizes translate into approximately seven months of additional instruction in ELA and 4.5 months of additional instruction in math at the fourth-grade level (Lipsey et al., 2012). [6]

[5] It is important to note that for subgroup analyses, the multiple comparisons increase the likelihood that some results will be statistically significant by chance.

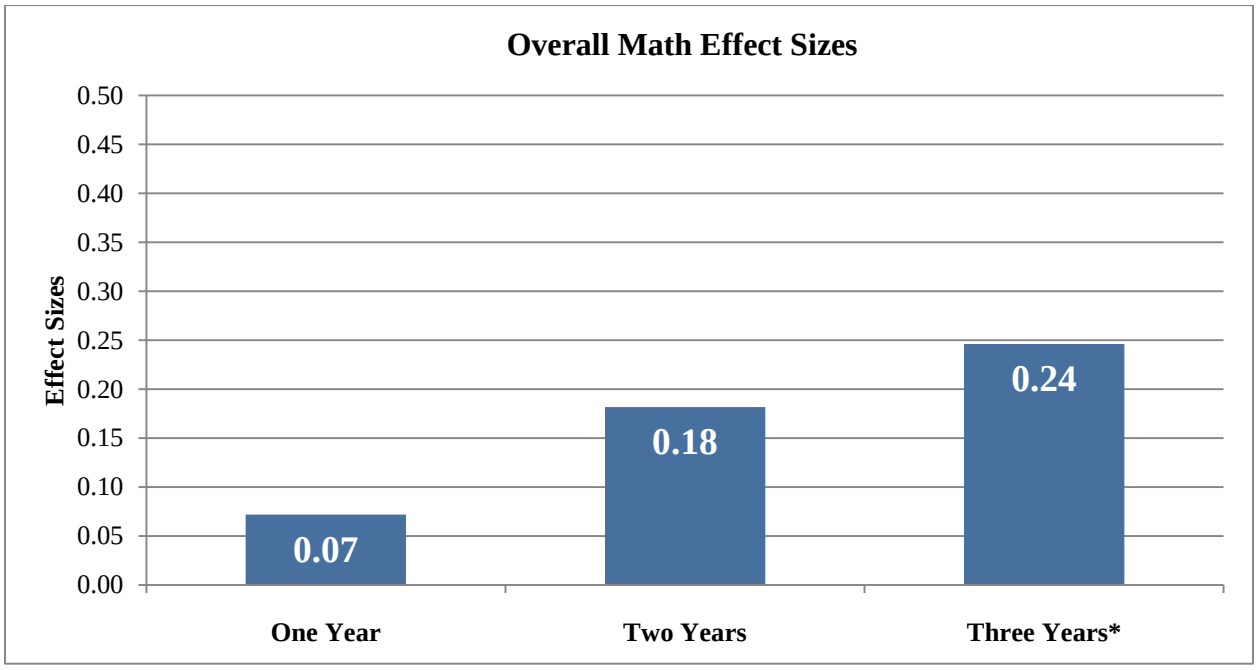
[6] It is important to note that the third-year effect was only observed for schools in the first cohort that began implementation in 2011–12, and for which AIR had the opportunity to collect data over three years. In other words, Cohort 2 schools are not included in the third-year effect.

Figure 1. Effect of WAZ on MCAS ELA Scores



** $p < .01$.

Figure 2. Effect of WAZ on MCAS Mathematics Scores



* $p < .05$.

Subgroup Analyses

Grade. Subgroup analyses by grade showed that the impact of receiving a WAZ grant on academic achievement was greatest in the younger grades. In fact, third and fourth grades were the only grades in which statistically significant impacts on MCAS ELA performance were observed, and third grade the only grade for mathematics; these were after three years. Estimates were equivalent to .51 and .43 standard deviations in third and fourth grade, respectively, for ELA and .55 in third grade for mathematics. Although the effect size for mathematics at the fourth grade level (.43) was not statistically significant, it was equivalent in magnitude to the effect for ELA, and was very close to reaching statistical significance. It is also important to note that after one and two years of implementation at these grade levels, effect sizes were relatively large, although not statistically significant. Effect sizes begin to decline after grade 4, and dramatically so after grade 5. Table 2, which includes effect sizes overall and for each grade, illustrates these trends.

Table 2. Effect Sizes Measuring WAZ Impact on MCAS ELA and Mathematics Scores, Overall and by Grade, After One, Two and Three Years of Implementation

	Year 1		Year 2		Year 3	
	ELA	**Mathematics**	**ELA**	**Mathematics**	**ELA**	**Mathematic**
Overall	**0.06**	**0.07**	**0.17**	**0.18**	**0.30****	**0.24***
Grades						
Grade 3	0.19	0.21	0.29	0.33	0.51*	0.55*
Grade 4	0.03	0.11	0.26	0.26	0.43*	0.43
Grade 5	-0.02	0.01	0.01	0.26	0.18	0.35
Grade 6	-0.03	0.04	0.00	0.09	-0.15	-0.05
Grade 7	-0.07	-0.10	-0.01	-0.10	-0.01	-0.25
Grade 8	-0.10	-0.02	-0.09	-0.19	-0.09	-0.22

** p < .05, ** p < .01*

Special populations. Analyses of special populations showed that the impact of WAZ varied by socioeconomic status, special education status, and limited English proficient (LEP) status, with the strongest effect for LEP students.

- For **students qualifying for free or reduced-price lunch (FRL)**, there was no difference in the impact of WAZ on ELA or mathematics performance, when compared to students not qualifying for free or reduced-price lunch.
- For **special education students**, the impact of WAZ on academic performance was weaker than it was for nonspecial education students in Years 1 and 2 for ELA and in Years 1, 2, and 3 for mathematics.
- For **LEP students**, the impact of WAZ on both ELA and mathematics performance was stronger than it was for non-LEP students in Year 3. The impact on LEP students in ELA performance after the third year was particularly notable, with gains equivalent to 0.42

standard deviations. This effect size equates to slightly more than a full year of typical achievement gains made between Grades 4 and 5.

Figure 3 through Figure 8 illustrate these variations by special population. Asterisks denote differences in effect sizes between the two groups that are statistically significant, with one asterisk indicating significance at the 0.05 level, two asterisks indicating significance at the 0.01 level, and three asterisks indicating significance at the 0.001 level.

Figure 3. Effect of WAZ on MCAS ELA Scores by Free or Reduced-Price Lunch Status

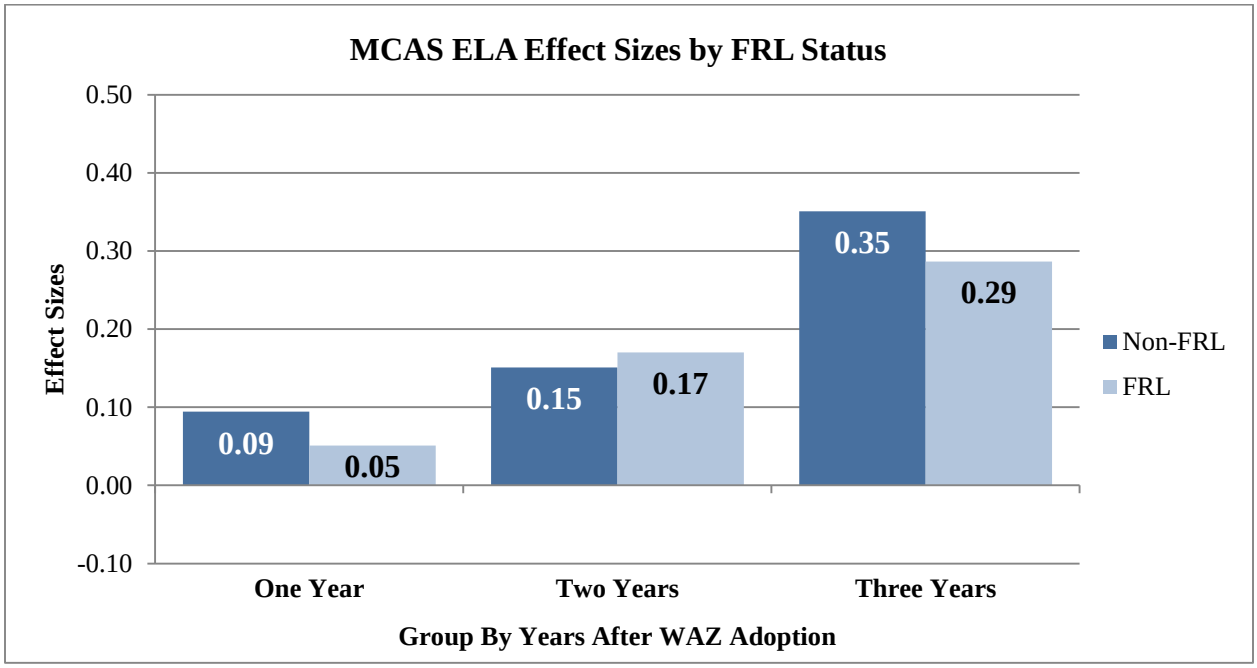


Figure 4. Effect of WAZ on MCAS Mathematics Scores by Free or Reduced-Price Lunch Status

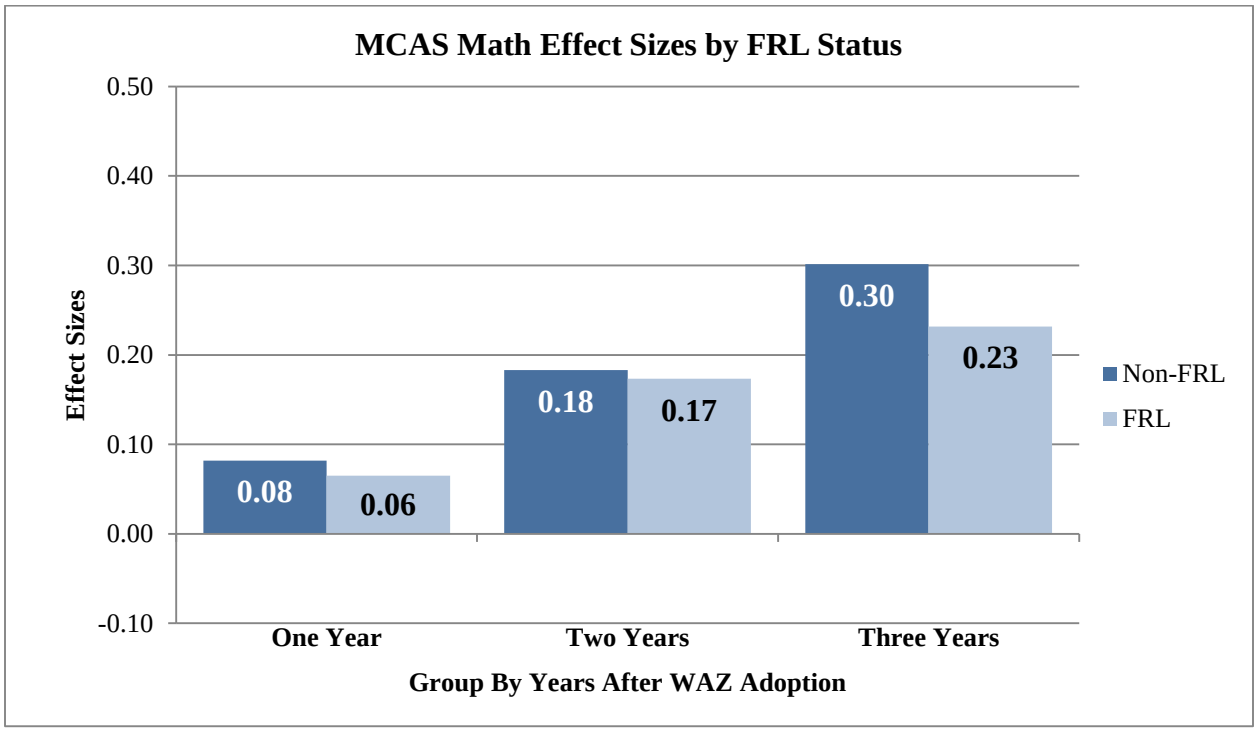
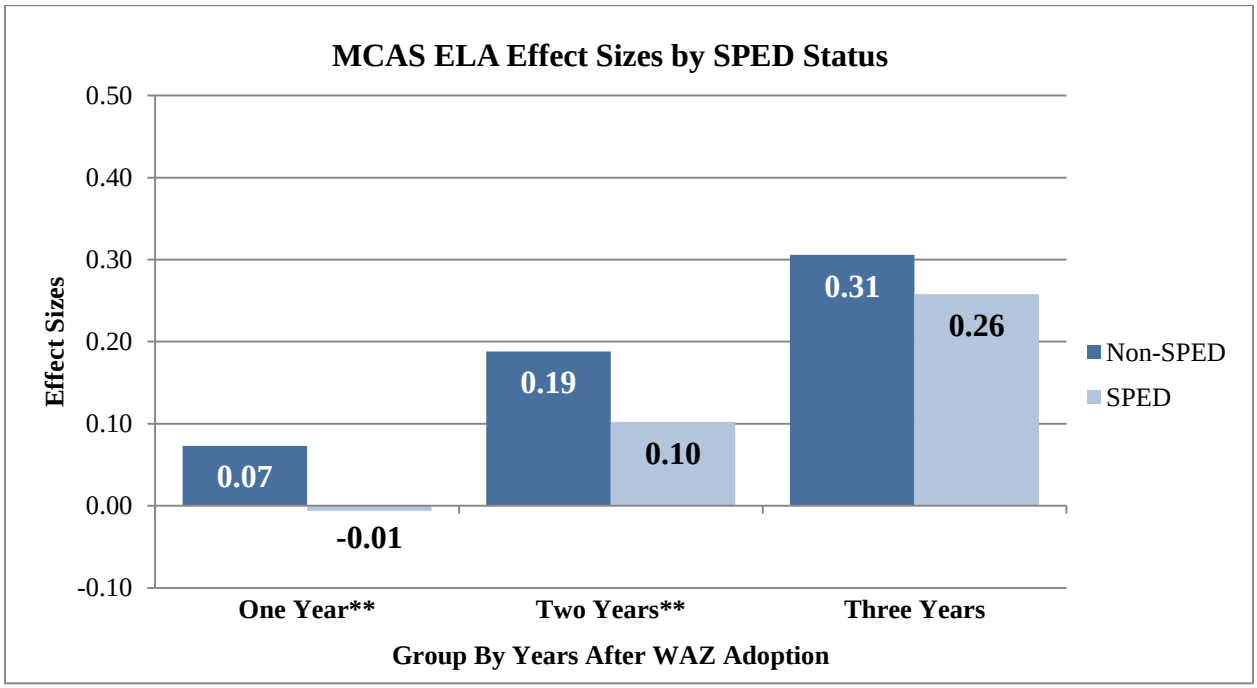
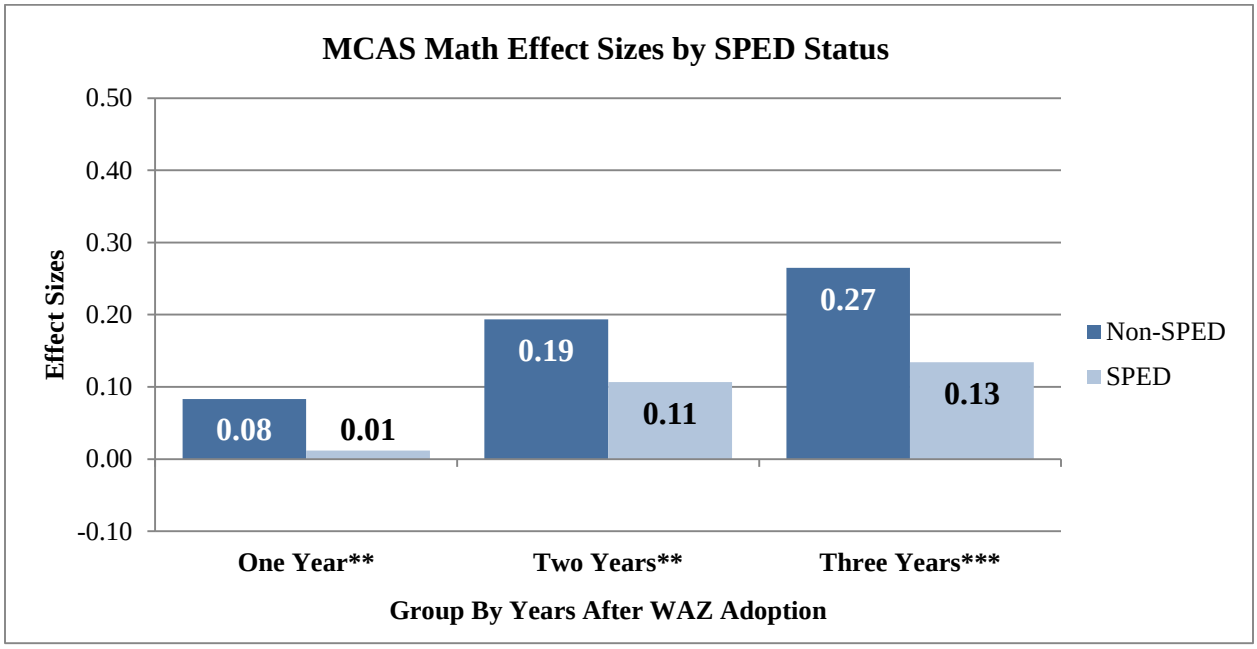


Figure 5. Effect of WAZ on MCAS ELA Scores by Special Education Status



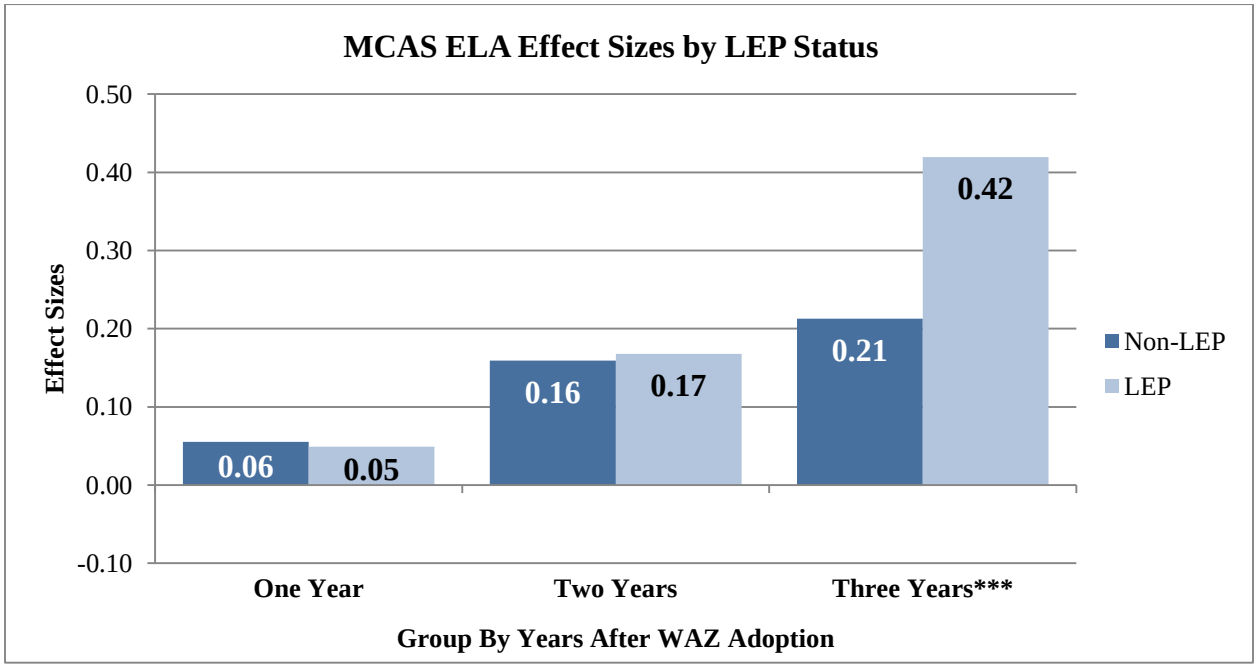
*** p < 0.01.*

Figure 6. Effect of WAZ on MCAS Mathematics Scores by Special Education Status



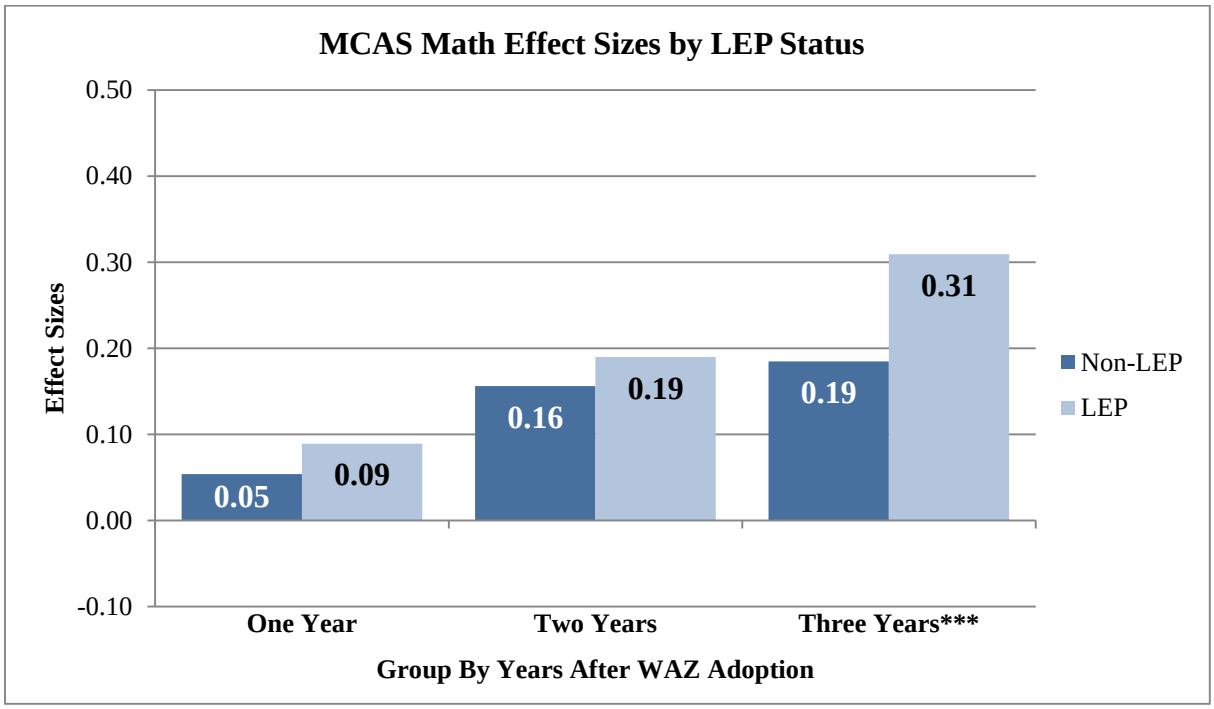
** $p < 0.01$. *** $p < 0.001$.

Figure 7. Effect of WAZ on MCAS ELA Scores by Limited English Proficiency (LEP) Status



*** $p < 0.001$.

Figure 8. Effect of WAZ on MCAS Mathematics Scores by Limited English Proficiency (LEP) Status



**** $p < 0.001$.*

Attendance

Overall, there was no statistically significant impact of WAZ on attendance rates. Specifically, in all three years of implementation, students in WAZ schools had attendance rates that were less than approximately a half a percentage point lower than projected had they remained on their trend absent WAZ, and this difference was not statistically different from zero.

Subgroup analyses

Grade. Analysis by grade revealed three instances of a statistically significant, negative impact of WAZ on attendance. Specifically, after three years of implementation, students in Grades 6, 7, and 8 had attendance rates that were three, two, and three percentage points lower, respectively, than projected had they remained on the trend absent WAZ.

Special populations. Analysis by subgroup revealed one instance in which the impact of WAZ on attendance varied by subgroup. Specifically, for LEP students, when compared to non-LEP students, WAZ had a larger impact on attendance after three years of WAZ implementation. However, this difference was very small, falling within less than 1 percentage point.

Retention

Overall, there was no statistically significantly impact of WAZ on a student's probability of being retained in grade. In other words, the probability that the grade a student was enrolled in during the fall was the same grade the student was enrolled in the fall of the previous academic

year was no different than their peers in non-WAZ schools, taking into account the probability of retention prior to WAZ implementation.

Subgroup analyses

Grade. Analysis by grade revealed a statistically significant impact of WAZ on retention at four grade levels. At Grade 3, the analysis showed that students in WAZ schools had lower probabilities of being retained after one year of WAZ implementation, when taking into account comparison schools and prior trends. By contrast, at Grades 5, 6 and 7, analysis showed that students in WAZ schools had higher probabilities of being retained after three years of WAZ implementation, when taking into account comparison schools and prior trends.

Special populations. Analysis by subgroup revealed one instance in which the impact of WAZ on retention was statistically significant different between groups. Specifically, for students receiving special education services, being in a WAZ school in the second year of implementation increased the probability of retention more than it did for students not receiving special education services.

Suspension

Overall, there was no statistically significantly impact of WAZ on a student's probability of receiving an in-school or out-of school suspension during the school year. In other words, the probability that students in WAZ schools were suspended was no different than their peers in non-WAZ schools, taking into account the probability of suspension prior to WAZ implementation.

Subgroup analyses

Grade. Analysis by grade revealed no impact of WAZ on suspension for any grade level.

Special populations. Analysis by subgroup revealed three instances in which the impact of WAZ on suspension was statistically significant different between groups. First, for students qualifying for free or reduced-price lunch, being in a WAZ school in the second year of implementation decreased the probability of suspension more than it did for students not qualifying for this program. For students not receiving special education services, being in a WAZ school had no effect on the probability of suspension, however in the first and third years of implementation being in a WAZ school increased the probability of suspension more for students receiving special education services and these differences between students who did and did not qualify for special education services were statistically significant. For LEP students, being in a WAZ school in the first year of implementation increased the probability of suspension more than it did for non-LEP students. It is not clear from the data whether these results reflect changes in behavior or changes in school discipline policies.

IV. Conclusion

This report describes findings from a quasi-experimental impact analysis that examined the extent to which student outcomes were associated with Wraparound Zones (WAZ) implementation. It is the final in a series of evaluation reports that assessed how well the WAZ initiative achieved its goals. The first four reports in the series used qualitative and some quantitative data to answer research questions about conditions that existed prior to WAZ; progress in WAZ implementation and early indicators of change; outcomes observed that stakeholders perceived to be associated with WAZ; and factors related to sustainability. This final report used extant quantitative data to provide a summative assessment of the degree to which WAZ contributed to a change in student outcomes over the full three years of the grant. The outcomes examined were student achievement, attendance, retention, and suspension.

Results showed that students in WAZ schools experienced greater gains in English language arts (ELA) and mathematics achievement than students in comparable non-WAZ schools over the same time period. Gains were particularly strong for limited English proficient (LEP) students and for students in earlier grades (Grades 3 and 4). Results also showed gains to be strongest after three years of implementation (for the first cohort of schools). The magnitude of the third-year effects for ELA was especially impressive: it was equivalent to seven months of instruction at the Grade 4 level for all students, and over a full year of typical achievement gains made between Grades 4 and 5 for LEP students. These results demonstrate a strong association between the WAZ program and growth in student achievement.

There was no overall statistically significant impact of WAZ on attendance, retention, or suspension. Although data showed some instances of statistically significant variations in subgroup effects for attendance, retention, and suspension, caution should be taken when interpreting these results. The sheer number of statistical comparisons increases the likelihood that these findings were due to chance.

Results from this evaluation add to a small but growing body of literature demonstrating a link between programs that provide wraparound-like supports and student academic outcomes. For example, Child Trends conducted a review of the literature on integrated student support (ISS) models and reported that most rigorous quasi-experimental studies showed an impact of ISS approaches on student achievement (Moore, Terzian, & Stratford, 2014). Reviews on aspects of school climate have also shown that programs that focus on school safety, relationships among students, staff and families, and a culture that promotes strong social–emotional skills are associated with improvements in teaching and learning (Thapa et al., 2013). The success of the WAZ initiative, which includes a focus on both overall school climate and elements of the integrated student support model (e.g., targeted supports for students, community partnerships), aligns well with the findings from these overall bodies of literature.

Evidence from within Massachusetts lends even further support to these findings. For example, 10 WAZ schools that began the initiative as Level 4 schools had exited Level 4 status by the time the grant was over. In fact, among the full 2010 cohort of Level 4 schools, those that were WAZ schools were more likely than non-WAZ schools to exit Level 4 status by 2014 (66 percent and 40 percent, respectively). Additionally, many of the WAZ schools received additional support

from a School Redesign Grant,[7] which was also found through a similar study to have a strong impact on student performance (Brown et al., forthcoming). These data point to the success of WAZ as a component of a school turnaround strategy.

Additionally, implementation research has shown that it takes time, typically at least three years, to realize gains in student achievement after launching a new program (Aladjem et al., 2006; Borman, Hewes, Overman, & Brown, 2003). Some research has also shown that implementation of new programs might lead to flat or even slightly negative outcomes in the early stages before gains are realized (Borman et al., 2003). The pattern in the WAZ data demonstrates this trend: no improvement, then a gain after one year, and then stronger gains in the second and third years. Based on the Borman et al.'s studies, which show substantial gains continued to increase after the fifth year of implementation and beyond, investments in sustaining the WAZ initiative should be strongly considered.

Together, the findings from all five of AIR's evaluation reports suggest that WAZ has been successful in meeting its goals. In addition to analyses of qualitative data that illustrate the ways in which WAZ has supported progress in the areas of student behavior, family engagement, student referral systems, and community partnerships, analysis of the quantitative extant data shows that the program has had an impact on student achievement. What is not clear, however, are the reasons why WAZ affect student achievement. Further analysis could potentially examine the link between the implementation data and outcome data.

The findings presented in this report raise a number of questions for further study that could be useful in informing policy decisions related to WAZ and other strategies for supporting low-performing schools. These include:

- Which factors associated with WAZ implementation contributed the most to achievement gains, such as strong school climate, strong community partnerships?
- Will student achievement gains in WAZ schools be sustained over time when the grant funding ends? If so, which factors contribute to this sustainability and which act as barriers?
- In what ways does the impact of WAZ vary for students in different subgroups?
- What is the combined impact of WAZ with other funding streams that target low-performing schools (e.g., School Redesign Grants)?

Research that answers these questions will add to the growing body of knowledge on the connection between comprehensive student supports and academic outcomes, both nationally and in Massachusetts. More research that demonstrates how and why this connection exists will have important implications for policymakers as they continue to develop and implement systems that support school improvement and reduce persistent achievement gaps.

[7] Funded through the federal School Improvement Grant program, the School Redesign Grants are intended to provide financial support to Level 4 schools implementing one of four federally approved turnaround models: turnaround, transformation, restart, or closure. More information on the SRG program can be found at http://www.doe.mass.edu/apa/sss/turnaround/grants/default.html

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Appendix A: Matching Procedures and Results

AIR employed a widely used matching technique—the Mahalanobis distance (Mahalanobis D)—to identify the optimal matched comparison school for each Wraparound Zone (WAZ) school based on a select set of key school-level indicators. While propensity score matching is one commonly used matching approach in social science research, it tends to perform less well when sample sizes are small (as is the case with the sample of 28 Year 1 and Year 2 WAZ schools). Therefore, Mahalanobis D matching is the preferred technique when dealing with small sample sizes (Rubin, 1979, 1980).

The sampling pool from which the comparison schools were selected consisted of all schools across the non-WAZ Massachusetts Commissioner's Districts: Boston, Brockton, Lowell, and New Bedford. This approach capitalizes on a source of randomness, or exogeneity, in the nature of district-level WAZ selection. All Commissioner's Districts were *eligible* to apply for WAZ funding. Specifically, limiting the pool of comparison schools to the Commissioner's Districts increases the overlap in observable and unobservable pretreatment characteristics. Moreover, by eliminating schools in WAZ districts from the pool, the problem of within-district contamination was avoided. In other words, non-WAZ schools in WAZ districts were likely to be implementing similar strategies or receiving similar district support as the WAZ schools, and therefore could not serve as sensible comparison schools. Also excluded were all schools from the sampling pool that were charters, served special populations (e.g., special education schools), or were vocational schools.

The goal of the matching procedure was to select non-WAZ schools with average values on select school-level characteristics at baseline that were comparable to WAZ schools. A review of district WAZ applications to Massachusetts Department of Elementary and Secondary Education (ESE) suggested that districts relied largely on achievement, behavioral, and accountability indicators when selecting WAZ schools. In addition, some districts also selected schools on the basis of feeder patterns and large proportions of high-need populations such as English language learners. AIR aimed to use similar indicators in the selection of comparison schools to mirror the districts' selection of WAZ schools. AIR also aimed to select five or fewer indicators because Mahalanobis D matching performs best with a smaller number of covariates (Rosenbaum & Rubin, 1985; Stuart & Rubin, 2007).

The covariates ultimately selected were percentage of students scoring at the Warning/Failing level on the Massachusetts Comprehensive Assessment System (MCAS) English language arts (ELA); school accountability level; average number of days absent; percentage English language learners (ELLs), and percentage low-income students. For each school, the average of each covariate across three years was computed—baseline School Year 2010–11 and two years prior—to account for any minor fluctuations in a school's student composition over time. The average values of these covariates was used to help achieve balance among WAZ and non-WAZ matched comparison schools. For accountability level, only the baseline year was used.

Table A1 is a diagram of the key combinations of matching variables considered when determining the final matching model. The columns represent the six models tested (Model A through Model F), and the rows represent the variables tested. The checkmarks in the cells

denote which variables were included in the respective models. The variables tested include the following:

- ***Variables measuring achievement (Rows 3 and 4)***. The percentage of students scoring at the Warning/Failing level on MCAS ELA and mathematics as the achievement measure were examined because (1) percentage of Warning/Failing is one of the criteria used to determine whether a school or district should be a Level 3 school, and (2) the WAZ program office strongly recommended this measure as more indicative of a school's academic progress than the percentage of students scoring at the *proficient* level or higher on MCAS.
- ***Variables that served as "base selection criteria" for WAZ (Rows 6–9)***. These variables include a school's accountability level, the average number of days absent, and the percentage of ELLs and low-income students. A review of district WAZ applications revealed these factors as playing the most prominent role in a district's selection of a school into the WAZ program.
- ***Other variables relevant to WAZ (Rows 11–13).*** The last three rows of the Table A1 represent additional variables considered as matching criteria. The number of students enrolled and number of suspensions were examined because they are related to school climate and the percentage of special education students was included because the WAZ support system targets high-need students.

Table A1. Outline of Matching Models Tested Based on Nine Most Commonly Used Selection Criteria

Variables Tested in Matching Model	Model A	Model B	Model C	Model D	Model E	Model F
Achievement						
Percent Warning/Failing MCAS (ELA)	✓	✓		✓	✓	✓
Percent Warning/Failing MCAS (mathematics)	✓		✓			
WAZ Base Selection Criteria						
School accountability level	✓	✓	✓	✓	✓	✓
Avg. number of days absent	✓	✓	✓	✓	✓	✓
Percent of school ELL	✓	✓	✓	✓	✓	✓
Percent of school low income	✓	✓	✓	✓	✓	✓

Variables Tested in Matching Model	Model A	Model B	Model C	Model D	Model E	Model F
Other Variables						
Number of students enrolled				✓		
Percent of school special education					✓	
Number of suspensions						✓

Table A2 provides two summary statistics for each model tested: the standardized group differences (i.e., effect sizes) and percent reduction in bias. These two indicators summarize the degree of similarity between treatment and matched comparison schools, based on a given set of matching variables.

- The **effect size** in each cell represents the standardized group differences between WAZ and matched comparison schools on the given indicator listed in Column 1 for the specific set of matching variables tested in each model. Effect sizes greater than 0.25 represent differences that are "substantively important" (What Works Clearinghouse, n.d., p. 60).
- **Percent reduction in bias** is a commonly used measure for assessing the effectiveness of the matching. It is defined as the percentage of the initial mean difference in key covariates that has been removed by selecting the given set of matched comparison schools (in comparison to all eligible matches). A greater percent reduction in bias indicates that the group of matched schools is more similar to WAZ schools on a given observable characteristic than the pool of eligible matches.

Table A2. Standardized Group Differences for Matching Models Based on Commonly Used WAZ District Selection Criteria and Percent Reduction in Bias

	Model A ELA+ mathematics+ base covariates	Model B ELA+base covariates	Model C Mathematics+base covariates	Model D ELA+base covariates+ total enroll	Model E ELA+base covariates+ special education	Model F ELA+base covariates+ suspension
Percent of students warning/ failing on ELA MCAS	0.39 (61.4%)	0.25 (75.3%)	0.21 (78.3%)	0.33 (67.5%)	0.31 (67.8%)	0.29 (70.8%)
Percent of students warning/ failing on mathematics MCAS	0.55 (59.7%)	0.55 (61.1%)	0.52 (62.9%)	0.57 (59.8%)	0.65 (52.1%)	0.59 (56.1%)
Percent of students proficient or higher on ELA MCAS	0.23 (63.8%)	0.14 (77.3%)	0.15 (75.0%)	0.09 (87.2%)	0.13 (79.4%)	0.13 (80.4%)
Percent of students proficient or higher on mathematics MCAS	0.41 (60.2%)	0.41 (62.1%)	0.32 (70.7%)	0.39 (66.4%)	0.46 (55.9%)	0.46 (55.4%)
Avg. number of days absent	0.05 (86.7%)	0.08 (80.2%)	0.13 65.5%)	0.07 (76.2%)	0.03 (91.9%)	0.01 (97.8%)
Number of suspensions	0.09 (55.8%)	0.08 (59.2%)	0.07 (63.08%)	0.29 (21.1%)	0.10 (61.6%)	0.29 (26.6%)
School accountability level	0.11 (88.7%)	0.07 (92.5%)	0.21 (77.5%)	0.04 (96.3%)	0.18 (81.3%)	0.14 (85%)
Percent of school ELL	0.06 (83.1%)	0.04 (89.3%)	0.09 (75.1%)	0.08 (78.7%)	0.10 (74.3%)	0.08 (77.4%)
Percent of school special education	0.06 (75.3%)	0.19 (10.6%)	0.13 (32.1%)	0.33 (-32.9%)	0.14 (37.5%)	0.20 (6.73%)
Percent of school low income	0.66 (55.8%)	0.50 (66.3%)	0.62 (56.9%)	0.54 (65.2%)	0.55 (63.5%)	0.58 (60.7%)
Number of students enrolled	0.18 (-23.8%)	0.18 (-22.5%)	0.11 (24.5%)	0.15 (42.2%)	0.06 (69.5%)	0.03 (87.8%)

Note. Percent reduction is in parentheses. $Percent\ reduction\ in\ bias = 100\% * (1 - \frac{\mu_{Treatment} - \mu_{Matched}}{\mu_{Treatment} - \mu_{All\ Potential\ Matches}})$.

Based on the review of the data in Table A2, Model B was selected as the final model for two reasons. First, Model B has the smallest standardized group differences, on average, across the models. Second, Model B has the greatest reduction in bias for percent of low-income students and the second largest reduction in percent bias for accountability level, which were two of the main selection criteria for WAZ schools.

Final Matches

The Stata command "mahapick" was used to generate multiple matches for each WAZ school based on the five school-level covariates. The purpose of generating multiple matches was to ensure each WAZ school was uniquely matched with a comparison school. It is preferable to obtain unique matches for each treatment school because it increases sample size and improves the ability to detect an effect of WAZ on the treatment schools. Unique matches also prevent any single school from disproportionately influencing the results of the impact evaluation. To control for the different grade configurations across WAZ schools, a school's ESE grade classification (elementary school, middle school, elementary school–middle school, middle school–high school) was matched. Each set of matches was then ranked by its Mahalanobis D measure (or "mahascore"), with the aim of selecting one unique comparison school for each WAZ school. In selecting comparison schools, the goal was to minimize the "distance" between two sets of indicators; therefore a low mahascore indicates a close match between treatment and potential comparison schools based on the selected matching variables. A detailed explanation of the procedures used to select the unique match is provided at the end of this appendix.

After the matches were generated, some treatment schools and their matched comparison schools were excluded from the analytic sample for substantive reasons. This included schools that had stopped participating in the WAZ intervention (n=4), and the only high school in the sample (n=1). In addition, two matched comparison schools closed during the period of the analysis. The closed schools were omitted and the respective treatment schools' matches were adjusted to their next closest matched comparison school available.

In Table A3, each WAZ school and its final match is listed. In Column 4, the "match number" is indicated, which represents the rank number of the given match generated from a set of five matches per school (WAZ schools have a match number of 0 because they are in the treatment group).

Table A3. List of WAZ Treatment Schools (in bold) and Final Matched Comparison Schools (highlighted in gray)

District	School	Grade Level	Match Number
Fall River	**Carlton M. Viveiros Elementary**	**ES**	**0**
Boston	Joseph P. Tynan	ES	1
Fall River	**Mary Fonseca Elementary**	**ES**	**0**
New Bedford	Sgt. William H. Carney Academy	ES	1
Fall River	**John J. Doran Elementary**	**ES**	**0**

District	School	Grade Level	Match Number
Boston	Mattahunt	ES	4
Fall River	**Edmond P. Talbot Middle**	**MS**	**0**
Boston	William B. Rogers Middle	MS	3
Fall River	**Matthew J. Kuss Middle**	**MS**	**0**
Brockton	North Middle School	MS	2
Holyoke	**Morgan Elementary**	**ESMS**	**0**
Boston	Orchard Gardens	ESMS	1
Holyoke	**William R. Peck School**	**ESMS**	**0**
Boston	John W. McCormack	ESMS	2
Holyoke	**Kelly Elementary**	**ESMS**	**0**
Boston	Maurice J. Tobin	ESMS	1
Lynn	**Cobbet Elementary**	**ES**	**0**
Boston	William E. Russell	ES	1
Lynn	**William P. Connery**	**ES**	**0**
Brockton	Huntington	ES	4
Lynn	**E. J. Harrington**	**ES**	**0**
Lowell	Charlotte M. Murkland Elementary	ES	3
Lynn	**Thurgood Marshall Middle**	**MS**	**0**
Boston	James P Timilty Middle	MS	1
Springfield	**Brightwood**	**ES**	**0**
Boston	John P. Holland	ES	1
Springfield	**Elias Brookings**	**ES**	**0**
Boston	Roger Clap	ES	2
Springfield	**White Street**	**ES**	**0**
Boston	Elihu Greenwood Leadership Academy	ES	1
Springfield	**Gerena**	**ES**	**0**
New Bedford	Hayden/McFadden	ES	1
Springfield	**Alfred G. Zanetti**	**ESMS**	**0**
Boston	Mission Hill School	ESMS	1
Springfield	**Chestnut Accelerated Street Middle**	**MS**	**0**
Boston	Dearborn Middle	MS	3
Springfield	**John F. Kennedy Middle**	**MS**	**0**
Boston	Harbor School	MS	1
Springfield	**M. Marcus Kiley Middle**	**MS**	**0**
New Bedford	Keith Middle	MS	1
Worcester	**Woodland Academy**	**ES**	**0**

District	School	Grade Level	Match Number
Boston	Curtis Guild	ES	1
Worcester	**Burncoat Street Preparatory**	**ES**	**0**
Boston	James W. Hennigan	ES	1
Worcester	**Chandler Elementary Community**	**ES**	**0**
Boston	Paul Dever	ES	1
Worcester	**Chandler Magnet**	**ES**	**0**
Boston	Thomas J. Kenny	ES	3
Worcester	**Goddard School of Science & Technology**	**ES**	**0**
Boston	Hugh Roe O'Donnell	ES	3
Worcester	**Union Hill School**	**ES**	**0**
Boston	Harvard	ES	5
Worcester	**Goddard Scholars Academy (at Sullivan Middle School)**	**MS**	**0**
Lowell	Henry J. Robinson Middle	MS	1
Worcester	**University Park Campus School**	**MSHS**	**0**
Boston	Boston Latin Academy	MSHS	1

Note. ES is elementary school; MS is middle school; ESMS is elementary and middle school; MSHS is middle school and high school.

Table A4 provides the baseline school characteristics for WAZ and matched comparison schools (Column 3) and the mean value for those characteristics for all non-treatment schools in the state (Column 5). Although the matched comparison schools that were most similar in observable characteristics to WAZ schools were selected, Table 4 indicates that there were still nontrivial differences in the proportion of students scoring at the Warning/Failing level and at or above the *proficient* level in mathematics[8] and the proportion of low-income students.[9] There were also differences in the number of suspensions.[10] These differences are to be expected because WAZ targeted a specific set of schools within each district, primarily those with the highest need as demonstrated by these indicators. Moreover, the comparative interrupted time series (CITS) approach does not require treatment and matched comparison groups to have identical school-level characteristics. Rather, CITS requires that comparison and treatment schools be affected similarly by policies and events. More concretely, WAZ might still be expected to affect the two groups of schools similarly because both groups are relatively low performing with large proportions of high-need students. Furthermore, although the differences reported may be statistically significant, they may not be substantively meaningful: a school where 41 percent of the student body scores at the Warning/Failing level in MCAS and 88 percent of its students are low-income would still be considered high need compared to a school with 33 percent of its students scoring at the Warning/Failing level in mathematics and 82 percent of the student body low-income.

[8] WAZ schools were lower performing with greater proportions of students performing in the Warning/Failing category and smaller proportions performing at or above *proficient*.
[9] WAZ schools had greater proportions of low-income students.
[10] WAZ schools had greater numbers of suspensions.

Table A4. Baseline School Characteristics for WAZ and Matched Comparison Schools[11]

	WAZ or Match	Mean	Standard Error	Mean for All Non-WAZ Schools
Percent of students Warning/ Failing ELA MCAS	WAZ	28.73	2.26	16.07
	Match	23.33	1.76	
Percent of students Warning/ Failing mathematics MCAS**	WAZ	42.96	2.48	24.48
	Match	33.08	2.23	
Percent of students *proficient* or above on ELA MCAS	WAZ	30.17	2.90	43.68
	Match	35.32	3.24	
Percent of students *proficient* or above on Math MCAS***	WAZ	23.36	2.09	39.13
	Match	30.23	2.58	
Avg. number of days absent	WAZ	11.47	0.57	12.39
	Match	11.02	0.38	
Number of suspensions***	WAZ	120.12	20.57	57.25
	Match	38.05	9.84	
School accountability level	WAZ	3.29	0.18	2.53
	Match	3.04	0.15	
Percent of school ELL	WAZ	31.78	3.80	21.42
	Match	28.21	3.46	
Percent of school special education	WAZ	18.26	1.05	18.91
	Match	18.50	1.21	
Percent of school low income*	WAZ	88.82	1.32	74.52
	Match	82.46	2.02	
Number of students enrolled	WAZ	558.93	36.83	515.18
	Match	525.96	58.09	

** p < .05. ** p < .01. ***p < .001*

Table A5 provides the average values of key academic and nonacademic indicators, the WAZ schools, their respective final matched comparison schools, and select demographic characteristics. It is important to note that the aim of the matching procedure is to obtain the most balanced unique set of matched comparison schools *across the entire sample on all covariates,* which is difficult to gauge by examining any one particular matched comparison school.

[11]The summary statistics presented in columns 3 and 4 include only schools in the final analytic sample. Column 5 includes all non-WAZ schools in the state prior to applying the initial exclusion criteria.

Table A5. WAZ Schools (in bold), Final Matched Comparison Schools (highlighted in grey), and Select Demographic Characteristics

Grade level	Match Number	District	School	% W/F ELA	% W/F math	% P/P+ ELA	% P/P+ math	Avg. days absent	Avg. susp.	School acct. level	% ELL	% SPED	% low-income	Total enroll
ES	**0**	**Fall River**	**Carlton M. Viveiros Elementary**	**24.95**	**34.58**	**29.33**	**23.67**	**13.20**	**138.67**	**2**	**4.65**	**15.30**	**83.33**	**760**
ES	1	Boston	Joseph P. Tynan	25.75	27.10	39.00	36.67	14.17	2.00	2	13.90	24.25	87.30	339
ES	**0**	**Fall River**	**Mary Fonseca Elementary**	**18.85**	**28.56**	**28.67**	**25.67**	**13.30**	**109.33**	**1**	**7.55**	**10.30**	**88.23**	**704**
ES	1	New Bedford	Sgt. William H. Carney Academy	9.90	9.51	50.67	59.00	9.00	2.00	1	0.00	27.10	73.80	582
ES	**0**	**Fall River**	**John J. Doran Elementary**	**30.97**	**38.54**	**21.67**	**25.67**	**11.80**	**42.67**	**4**	**26.00**	**14.10**	**92.90**	**447**
ES	4	Boston	Mattahunt	26.09	37.97	27.00	19.33	9.73	1.33	3	18.40	22.35	84.47	626
MS	**0**	**Fall River**	**Edmond P. Talbot Middle**	**15.14**	**33.71**	**52.33**	**31.33**	**12.00**	**122.67**	**3**	**10.40**	**21.85**	**82.43**	**611**
MS	3	Boston	William B. Rogers Middle	12.00	39.24	51.00	27.67	12.27	68.00	3	17.65	26.85	83.47	623
MS	**0**	**Fall River**	**Matthew J. Kuss Middle**	**11.07**	**26.80**	**57.33**	**44.00**	**11.50**	**179.33**	**4**	**0.35**	**18.85**	**83.20**	**648**
MS	2	Brockton	North Middle School	6.19	30.04	61.33	32.67	9.30	64.33	3	7.60	12.65	79.00	421
ESMS	**0**	**Holyoke**	**Morgan Elementary**	**45.50**	**63.80**	**14.67**	**8.33**	**11.83**	**228.00**	**4**	**43.40**	**24.10**	**95.00**	**372**
ESMS	1	Boston	Orchard Gardens	33.38	50.27	21.00	20.00	13.33	29.33	4	40.35	19.10	84.17	698
ESMS	**0**	**Holyoke**	**William R. Peck School**	**43.97**	**55.64**	**22.00**	**16.33**	**12.67**	**293.67**	**2**	**40.70**	**23.20**	**87.43**	**612**
ESMS	2	Boston	John W. McCormack	21.82	36.32	43.33	33.33	14.20	163.33	3	25.90	25.55	87.93	572
ESMS	**0**	**Holyoke**	**Kelly Elementary**	**43.11**	**59.63**	**17.33**	**10.33**	**13.40**	**202.33**	**3**	**44.95**	**20.75**	**93.37**	**573**
ESMS	1	Boston	Maurice J. Tobin	26.88	38.85	23.67	19.33	13.60	26.67	3	41.30	13.50	87.33	460
ES	**0**	**Lynn**	**Cobbet Elementary**	**17.71**	**30.67**	**26.33**	**29.00**	**8.17**	**27.33**	**3**	**53.40**	**10.55**	**91.73**	**645**
ES	1	Boston	William E. Russell	20.43	21.71	30.67	36.00	9.07	8.33	3	48.45	14.35	85.73	381
ES	**0**	**Lynn**	**William P. Connery**	**34.75**	**37.47**	**19.00**	**24.67**	**7.73**	**30.67**	**4**	**51.20**	**9.95**	**92.47**	**583**
ES	4	Brockton	Huntington	27.69	31.98	25.00	26.00	9.07	23.33	3	34.50	6.90	85.70	543
ES	**0**	**Lynn**	**E. J. Harrington**	**28.61**	**35.76**	**24.00**	**22.33**	**8.93**	**35.00**	**4**	**47.10**	**13.35**	**88.47**	**563**
ES	3	Lowell	Charlotte M Murkland Elementary	31.00	26.10	20.00	33.33	13.87	16.00	4	40.30	12.35	83.03	500
MS	**0**	**Lynn**	**Thurgood Marshall Middle**	**19.79**	**46.64**	**46.33**	**22.33**	**10.63**	**284.67**	**3**	**23.55**	**20.05**	**92.27**	**930**
MS	1	Boston	James P. Timilty Middle	17.91	35.79	46.33	28.67	9.33	75.00	3	29.40	23.15	88.97	714
ES	**0**	**Springfield**	**Brightwood**	**44.60**	**55.23**	**12.67**	**12.00**	**14.60**	**19.67**	**4**	**32.15**	**17.95**	**96.23**	**403**
ES	1	Boston	John P. Holland	36.44	41.32	12.00	20.00	12.80	11.67	4	38.10	20.15	88.87	702

Grade level	Match Number	District	School	% W/F ELA	% W/F math	% P/P+ ELA	% P/P+ math	Avg. days absent	Avg. susp.	School acct. level	% ELL	% SPED	% low-income	Total enroll
ES	**0**	**Springfield**	**Elias Brookings**	**40.88**	**51.89**	**18.67**	**15.33**	**9.93**	**43.00**	**4**	**19.25**	**26.05**	**92.47**	**343**
ES	2	Boston	Roger Clap	31.44	42.78	30.33	17.67	9.30	0.33	3	18.65	23.35	74.00	148
ES	**0**	**Springfield**	**White Street**	**32.14**	**32.05**	**18.67**	**21.67**	**10.50**	**32.67**	**4**	**25.75**	**11.35**	**91.13**	**368**
ES	1	Boston	Elihu Greenwood Leadership Academy	26.79	34.91	24.67	26.33	10.60	12.33	4	16.60	18.65	83.00	335
ES	**0**	**Springfield**	**Gerena**	**52.75**	**70.09**	**10.00**	**6.33**	**15.27**	**33.00**	**4**	**22.60**	**19.45**	**87.20**	**702**
ES	1	New Bedford	Hayden/McFadden	37.68	39.87	17.33	21.00	11.50	7.00	3	9.05	26.15	86.37	713
ESMS	**0**	**Springfield**	**Alfred G. Zanetti**	**16.75**	**32.82**	**45.33**	**32.33**	**8.53**	**3.33**	**4**	**5.95**	**13.05**	**63.27**	**434**
ESMS	1	Boston	Mission Hill School	17.99	29.90	53.00	40.67	8.63	0.67	3	4.60	21.75	46.27	162
MS	**0**	**Springfield**	**Chestnut Accelerated Street Middle**	**30.04**	**58.80**	**35.67**	**20.67**	**14.93**	**318.33**	**4**	**23.25**	**27.20**	**87.13**	**967**
MS	3	Boston	Dearborn Middle	31.59	52.66	27.00	17.67	12.30	67.00	4	44.15	19.15	89.13	258
MS	**0**	**Springfield**	**John F. Kennedy Middle**	**19.26**	**57.20**	**40.33**	**15.00**	**16.90**	**184.67**	**4**	**10.30**	**22.00**	**90.07**	**646**
MS	1	Boston	Harbor School	18.36	50.99	41.00	13.33	11.40	23.33	4	9.40	29.55	83.43	256
MS	**0**	**Springfield**	**M. Marcus Kiley Middle**	**24.09**	**57.24**	**33.00**	**12.67**	**20.53**	**329.67**	**4**	**16.10**	**25.85**	**86.97**	**828**
MS	1	New Bedford	Keith Middle	14.46	35.38	45.00	29.67	14.07	190.33	3	0.05	19.80	79.07	1028
ES	**0**	**Worcester**	**Woodland Academy**	**27.14**	**30.76**	**21.33**	**28.00**	**8.03**	**61.00**	**3**	**65.00**	**13.75**	**96.00**	**491**
ES	1	Boston	Curtis Guild	32.24	31.25	20.33	28.00	8.87	2.33	3	64.35	16.10	91.27	298
ES	**0**	**Worcester**	**Burncoat Street Preparatory**	**25.07**	**33.43**	**30.67**	**34.00**	**10.03**	**45.33**	**3**	**46.85**	**26.10**	**89.57**	**217**
ES	1	Boston	James W. Hennigan	27.64	36.00	30.00	24.00	10.07	6.67	3	46.95	17.05	87.67	523
ES	**0**	**Worcester**	**Chandler Elementary Community**	**38.76**	**47.45**	**20.00**	**19.00**	**10.23**	**42.00**	**4**	**58.30**	**15.70**	**95.33**	**378**
ES	1	Boston	Paul Dever	32.11	36.43	20.00	23.33	12.70	8.33	4	40.50	17.35	91.90	482
ES	**0**	**Worcester**	**Chandler Magnet**	**41.41**	**48.52**	**26.67**	**19.33**	**9.70**	**77.67**	**3**	**70.75**	**16.80**	**88.10**	**460**
ES	3	Boston	Thomas J. Kenny	28.40	28.40	24.33	24.33	7.67	0.67	3	55.40	13.20	76.27	279
ES	**0**	**Worcester**	**Goddard School of Science & Technology**	**28.00**	**37.50**	**25.50**	**23.50**	**9.27**	**72.67**	**2**	**60.80**	**17.85**	**96.60**	**586**
ES	3	Boston	Hugh Roe O'Donnell	13.71	16.20	39.33	40.33	10.30	0.00	2	44.25	11.75	89.80	275
ES	**0**	**Worcester**	**Union Hill School**	**28.95**	**36.63**	**21.00**	**21.00**	**9.87**	**69.33**	**4**	**40.95**	**20.55**	**96.23**	**344**
ES	5	Boston	Harvard	22.97	18.45	33.33	44.33	8.93	27.00	3	43.85	18.50	93.63	448
MS	**0**	**Worcester**	**Goddard Scholars Academy (at Sullivan Middle)**	**16.18**	**44.72**	**51.00**	**29.33**	**10.17**	**329.00**	**3**	**25.85**	**25.25**	**81.33**	**794**
MS	1	Lowell	Henry J Robinson Middle	21.99	44.56	36.33	24.67	12.40	144.00	3	35.25	15.80	85.47	645

Grade level	Match Number	District	School	% W/F ELA	% W/F math	% P/P+ ELA	% P/P+ math	Avg. days absent	Avg. susp.	School acct. level	% ELL	% SPED	% low-income	Total enroll
MSHS	**0**	**Worcester**	**University Park Campus School**	**3.90**	**16.71**	**75.33**	**60.33**	**7.50**	**7.67**	**1**	**12.70**	**9.95**	**78.50**	**241**
MSHS	1	Boston	Boston Latin Academy	0.24	2.26	96.00	79.00	10.13	84.00	1	1.00	1.70	51.77	1716

Note. Demographic data based on average of data from baseline year (School Year 2010–11) and two years prior (School Years 2008–09 and 2009–10), with the exception of school accountability level, which is from baseline year only. W/F is Warning/Failing. P/P+ is Percent Proficient or Above. ES is elementary school, ESMS is elementary school–middle school, MS is middle school, and MSHS is middle school–high school.

Explanation of Procedure for Selecting Unique Matches Using Increase in Mahalanobis Distance

There were two main decision rules for selecting unique matches from the list of five potential matched comparison schools generated by Model B. The decision rules were applied across the whole sample and in order.[12]

(1) Decision Rule 1: A WAZ school's first place match was prioritized if it was uniquely matched to a given school. Accordingly, AIR crossed out potential matched schools that were a first place match for another school. For instance, Orchard Gardens was a unique first place match to Morgan Elementary; therefore, it became Morgan Elementary's final match and was "crossed out" as a potential match from any other school.

(2) Decision Rule 2: When multiple schools had the same first place match, the increase in the Mahalanobis D from each of these WAZ schools was compared to its next available match. The goal was to minimize the increase in Mahalanobis D that would result from moving to the next available match. A larger increase in the Mahalanobis D score would indicate that overall, the sample would be less balanced by matching a given WAZ school with its next available match.

To illustrate this procedure, in Table A6, two WAZ schools—William R. Peck School and Kelly Elementary School—have the same first place match, so these two schools are used to describe an application of Decision Rule 2. Table A6 illustrates that Maurice J. Tobin School in Boston was a first place match for both William R. Peck School and Kelly Elementary School (both in Holyoke). Examining the increase in Mahalanobis D in Column 5 for each school indicated that selecting William R. Peck's next available match (John W. McCormack) would increase the Mahalanobis D by 1.16, whereas selecting Kelly Elementary's next available match (also John W. McCormack) would increase the Mahalanobis D by 1.43. Because the increase for matching Kelly Elementary with its next place match (1.43) would be greater than the respective distance for matching William R. Peck with its next place match (1.16), Maurice J. Tobin School was matched with Kelly Elementary and William R. Peck was matched with John W. McCormack. In other words, matching Maurice J. Tobin with Kelly Elementary was preferred because it helped minimize the Mahalanobis D score overall and contributed to a more balanced sample.

[12] After applying these two decision rules, several matches were adjusted manually to account for the subsequent exclusion of five treatment schools and two closed comparison schools. Detail on reasons for this exclusion is provided at the beginning of Appendix A

Table A6. William R. Peck School and Kelly Elementary School and the Respective Top Five Matches

District	School	Grade Level	Mahalanobis D Score	Increase in Mahalanobis D	Match Number	Duplicate match? (1=yes; 0=no)
Holyoke	**William R. Peck School**	**ESMS**	**0.00**		**0**	**0**
Boston	Maurice J. Tobin	ESMS	10.55		1	1
Boston	John W. McCormack	ESMS	11.71	1.16	2	1
Boston	Oliver Hazard Perry	ESMS	11.83	1.28	3	0
Brockton	Oscar F. Raymond	ESMS	11.97	1.42	4	1
Brockton	Edgar B. Davis	ESMS	12.80	2.25	5	0
Holyoke	**Kelly Elementary**	**ESMS**	**0.00**		**0**	**0**
Boston	Maurice J. Tobin	ESMS	4.45		1	1
Boston	John W. McCormack	ESMS	5.88	1.43	2	1
Boston	Orchard Gardens	ESMS	5.96	1.50	3	0
Brockton	Oscar F. Raymond	ESMS	6.27	1.82	4	1
Boston	Curley K.	ESMS	6.99	2.54	5	0

Note. WAZ schools are in bold. Final matched comparison schools are highlighted in grey. ESMS is elementary school–middle school.

Appendix B: Comparative Interrupted Time Series Model Specifications

Overall Impact Analyses:

American Institutes for Research (AIR) used the following equations for the comparative interrupted time series (CITS) model to determine whether Wraparound Zones (WAZ) had an overall impact on student outcomes one, two, and three years after program implementation. The model can be written as follows:

$$\begin{aligned} Y_{ijt} = \beta_0 + \beta_1 WAZ_j + \beta_2 Time_t + \beta_3 WAZ_j Time_t + \beta_4 PY1_t + \beta_5 PY2_t + \beta_6 PY3_t \\ + \beta_7 WAZ_j PY1_t + \beta_8 WAZ_j PY2_t + \beta_9 WAZ_j PY3_t + B_{10} X_{ijt} + B_{11} Z_{jt} \\ + B_{12} WAZPair_j + \varepsilon_{ijt} + \mu_{jt} \\ + \omega_t \end{aligned} \quad (1)$$

where, Y_{ijt} is the outcome measure (i.e., standardized raw Massachusetts Comprehensive Assessment System [MCAS] test scores, attendance rate, retention, or suspension) for a student *i* in school *j* at year *t*.

WAZ_j is an indicator for a school *j* that received WAZ.

$Time_t$ is a counter for time. Time starts from 2008 (for the 2007–08 school year) and increases by one unit for each subsequent cohort until 2014 (for the 2013–14 school year).

$WAZ_j Time_t$ is an interaction between *WAZ* and *Time,* allowing for different preintervention trends between WAZ and non-WAZ schools.

$PY1_t$, $PY2_t$, $PY3_t$ are indicators for one, two, and three years after the WAZ schools began implementing WAZ. For example, for Cohort 1, WAZ schools and their matched schools, $PY1_t$ equals 1 if the observation is from 2011–12; $PY2_t$ equals 1 if the observation is from 2012–13; and $PY3_t$ equals 1 if the observation is from 2013–14.

For Cohort 2, WAZ schools and their matched schools, $PY1_t$ equals 1 if the observation is from 2012–13; and $PY2_t$ equals 1 if the observation is from 2013–14.

$WAZ_j PY1_t$, $WAZ_j PY2_t$, and $WAZ_j PY3_t$ are interactions between *WAZ* and *PY1*, *PY2*, and *PY3*. These are indicators are whether school *j* at year *t* had received WAZ intervention one, two, and three years respectively after program implementation.

The vector *X* includes student characteristics (i.e., gender, free or reduced-price lunch, limited English proficient [LEP], special education status, and racial minority).

The vector *Z* includes school characteristics (i.e., proportion of male students, proportion of students on free or reduced-price lunch, proportion of special education students, proportion of LEP students, proportion of racial and minority students, whether or not school received a planning grant in the current year or at any year).

$WAZPair_j$ is a vector of indicators for treatment and matched comparison identities.

Random effects were included to account for student, school, and cohort effects by adding a random error term for each student (ε_{ijt}), school (μ_{jt}), and cohort (ω_t).

β_0 is an overall intercept term.

β_1 compares the mean outcome score between students in WAZ schools and comparison schools at time = 0.

β_2 represents the comparison schools' outcome trend during pretreatment years (i.e., 2008 through 2011 for Cohort 1; 2008 through 2012 for Cohort 2).

β_3 is the difference in the outcome trend between comparison and WAZ schools during pretreatment years (2008 through 2011 for Cohort 1; 2008 through 2012 for Cohort 2).

β_4, β_5, and β_6, are the differences in mean outcome for comparison schools for the first, second, and third post-treatment years respectively compared to the pretreatment year trends (2008 through 2011 for Cohort 1; 2008 through 2012 for Cohort 2).

β_7, β_8, and β_9, are the coefficients of interest for the posttreatment differences in outcome trend between comparison and WAZ schools for the first, second, and third posttreatment years.

B_{10} is a vector of student level predictors.

B_{11} is a vector of school level predictors.

B_{12} is a vector of matched pair fixed effects.

Subgroup Analysis

Grade Subgroup. In order to examine whether the program is effective for each grade level, AIR separately estimated Equation 1 by grade level.

It should be noted that the vector *Z* in grade-level analyses includes characteristics of a school at a certain grade level (i.e., proportion of male students, proportion of students on free or reduced-price lunch, proportion of special education students, proportion of LEP students, proportion of racial and minority students, and whether or not school received a planning grant in the current

year or at any year). B_{11} is a coefficient vector containing grade-level predictors directly analogous to vector Z.

Free or reduced-price lunch, LEP, and Special Education Subgroup. AIR estimated whether there were differential treatment effects between students in a subgroup and students not in the subgroup after program implementation.

The equation is as follows:

$$Y_{ijt} = \beta_0 + \beta_1 WAZ_j + \beta_2 Time_t + \beta_3 WAZ_j Time_t + \beta_4 PY1_t + \beta_5 PY2_t + \beta_6 PY3_t + \beta_7 WAZ_j PY1_t + \beta_8 WAZ_j PY2_t + \beta_9 WAZ_j PY3_t + \beta_{10} Subgroup_{ijt} WAZ_j + \beta_{11} Subgroup_{ijt} WAZ_j PY1_t + \beta_{12} Subgroup_{ijt} WAZ_j PY2_t + \beta_{13} Subgroup_{ijt} WAZ_j PY3_t + + B_{14} X_{ijt} + B_{15} Z_{jt} + B_{12} WAZPair_j + \varepsilon_{ijt} + \mu_{jt} \quad (2)$$

In Equation 2, interaction term between each subgroup—free or reduced-price lunch, LEP, and special education status—and treatment effect (i.e., $Subgroup_{ijt} WAZ_j$) were added. The corresponding coefficient β_{10} is the preintervention time period difference in the differences between students in the subgroup and students not in a subgroup between WAZ and comparison schools. Additionally, three-way interaction terms between each subgroup, WAZ, and *PY1* through *PY3 (i.e.,* $Subgroup_{ijt} WAZ_j PY1_t, Subgroup_{ijt} WAZ_j PY2_t, and\ Subgroup_{ijt} WAZ_j PY3_t$) were added. The β_{11} through β_{13} coefficients represent the differential effect of WAZ among students in a subgroup and students not in the subgroup one year, two years, and three years posttreatment.

Free or reduced-price lunch, LEP, and Special Education Subgroup. AIR estimated whether there were differential treatment effects between students in a subgroup and students not in the subgroup after program implementation.

The equation is as follows:

$$Y_{ijt} = \beta_0 + \beta_1 WAZ_j + \beta_2 Time_t + \beta_3 WAZ_j Time_t + \beta_4 PY1_t + \beta_5 PY2_t + \beta_6 PY3_t + \beta_7 WAZ_j PY1_t + \beta_8 WAZ_j PY2_t + \beta_9 WAZ_j PY3_t + \beta_{10} Subgroup_{ijt} WAZ_j + \beta_{11} Subgroup_{ijt} WAZ_j PY1_t + \beta_{12} Subgroup_{ijt} WAZ_j PY2_t + \beta_{13} Subgroup_{ijt} WAZ_j PY3_t + + B_{14} X_{ijt} + B_{15} Z_{jt} + \varepsilon_{ijt} + \mu_{jt} \quad (2)$$

In Equation 2, interaction term between each subgroup—free or reduced-price lunch, LEP, and special education status—and treatment effect (i.e., $Subgroup_{ijt} WAZ_j$) were added. The corresponding coefficient β_{10} is the preintervention time period difference in the differences

between students in the subgroup and students not in a subgroup between WAZ and comparison schools. Additionally, three-way interaction terms between each subgroup, WAZ, and *PY1* through *PY3 (i.e.,* $Subgroup_{ijt}WAZ_jPY1_t, Subgroup_{ijt}WAZ_jPY2_t, and\ Subgroup_{ijt}WAZ_jPY3_t$) were added. The β_{11} through β_{13} coefficients represent the differential effect of WAZ among students in a subgroup and students not in the subgroup one year, two years, and three years posttreatment.

Appendix C: Descriptive Results

Table C1. Mean Outcomes by Year and Treatment Status

Year	English Language Arts (ELA)						Mathematics					
	ELA Raw Score		ELA Standardized Score		Valid *N*		Mathematics Raw Score		Mathematics Standardized Score		Valid *N*	
	T	C	T	C	T	C	T	C	T	C	T	C
2008	32.86	35.43	-0.98	-0.7	8698	8389	24.8	28.63	-0.94	-0.59	8682	8404
2009	32.89	35.12	-0.97	-0.75	9737	8343	25.1	28.39	-0.96	-0.67	9767	8414
2010	33	34.05	-0.9	-0.77	9600	8643	26.21	29.14	-0.88	-0.61	9619	8731
2011	33.16	34.67	-0.91	-0.75	9490	8514	26.89	29.63	-0.85	-0.6	9515	8588
2012	32.98	34.29	-0.87	-0.75	9519	8634	26.51	29.22	-0.83	-0.58	9531	8686
2013	32.95	34.25	-1.08	-0.93	9607	8549	26.52	29.05	-0.99	-0.74	9656	8623
2014	33.62	34.27	-0.76	-0.7	9836	8320	27.82	29.33	-0.69	-0.55	9796	8399
Year	**Attendance Rate**				**Suspension**				**Retention**			
	Mean		**Valid *N***		**Mean**		**Valid *N***		**Mean**		**Valid *N***	
	T	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**	**T**	**C**
2008	0.93	0.94	11849	11370	0.21	0.09	11849	11370	0.06	0.06	11849	11370
2009	0.92	0.93	13562	11428	0.2	0.09	13562	11428	0.05	0.06	13562	11428
2010	0.93	0.94	13338	11718	0.2	0.08	13338	11718	0.05	0.05	13338	11718
2011	0.93	0.94	13419	11672	0.19	0.08	13419	11672	0.06	0.06	13419	11672
2012	0.93	0.94	13489	11979	0.19	0.06	13489	11979	0.03	0.05	13489	11979
2013	0.94	0.94	13482	12037	0.16	0.08	13482	12037	0.04	0.05	13482	12037
2014	0.94	0.94	13599	11853	0.15	0.08	13599	11853	0.05	0.04	13599	11853

Table C2. Student Demographics by Year and Treatment Status

Year	Special Education		Free or Reduced-Price Lunch		Individualized Education Program	
	T	C	T	C	T	C
2008	21.13%	20.11%	87.96%	81.11%	28.45%	18.37%
2009	21.07%	20.41%	87.31%	83.44%	28.92%	21.03%
2010	19.99%	19.10%	89.57%	85.00%	29.36%	29.32%
2011	19.49%	18.69%	91.09%	83.46%	30.37%	30.33%
2012	18.86%	17.95%	90.94%	75.17%	30.07%	31.78%
2013	18.26%	18.51%	90.88%	79.90%	29.75%	30.03%
2014	18.07%	18.75%	91.13%	85.46%	28.94%	30.69%

Year	Hispanic		Black		White		Asian	
	T	C	T	C	T	C	T	C
2008	57.03%	35.12%	14.64%	36.22%	20.74%	17.85%	4.58%	7.62%
2009	56.05%	36.82%	12.73%	35.34%	23.40%	17.08%	4.87%	7.67%
2010	56.87%	38.04%	12.60%	34.73%	22.67%	15.98%	4.88%	8.01%
2011	58.13%	39.29%	12.12%	35.08%	21.42%	14.47%	5.34%	7.92%
2012	58.48%	39.46%	12.19%	35.67%	20.84%	13.83%	5.14%	7.71%
2013	58.23%	38.92%	12.05%	35.90%	20.89%	13.90%	5.29%	7.76%
2014	56.60%	40.43%	11.43%	34.56%	22.62%	13.68%	5.26%	7.74%

Year	*N* of Unique Student IDs	
	T	C
2008	11849	11370
2009	13562	11428
2010	13338	11718
2011	13419	11672
2012	13489	11979
2013	13482	12037
2014	13599	11853

Appendix D: Comparative Interrupted Time Series Model Results

Table D1. CITS Regression Coefficients and Standard Errors for Student Achievement, Main Effects

	English Language Arts	Mathematics
WAZ (β1)	-0.195 **	-0.253 ***
	(0.063)	(0.073)
Time (β2)	0.033 *	0.037 *
	(0.014)	(0.016)
WAZ * Time (β3)	-0.014	-0.015
	(0.020)	(0.021)
Post Year 1 (β4)	-0.095	-0.112
	(0.054)	(0.058)
Post Year 2 (β5)	-0.228 ***	-0.202 **
	(0.063)	(0.069)
Post Year 3 (β6)	-0.088	-0.039
	(0.079)	(0.086)
WAZ * Post Year 1 (β7)	0.059	0.070
	(0.075)	(0.082)
WAZ * Post Year 2 (β8)	0.174	0.179
	(0.089)	(0.097)
WAZ * Post Year 3 (β9)	0.298 **	0.243 *
	(0.111)	(0.121)
Student-Level Covariates		
Female	-0.190 ***	0.065 ***
	(0.005)	(0.005)
Free or reduced-price lunch program	-0.251 ***	-0.227 ***
	(0.008)	(0.008)
Special education	-0.986 ***	-0.845 ***
	(0.007)	(0.007)
Racial minority	-0.160 ***	-0.181 ***
	(0.008)	(0.008)

	English Language Arts	Mathematics
Limited English proficient (LEP)	-0.804 ***	-0.528 ***
	(0.007)	(0.006)
School-Level Covariates		
Percent female	-0.553	-0.605
	(0.440)	(0.482)
Percent students in free or reduced-price lunch program	0.363	0.023
	(0.203)	(0.222)
Percent students in special education program	-0.686 *	-1.340 ***
	(0.302)	(0.333)
Percent LEP	-0.129	-0.083
	(0.179)	(0.197)
Percent racial minority	-0.107	-0.325
	(0.208)	(0.245)
Received a planning grant during current year	-0.017	-0.013
	(0.092)	(0.100)
Constant (β0)	0.151	-0.033
	(0.137)	(0.164)
Random Effects		
Variance: School	0.024	0.036
Variance: Cohort	0.029	0.035
Variance: Residual	0.870	0.826
Sample Size		
N of observation	125879	126411
N of Cohort	389	389
N of School	56	56

Note: Standard errors are in parentheses. All models include school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

Table D2. CITS Regression Coefficients and Standard Errors for Student English Language Arts Achievement, Grade-Level Effects

	English Language Arts					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
WAZ (β1)	-0.148	-0.257 *	-0.397 ***	-0.070	-0.060	-0.035
	(0.114)	(0.101)	(0.095)	(0.164)	(0.093)	(0.085)
Time (β2)	0.079 **	0.060 *	0.010	-0.029	0.016	0.011
	(0.027)	(0.028)	(0.023)	(0.023)	(0.022)	(0.021)
WAZ * Time (β3)	-0.075 *	-0.019	0.035	0.032	0.005	0.005
	(0.037)	(0.039)	(0.031)	(0.029)	(0.030)	(0.028)
Post Year 1 (β4)	-0.132	-0.075	0.008	-0.009	-0.040	-0.124
	(0.100)	(0.105)	(0.083)	(0.084)	(0.080)	(0.078)
Post Year 2 (β5)	-0.354 **	-0.329 **	-0.123	-0.029	-0.086	-0.076
	(0.117)	(0.124)	(0.099)	(0.100)	(0.095)	(0.093)
Post Year 3 (β6)	-0.221	-0.270	-0.032	0.323 *	0.039	0.145
	(0.143)	(0.149)	(0.120)	(0.134)	(0.124)	(0.121)
WAZ * Post Year 1 (β7)	0.191	0.029	-0.020	-0.033	-0.068	-0.095
	(0.137)	(0.144)	(0.114)	(0.111)	(0.114)	(0.111)
WAZ * Post Year 2 (β8)	0.287	0.262	0.008	0.002	-0.013	-0.088
	(0.165)	(0.173)	(0.137)	(0.135)	(0.137)	(0.132)
WAZ * Post Year 3 (β9)	0.505 *	0.429 *	0.182	-0.150	-0.012	-0.086
	(0.202)	(0.209)	(0.167)	(0.177)	(0.176)	(0.171)

	English Language Arts					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
Female	-0.137 ***	-0.220 ***	-0.156 ***	-0.175 ***	-0.258 ***	-0.173 ***
	(0.016)	(0.015)	(0.015)	(0.012)	(0.011)	(0.011)
Free or reduced-price lunch program	-0.285 ***	-0.218 ***	-0.175 ***	-0.277 ***	-0.249 ***	-0.231 ***
	(0.026)	(0.025)	(0.025)	(0.018)	(0.015)	(0.015)
Special education	-0.879 ***	-0.966 ***	-0.937 ***	-0.990 ***	-1.011 ***	-1.022 ***
	(0.022)	(0.019)	(0.019)	(0.015)	(0.014)	(0.014)
Racial minority	-0.193 ***	-0.127 ***	-0.173 ***	-0.198 ***	-0.115 ***	-0.150 ***
	(0.025)	(0.023)	(0.023)	(0.017)	(0.015)	(0.015)
Limited English proficient (LEP)	-0.523 ***	-0.557 ***	-0.737 ***	-0.897 ***	-0.965 ***	-1.094 ***
	(0.018)	(0.017)	(0.017)	(0.016)	(0.015)	(0.016)
Percent female	0.342	0.429	0.206	-0.556	-1.500 *	-2.436 ***
	(0.791)	(0.802)	(0.671)	(0.698)	(0.732)	(0.708)
Percent students in free or reduced-price lunch program	0.977 **	0.702	0.504	-0.978 *	-0.036	-0.123
	(0.355)	(0.366)	(0.302)	(0.404)	(0.371)	(0.356)
Percent students in special education program	-0.539	-0.867	-1.069 *	-2.428 ***	-1.197 *	-1.179 *
	(0.509)	(0.502)	(0.421)	(0.512)	(0.500)	(0.483)
Percent LEP	-0.354	-0.452	0.244	-0.068	-0.187	-0.049
	(0.298)	(0.299)	(0.256)	(0.356)	(0.346)	(0.329)

	English Language Arts					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
Percent racial minority	-0.286	0.003	-0.090	0.101	0.203	0.162
	(0.417)	(0.333)	(0.342)	(0.485)	(0.289)	(0.254)
Received a planning grant during current year	-0.004	-0.134	0.125	-0.073	-0.076	0.028
	(0.151)	(0.160)	(0.125)	(0.146)	(0.148)	(0.145)
Constant (β0)	-0.038	-0.004	0.229	0.461	0.385	0.302
	(0.218)	(0.174)	(0.177)	(0.396)	(0.236)	(0.274)
Random Effects						
Variance: School	0.051	0.022	0.032	0.104	0.018	0.012
Variance: Cohort	0.051	0.062	0.032	0.025	0.026	0.025
Variance: Residual	1.066	0.891	0.885	0.835	0.741	0.768
Sample Size						
N of observation	17102	16710	16080	23439	26065	26483
N of Cohort	269	270	270	192	170	169
N of School	39	39	39	30	26	26

Note. Standard errors are in parentheses. All models include school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

Table D3. CITS Regression Coefficients and Standard Errors for Student Mathematics Achievement, Grade-Level Effects

	Mathematics					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
WAZ (β1)	-0.203	-0.266 *	-0.366 **	-0.125	-0.169	-0.173
	(0.156)	(0.116)	(0.118)	(0.144)	(0.096)	(0.094)
Time (β2)	0.101 **	0.044	0.013	0.023	0.010	0.001
	(0.036)	(0.029)	(0.026)	(0.026)	(0.024)	(0.022)
WAZ * Time (β3)	-0.075	-0.025	-0.027	0.014	0.029	0.045
	(0.049)	(0.041)	(0.035)	(0.033)	(0.032)	(0.029)
Post Year 1 (β4)	-0.164	-0.115	-0.002	-0.157	-0.056	-0.107
	(0.133)	(0.110)	(0.093)	(0.095)	(0.088)	(0.081)
Post Year 2 (β5)	-0.369 *	-0.241	-0.169	-0.154	-0.082	0.030
	(0.157)	(0.130)	(0.111)	(0.114)	(0.104)	(0.096)
Post Year 3 (β6)	-0.146	-0.143	-0.008	0.065	0.058	0.153
	(0.191)	(0.157)	(0.135)	(0.151)	(0.136)	(0.127)
WAZ * Post Year 1 (β7)	0.208	0.110	0.007	0.043	-0.103	-0.021
	(0.183)	(0.151)	(0.128)	(0.125)	(0.126)	(0.116)
WAZ * Post Year 2 (β8)	0.333	0.261	0.259	0.091	-0.100	-0.194
	(0.220)	(0.181)	(0.153)	(0.152)	(0.150)	(0.137)
WAZ * Post Year 3 (β9)	0.548 *	0.432	0.345	-0.051	-0.253	-0.224
	(0.270)	(0.220)	(0.188)	(0.199)	(0.192)	(0.178)
Female	0.072 ***	0.070 ***	0.060 ***	0.047 ***	0.057 ***	0.084 ***
	(0.015)	(0.015)	(0.014)	(0.012)	(0.011)	(0.010)

	Mathematics					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
Free or reduced-price lunch program	-0.273 ***	-0.218 ***	-0.162 ***	-0.287 ***	-0.211 ***	-0.195 ***
	(0.025)	(0.024)	(0.024)	(0.018)	(0.015)	(0.014)
Special education	-0.808 ***	-0.792 ***	-0.825 ***	-0.922 ***	-0.833 ***	-0.818 ***
	(0.021)	(0.019)	(0.018)	(0.015)	(0.014)	(0.013)
Racial minority	-0.244 ***	-0.167 ***	-0.172 ***	-0.235 ***	-0.152 ***	-0.137 ***
	(0.025)	(0.023)	(0.022)	(0.017)	(0.014)	(0.014)
Limited English proficient (LEP)	-0.294 ***	-0.374 ***	-0.488 ***	-0.667 ***	-0.638 ***	-0.643 ***
	(0.018)	(0.017)	(0.017)	(0.015)	(0.014)	(0.015)
Percent female	0.678	-0.297	-0.850	-1.121	-0.702	-1.797 *
	(1.047)	(0.853)	(0.752)	(0.778)	(0.791)	(0.750)
Percent students in free or reduced-price lunch program	0.420	0.173	0.224	-1.426 **	-0.644	-0.379
	(0.471)	(0.387)	(0.337)	(0.452)	(0.398)	(0.377)
Percent students in special education program	-1.775 **	-1.162 *	-1.800 ***	-2.645 ***	-1.493 **	-1.183 *
	(0.675)	(0.540)	(0.475)	(0.554)	(0.527)	(0.513)
Percent LEP	-0.375	-0.581	-0.104	0.315	0.307	0.637
	(0.399)	(0.323)	(0.291)	(0.392)	(0.370)	(0.353)
Percent racial minority	-0.465	-0.136	-0.100	-0.290	-0.323	-0.409
	(0.578)	(0.415)	(0.439)	(0.449)	(0.288)	(0.294)

	Mathematics					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
Received a planning grant during current year	0.043	-0.210	0.143	-0.106	-0.003	-0.049
	(0.203)	(0.168)	(0.141)	(0.165)	(0.162)	(0.151)
Constant (β0)	-0.228	-0.156	0.101	0.136	0.222	0.151
	(0.303)	(0.215)	(0.229)	(0.338)	(0.239)	(0.293)
Random Effects						
Variance: School	0.104	0.045	0.062	0.066	0.016	0.019
Variance: Cohort	0.106	0.068	0.045	0.035	0.033	0.028
Variance: Residual	0.992	0.884	0.815	0.825	0.705	0.680
Sample Size						
N of observation	17198	16793	16200	23531	26174	26515
N of Cohort	269	270	270	192	170	169
N of School	39	39	39	30	26	26

Note. Standard errors are in parentheses. All models include school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

Table D4. CITS Regression Coefficients and Standard Errors for Student Achievement, Subgroup Effects

	English Language Arts			Mathematics		
	Low-Income	Special Education	Limited English Proficient	Low-Income	Special Education	Limited English Proficient
WAZ (β1)	-0.009	-0.201 **	-0.149 *	-0.055	-0.264 ***	-0.204 **
	(0.064)	(0.063)	(0.064)	(0.074)	(0.073)	(0.074)
Time (β2)	0.033 *	0.033 *	0.029 *	0.036 *	0.036 *	0.033 *
	(0.014)	(0.014)	(0.014)	(0.016)	(0.016)	(0.016)
WAZ * Time (β3)	-0.012	-0.014	-0.010	-0.013	-0.014	-0.010
	(0.020)	(0.020)	(0.020)	(0.021)	(0.021)	(0.021)
Post Year 1 (β4)	-0.093	-0.095	-0.091	-0.110	-0.111	-0.108
	(0.054)	(0.054)	(0.054)	(0.059)	(0.058)	(0.059)
Post Year 2 (β5)	-0.227 ***	-0.228 ***	-0.218 ***	-0.201 **	-0.201 **	-0.191 **
	(0.063)	(0.063)	(0.064)	(0.069)	(0.069)	(0.069)
Post Year 3 (β6)	-0.088	-0.088	-0.074	-0.039	-0.038	-0.025
			(0.080)	(0.086)	(0.086)	(0.087)
	(0.079)	(0.079)				
WAZ * Post Year 1 (β7)	0.094	0.073	0.055	0.082	0.083	0.054
	(0.082)	(0.075)	(0.076)	(0.088)	(0.082)	(0.082)
WAZ * Post Year 2 (β8)	0.151	0.188 *	0.159	0.183	0.193 *	0.156
	(0.095)	(0.089)	(0.090)	(0.102)	(0.097)	(0.098)
WAZ * Post Year 3 (β9)	0.351 **	0.306 **	0.213	0.301 *	0.265 *	0.185
	(0.119)	(0.111)	(0.113)	(0.128)	(0.122)	(0.123)

	English Language Arts			Mathematics		
	Low-Income	**Special Education**	**Limited English Proficient**	**Low-Income**	**Special Education**	**Limited English Proficient**
Subgroup * WAZ (β10)	-0.212 ***	0.022	-0.187 ***	-0.224 ***	0.047 **	-0.192 ***
	(0.018)	(0.015)	(0.015)	(0.017)	(0.015)	(0.014)
Subgroup * WAZ * Post Year 1 (β11)	-0.043	-0.079 **	-0.006	-0.017	-0.071 **	0.035
	(0.037)	(0.027)	(0.026)	(0.036)	(0.027)	(0.025)
Subgroup * WAZ * Post Year 2 (β12)	0.019	-0.086 **	0.009	-0.010	-0.087 **	0.034
	(0.036)	(0.027)	(0.026)	(0.035)	(0.027)	(0.025)
Subgroup * WAZ * Post Year 3 (β13)	-0.064	-0.048	0.207 ***	-0.070	-0.131 ***	0.124 ***
	(0.047)	(0.036)	(0.034)	(0.045)	(0.036)	(0.034)
Female	-0.190 ***	-0.190 ***	-0.190 ***	0.065 ***	0.065 ***	0.065 ***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Free or reduced-price lunch program	-0.159 ***	-0.251 ***	-0.250 ***	-0.131 ***	-0.227 ***	-0.227 ***
	(0.010)	(0.008)	(0.008)	(0.010)	(0.008)	(0.008)
Special education	-0.984 ***	-0.984 ***	-0.983 ***	-0.843 ***	-0.853 ***	-0.842 ***
	(0.007)	(0.010)	(0.007)	(0.007)	(0.010)	(0.007)
Racial minority	-0.156 ***	-0.160 ***	-0.156 ***	-0.177 ***	-0.181 ***	-0.177 ***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Limited English Proficient (LEP)	-0.802 ***	-0.804 ***	-0.712 ***	-0.526 ***	-0.529 ***	-0.436 ***
	(0.007)	(0.007)	(0.010)	(0.006)	(0.006)	(0.009)

	English Language Arts			Mathematics		
	Low-Income	**Special Education**	**Limited English Proficient**	**Low-Income**	**Special Education**	**Limited English Proficient**
Percent female	-0.540	-0.553	-0.551	-0.593	-0.602	-0.599
	(0.440)	(0.440)	(0.444)	(0.482)	(0.483)	(0.485)
Percent students in free or reduced-price lunch program	0.291	0.362	0.370	-0.052	0.023	0.022
	(0.203)	(0.203)	(0.205)	(0.222)	(0.222)	(0.224)
Percent students in special education program	-0.690 *	-0.684 *	-0.700 *	-1.335 ***	-1.329 ***	-1.340 ***
	(0.301)	(0.302)	(0.305)	(0.332)	(0.333)	(0.335)
Percent LEP	-0.125	-0.122	-0.134	-0.080	-0.075	-0.091
	(0.178)	(0.179)	(0.181)	(0.197)	(0.197)	(0.198)
Percent racial minority	-0.091	-0.110	-0.094	-0.307	-0.330	-0.306
	(0.207)	(0.208)	(0.215)	(0.242)	(0.245)	(0.247)
Received a planning grant during current year	-0.016	-0.015	-0.022	-0.013	-0.011	-0.019
	(0.092)	(0.092)	(0.093)	(0.101)	(0.100)	(0.101)
Constant (β0)	0.073	0.152	0.133	-0.117	-0.030	-0.054
	(0.136)	(0.137)	(0.142)	(0.161)	(0.163)	(0.165)
Random Effects						
Variance: School	0.023	0.024	0.026	0.035	0.036	0.037
Variance: Cohort	0.029	0.029	0.029	0.035	0.035	0.035

	English Language Arts			Mathematics		
	Low-Income	**Special Education**	**Limited English Proficient**	**Low-Income**	**Special Education**	**Limited English Proficient**
Variance: Residual	0.869	0.870	0.869	0.825	0.826	0.825
Sample Size						
N of observation	125879	125879	125879	126411	126411	126411
N of Cohort	389	389	389	389	389	389
N of School	56	56	56	56	56	56

Note. Standard errors are in parentheses. All models include school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

Table D5. CITS Regression Coefficients and Standard Errors for Attendance, Main Effects

	Attendance
WAZ (β1)	-0.015 ***
	(0.003)
Time (β2)	-0.001
	(0.001)
WAZ * Time (β3)	0.003 **
	(0.001)
Post Year 1 (β4)	0.003
	(0.003)
Post Year 2 (β5)	0.000
	(0.003)
Post Year 3 (β6)	0.004
	(0.004)
WAZ * Post Year 1 (β7)	-0.002
	(0.004)
WAZ * Post Year 2 (β8)	-0.000
	(0.004)
WAZ * Post Year 3 (β9)	-0.005
	(0.005)
Student-Level Covariates	
Female	-0.002 ***
	(0.000)
Free or reduced-price lunch program	-0.014 ***
	(0.001)
Special education	-0.015 ***
	(0.000)
Racial minority	0.002 ***
	(0.000)
Limited English proficient (LEP)	0.007 ***
	(0.000)
School-Level Covariates	
Percent female	-0.025
	(0.022)

	Attendance
Percent students in free or reduced-price lunch program	0.007
	(0.010)
Percent students in special education program	-0.022
	(0.015)
Percent LEP	0.015
	(0.009)
Percent racial minority	-0.013
	(0.012)
Received a planning grant during current year	-0.001
	(0.004)
Constant (β0)	0.941 ***
	(0.008)
Random Effects	
Variance: School	0.000
Variance: Cohort	0.000
Variance: Residual	0.005
Sample Size	
N of observation	174795
N of Cohort	389
N of School	56

Note. Standard errors are in parentheses. The model includes school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

Table D6. CITS Regression Coefficients and Standard Errors for Attendance, Grade-Level Effects

	Attendance					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
WAZ (β1)	-0.011 **	-0.016 ***	-0.010 *	-0.022 **	-0.018 *	-0.016 *
	(0.004)	(0.005)	(0.004)	(0.007)	(0.008)	(0.008)
Time (β2)	-0.000	-0.000	0.000	-0.002	-0.002	-0.003 *
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
WAZ * Time (β3)	0.002	0.003 *	0.001	0.005 **	0.004 *	0.004
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Post Year 1 (β4)	0.002	0.001	-0.003	0.005	0.006	0.012 *
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)
Post Year 2 (β5)	0.000	0.001	-0.008	0.001	0.004	0.008
	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Post Year 3 (β6)	-0.001	-0.000	-0.004	0.018 *	0.017 *	0.023 **
	(0.005)	(0.006)	(0.006)	(0.007)	(0.008)	(0.008)
WAZ * Post Year 1 (β7)	-0.001	-0.001	0.002	-0.004	-0.004	-0.006
	(0.005)	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
WAZ * Post Year 2 (β8)	-0.005	-0.003	0.011	-0.002	-0.004	-0.000
	(0.006)	(0.007)	(0.007)	(0.008)	(0.009)	(0.009)
WAZ * Post Year 3 (β9)	0.002	-0.006	0.007	-0.028 **	-0.024 *	-0.026 *
	(0.008)	(0.009)	(0.008)	(0.010)	(0.011)	(0.012)

	Attendance					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
Female	-0.002 **	-0.002 *	-0.004 ***	-0.006 ***	-0.002 *	0.002 *
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Free or reduced-price lunch program	-0.010 ***	-0.009 ***	-0.009 ***	-0.016 ***	-0.018 ***	-0.018 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Special education	-0.012 ***	-0.013 ***	-0.015 ***	-0.019 ***	-0.019 ***	-0.019 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Racial minority	0.001	0.002	0.004 **	0.003 *	0.004 **	0.004 **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Limited English proficient (LEP)	0.010 ***	0.008 ***	0.005 ***	0.004 **	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Percent female	-0.021	0.046	-0.056	-0.039	-0.022	-0.088
	(0.030)	(0.034)	(0.033)	(0.039)	(0.049)	(0.050)
Percent students in free or reduced-price lunch program	0.003	0.008	0.003	-0.007	-0.010	0.001
	(0.014)	(0.016)	(0.015)	(0.023)	(0.025)	(0.026)
Percent students in special education program	-0.000	-0.007	0.019	-0.042	-0.083 *	-0.073
	(0.019)	(0.022)	(0.021)	(0.030)	(0.036)	(0.038)

	Attendance					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
Percent LEP	-0.002	0.014	0.001	0.020	0.026	0.024
	(0.011)	(0.013)	(0.013)	(0.020)	(0.023)	(0.024)
Percent racial minority	-0.003	-0.016	-0.003	-0.026	-0.020	-0.007
	(0.014)	(0.016)	(0.016)	(0.021)	(0.026)	(0.025)
Received a planning grant during current year	0.003	0.000	0.001	-0.008	-0.005	-0.020 *
	(0.006)	(0.007)	(0.006)	(0.008)	(0.009)	(0.010)
Constant (β0)	0.941 ***	0.941 ***	0.941 ***	0.967 ***	0.962 ***	0.966 ***
	(0.008)	(0.008)	(0.008)	(0.016)	(0.022)	(0.025)
Random Effects						
Variance: School	0.000	0.000	0.000	0.000	0.000	0.000
Variance: Cohort	0.000	0.000	0.000	0.000	0.000	0.000
Variance: Residual	0.003	0.003	0.003	0.005	0.006	0.008
Sample Size						
N of observation	18347	17898	17358	25328	28202	28628
N of Cohort	269	270	270	192	170	169
N of School	39	39	39	30	26	26

Note. Standard errors are in parentheses. All models include school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

Table D7. CITS Regression Coefficients and Standard Errors for Attendance, Subgroup Effects

	Attendance		
	Low-Income	**Special Education**	**Limited English Proficient**
WAZ (β1)	-0.010 **	-0.015 ***	-0.012 **
	(0.004)	(0.003)	(0.004)
Time (β2)	-0.001	-0.001	-0.001 *
	(0.001)	(0.001)	(0.001)
WAZ * Time (β3)	0.003 **	0.003 **	0.003 ***
	(0.001)	(0.001)	(0.001)
Post Year 1 (β4)	0.003	0.003	0.003
	(0.003)	(0.003)	(0.003)
Post Year 2 (β5)	0.000	0.000	0.001
	(0.003)	(0.003)	(0.003)
Post Year 3 (β6)	0.004	0.004	0.004
	(0.004)	(0.004)	(0.004)
WAZ * Post Year 1 (β7)	0.001	-0.002	-0.002
	(0.004)	(0.004)	(0.004)
WAZ * Post Year 2 (β8)	-0.001	-0.000	-0.002
	(0.005)	(0.004)	(0.004)
WAZ * Post Year 3 (β9)	-0.007	-0.005	-0.008
	(0.006)	(0.005)	(0.005)
Subgroup * WAZ (β10)	-0.005 ***	0.000	-0.012 ***
	(0.001)	(0.001)	(0.001)
Subgroup * WAZ * Post Year 1 (β11)	-0.003	0.000	0.001
	(0.002)	(0.002)	(0.002)
Subgroup * WAZ * Post Year 2 (β12)	0.001	0.002	0.002
	(0.002)	(0.002)	(0.002)
Subgroup * WAZ * Post Year 3 (β13)	0.001	-0.004	0.004 *
	(0.003)	(0.002)	(0.002)
Female	-0.002 ***	-0.002 ***	-0.002 ***
	(0.000)	(0.000)	(0.000)

	Attendance		
	Low-Income	**Special Education**	**Limited English Proficient**
Free or reduced-price lunch program	-0.012 ***	-0.014 ***	-0.014 ***
	(0.001)	(0.001)	(0.001)
Special education	-0.015 ***	-0.015 ***	-0.015 ***
	(0.000)	(0.001)	(0.000)
Racial minority	0.002 ***	0.002 ***	0.002 ***
	(0.000)	(0.000)	(0.000)
Limited English Proficient (LEP)	0.007 ***	0.007 ***	0.013 ***
	(0.000)	(0.000)	(0.001)
Percent female	-0.024	-0.024	-0.025
	(0.022)	(0.022)	(0.022)
Percent students in free or reduced-price lunch program	0.006	0.007	0.007
	(0.010)	(0.010)	(0.010)
Percent students in special education program	-0.022	-0.022	-0.023
	(0.015)	(0.015)	(0.015)
Percent LEP	0.016	0.015	0.015
	(0.009)	(0.009)	(0.009)
Percent racial minority	-0.012	-0.013	-0.012
	(0.012)	(0.011)	(0.012)
Received a planning grant at any time	-0.001	-0.001	-0.001
	(0.004)	(0.004)	(0.004)
Received a planning grant during current year	-0.002 ***	-0.002 ***	-0.002 ***
	(0.000)	(0.000)	(0.000)
Constant (β0)	0.939 ***	0.941 ***	0.940 ***
	(0.008)	(0.008)	(0.008)
Random Effects			
Variance: School	0.000	0.000	0.000
Variance: Cohort	0.000	0.000	0.000
Variance: Residual	0.005	0.005	0.005
Sample Size			
N of observation	174795	174795	174795
N of Cohort	389	389	389
N of School	56	56	56

Note. Standard errors are in parentheses. All models include school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

Table D8. CITS Regression Coefficients and Standard Errors for Retention, Main Effects

	Retention
WAZ (β1)	0.002
	(0.010)
Time (β2)	-0.000
	(0.002)
WAZ * Time (β3)	-0.000
	(0.002)
Post Year 1 (β4)	-0.000
	(0.007)
Post Year 2 (β5)	-0.001
	(0.008)
Post Year 3 (β6)	-0.009
	(0.010)
WAZ * Post Year 1 (β7)	-0.011
	(0.009)
WAZ * Post Year 2 (β8)	-0.006
	(0.011)
WAZ * Post Year 3 (β9)	0.022
	(0.014)
Student-Level Covariates	
Female	0.006 ***
	(0.001)
Free or reduced-price lunch program	-0.000
	(0.002)
Special education	-0.004 ***
	(0.001)
Racial minority	-0.006 ***
	(0.002)
Limited English proficient (LEP)	0.004 **
	(0.001)
School-Level Covariates	
Percent female	0.043
	(0.056)

	Retention
Percent students in free or reduced-price lunch program	-0.055 *
	(0.026)
Percent students in special education program	0.000
	(0.039)
Percent LEP	-0.007
	(0.023)
Percent racial minority	-0.067 *
	(0.033)
Received a planning grant during current year	-0.013
	(0.011)
Constant (β0)	0.016
	(0.023)
Random Effects	
Variance: School	0.001
Variance: Cohort	0.000
Variance: Residual	0.046
Sample Size	
N of observation	174795
N of Cohort	389
N of School	56

Note. Standard errors are in parentheses. The models includes school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

Table D9. CITS Regression Coefficients and Standard Errors for Retention, Grade-Level Effects

	Retention					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
WAZ (β1)	-0.014	0.164 ***	0.010	0.020 *	0.020	-0.052
	(0.010)	(0.026)	(0.014)	(0.010)	(0.011)	(0.037)
Time (β2)	-0.004	-0.002	0.006	0.000	-0.000	-0.000
	(0.003)	(0.006)	(0.004)	(0.003)	(0.003)	(0.006)
WAZ * Time (β3)	0.011 **	-0.019 *	-0.005	-0.008 *	-0.006	-0.002
	(0.004)	(0.009)	(0.005)	(0.003)	(0.004)	(0.008)
Post Year 1 (β4)	0.007	0.024	-0.000	0.005	-0.007	-0.000
	(0.011)	(0.024)	(0.014)	(0.010)	(0.011)	(0.023)
Post Year 2 (β5)	0.004	0.017	-0.018	0.003	-0.005	0.018
	(0.013)	(0.029)	(0.016)	(0.012)	(0.013)	(0.027)
Post Year 3 (β6)	0.006	0.030	-0.054 **	-0.011	-0.019	0.022
	(0.016)	(0.035)	(0.020)	(0.016)	(0.017)	(0.036)
WAZ * Post Year 1 (β7)	-0.038 *	0.017	-0.011	0.004	0.007	-0.016
	(0.015)	(0.033)	(0.019)	(0.013)	(0.016)	(0.033)
WAZ * Post Year 2 (β8)	-0.025	-0.004	0.009	0.017	0.014	-0.004
	(0.018)	(0.040)	(0.022)	(0.016)	(0.019)	(0.039)
WAZ * Post Year 3 (β9)	-0.036	0.018	0.054 *	0.044 *	0.054 *	0.044
	(0.022)	(0.049)	(0.027)	(0.021)	(0.024)	(0.051)

	Retention					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
Female	0.004	0.085 ***	0.006 *	0.010 ***	0.014 ***	-0.005
	(0.002)	(0.004)	(0.003)	(0.002)	(0.002)	(0.003)
Free or reduced-price lunch program	0.004	0.021 **	-0.008	0.009 **	0.010 **	-0.015 ***
	(0.004)	(0.007)	(0.004)	(0.003)	(0.003)	(0.004)
Special education	0.001	0.050 ***	0.001	0.003	0.001	-0.008 *
	(0.003)	(0.005)	(0.003)	(0.003)	(0.003)	(0.004)
Racial minority	0.004	0.037 ***	-0.007	-0.002	0.004	-0.036 ***
	(0.004)	(0.006)	(0.004)	(0.003)	(0.003)	(0.004)
Limited English Proficient (LEP)	0.005	-0.030 ***	0.007 *	0.008 **	-0.001	-0.006
	(0.003)	(0.005)	(0.003)	(0.003)	(0.003)	(0.005)
Percent female	0.127	0.026	0.043	0.020	-0.026	-0.005
	(0.086)	(0.190)	(0.108)	(0.080)	(0.098)	(0.218)
Percent students in free or reduced-price lunch program	-0.014	0.062	-0.077	0.043	-0.027	-0.109
	(0.039)	(0.086)	(0.049)	(0.048)	(0.050)	(0.111)
Percent students in special education program	0.009	-0.099	-0.060	0.013	0.001	0.198
	(0.054)	(0.121)	(0.067)	(0.059)	(0.069)	(0.158)
Percent LEP	-0.005	-0.083	0.023	-0.053	-0.032	0.098
	(0.031)	(0.072)	(0.040)	(0.038)	(0.045)	(0.106)
Percent racial minority	0.001	-0.034	0.046	-0.005	0.018	-0.483 ***
	(0.032)	(0.094)	(0.047)	(0.027)	(0.032)	(0.119)

	Retention					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
Received a planning grant during current year	-0.040 *	0.040	-0.009	0.011	-0.010	-0.002
	(0.016)	(0.037)	(0.020)	(0.017)	(0.020)	(0.042)
Constant (β0)	0.014	-0.078	0.073 **	-0.022	-0.019	0.386 ***
	(0.017)	(0.049)	(0.024)	(0.024)	(0.032)	(0.109)
Random Effects						
Variance: School	0.000	0.002	0.000	0.000	0.000	0.005
Variance: Cohort	0.000	0.003	0.001	0.000	0.000	0.002
Variance: Residual	0.027	0.074	0.030	0.033	0.035	0.074
Sample Size						
N of observation	18347	17898	17358	25328	28202	28628
N of Cohort	269	270	270	192	170	169
N of School	39	39	39	30	26	26

Note. Standard errors are in parentheses. All models include school-pair fixed effects. All models include school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

Table D10. CITS Regression Coefficients and Standard Errors for Retention, Subgroup Effects

	Retention		
	Low-Income	**Special Education**	**LEP**
WAZ (β1)	0.002	0.005	0.001
	(0.010)	(0.010)	(0.010)
Time (β2)	-0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)
WAZ * Time (β3)	-0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)
Post Year 1 (β4)	-0.000	-0.000	-0.000
	(0.007)	(0.007)	(0.007)
Post Year 2 (β5)	-0.001	-0.001	-0.001
	(0.008)	(0.008)	(0.008)
Post Year 3 (β6)	-0.009	-0.010	-0.010
	(0.010)	(0.010)	(0.010)
WAZ * Post Year 1 (β7)	-0.008	-0.012	-0.008
	(0.012)	(0.009)	(0.009)
WAZ * Post Year 2 (β8)	0.003	-0.007	-0.005
	(0.013)	(0.011)	(0.011)
WAZ * Post Year 3 (β9)	0.022	0.020	0.024
	(0.016)	(0.014)	(0.014)
Subgroup * WAZ (β10)	0.000	-0.010 ***	0.006 *
	(0.004)	(0.003)	(0.003)
Subgroup * WAZ * Post Year 1 (β11)	-0.003	0.007	-0.009
	(0.007)	(0.005)	(0.005)
Subgroup * WAZ * Post Year 2 (β12)	-0.009	0.011 *	-0.000
	(0.007)	(0.005)	(0.005)
Subgroup * WAZ * Post Year 3 (β13)	-0.000	0.011	-0.006
	(0.009)	(0.007)	(0.006)

	Retention		
	Low-Income	**Special Education**	**LEP**
Female	0.006 ***	0.006 ***	0.006 ***
	(0.001)	(0.001)	(0.001)
Free or reduced-price lunch program	0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)
Special education	-0.004 ***	-0.001	-0.005 ***
	(0.001)	(0.002)	(0.001)
Racial minority	-0.006 ***	-0.006 ***	-0.006 ***
	(0.002)	(0.002)	(0.002)
Limited English proficient (LEP)	0.004 **	0.004 **	0.001
	(0.001)	(0.001)	(0.002)
Percent female	0.043	0.042	0.042
	(0.056)	(0.056)	(0.056)
Percent students in free or reduced-price lunch program	-0.056 *	-0.056 *	-0.056 *
	(0.026)	(0.026)	(0.026)
Percent students in special education program	0.000	-0.000	0.001
	(0.039)	(0.039)	(0.039)
Percent LEP	-0.007	-0.008	-0.007
	(0.023)	(0.023)	(0.023)
Percent racial minority	-0.067 *	-0.066 *	-0.067 *
	(0.033)	(0.033)	(0.032)
Received a planning grant during current year	-0.013	-0.013	-0.013
	(0.011)	(0.011)	(0.011)
Constant (β0)	0.016	0.015	0.017
	(0.023)	(0.023)	(0.023)
Random Effects			
Variance: School	0.001	0.001	0.001
Variance: Cohort	0.000	0.000	0.000
Variance: Residual	0.046	0.046	0.046

	Retention		
	Low-Income	**Special Education**	**LEP**
Sample Size			
N of observation	174795	174795	174795
N of Cohort	389	389	389
N of School	56	56	56

Note. Standard errors are in parentheses. All models include school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

Table D11. CITS Regression Coefficients and Standard Errors for Suspension, Main Effects

	Suspension
WAZ (β1)	0.123 ***
	(0.017)
Time (β2)	0.001
	(0.003)
WAZ * Time (β3)	-0.008
	(0.005)
Post Year 1 (β4)	-0.000
	(0.013)
Post Year 2 (β5)	0.011
	(0.015)
Post Year 3 (β6)	0.006
	(0.019)
WAZ * Post Year 1 (β7)	0.007
	(0.018)
WAZ * Post Year 2 (β8)	-0.030
	(0.021)
WAZ * Post Year 3 (β9)	-0.012
	(0.027)
Student-Level Covariates	
Female	0.078 ***
	(0.002)
Free or reduced-price lunch program	0.044 ***
	(0.002)
Special education	0.066 ***
	(0.002)
Racial minority	0.043 ***
	(0.002)
Limited English proficient (LEP)	-0.023 ***
	(0.002)

	Suspension
School-Level Covariates	
Percent female	0.249 *
	(0.107)
Percent students in free or reduced-price lunch program	0.064
	(0.049)
Percent students in special education program	-0.075
	(0.074)
Percent LEP	-0.059
	(0.044)
Percent racial minority	-0.012
	(0.059)
Received a planning grant during current year	0.010
	(0.022)
Constant (β0)	-0.101 *
	(0.040)
Random Effects	
Variance: School	0.002
Variance: Cohort	0.002
Variance: Residual	0.105
Sample Size	
N of observation	174795
N of Cohort	389
N of School	56

Note. Standard errors are in parentheses. The model includes school-pair fixed effects.
** p < 0.05. *** p < 0.001.*

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Table D12. CITS Regression Coefficients and Standard Errors for Suspension, Grade-Level Effects

	Suspension					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
WAZ (β1)	0.098 ***	0.164 ***	0.152 ***	0.140 **	0.171 **	0.191 ***
	(0.024)	(0.026)	(0.034)	(0.049)	(0.054)	(0.054)
Time (β2)	0.001	-0.002	-0.002	-0.005	0.004	0.011
	(0.005)	(0.006)	(0.007)	(0.008)	(0.008)	(0.009)
WAZ * Time (β3)	-0.006	-0.019 *	-0.006	-0.001	-0.017	-0.031 **
	(0.008)	(0.009)	(0.009)	(0.010)	(0.011)	(0.011)
Post Year 1 (β4)	-0.006	0.024	0.032	-0.011	0.011	-0.061
	(0.020)	(0.024)	(0.025)	(0.030)	(0.029)	(0.031)
Post Year 2 (β5)	0.014	0.017	0.024	0.021	-0.004	-0.038
	(0.024)	(0.029)	(0.030)	(0.035)	(0.034)	(0.037)
Post Year 3 (β6)	-0.001	0.030	0.031	0.018	-0.023	-0.078
	(0.029)	(0.035)	(0.036)	(0.047)	(0.045)	(0.049)
WAZ * Post Year 1 (β7)	0.013	0.017	-0.015	0.017	-0.025	0.079
	(0.028)	(0.033)	(0.034)	(0.039)	(0.041)	(0.045)
WAZ * Post Year 2 (β8)	-0.017	-0.004	-0.038	-0.057	0.000	0.007
	(0.034)	(0.040)	(0.041)	(0.047)	(0.049)	(0.053)
WAZ * Post Year 3 (β9)	-0.012	0.018	-0.033	-0.048	0.011	0.097
	(0.042)	(0.049)	(0.051)	(0.062)	(0.065)	(0.070)

	Suspension					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
Female	0.076 ***	0.085 ***	0.087 ***	0.098 ***	0.092 ***	0.074 ***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Free or reduced-price lunch program	0.014 *	0.021 **	0.029 ***	0.063 ***	0.056 ***	0.071 ***
	(0.006)	(0.007)	(0.008)	(0.007)	(0.007)	(0.006)
Special education	0.044 ***	0.050 ***	0.055 ***	0.073 ***	0.077 ***	0.084 ***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Racial minority	0.034 ***	0.037 ***	0.035 ***	0.064 ***	0.056 ***	0.048 ***
	(0.006)	(0.006)	(0.007)	(0.007)	(0.006)	(0.006)
Limited English proficient (LEP)	-0.035 ***	-0.030 ***	-0.028 ***	-0.010	-0.010	-0.006
	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)	(0.007)
Percent female	0.038	0.026	-0.058	0.492 *	0.459	0.882 **
	(0.164)	(0.190)	(0.205)	(0.246)	(0.275)	(0.301)
Percent students in free or reduced-price lunch program	0.057	0.062	0.127	0.182	0.374 **	0.281
	(0.074)	(0.086)	(0.092)	(0.142)	(0.141)	(0.153)
Percent students in special education program	-0.102	-0.099	-0.209	-0.022	0.129	0.097
	(0.106)	(0.121)	(0.130)	(0.182)	(0.202)	(0.219)
Percent LEP	-0.103	-0.083	-0.006	0.083	-0.235	-0.198
	(0.062)	(0.072)	(0.079)	(0.125)	(0.134)	(0.146)
Percent racial minority	-0.064	-0.034	-0.047	-0.094	0.047	0.094
	(0.090)	(0.094)	(0.126)	(0.152)	(0.167)	(0.172)

	Suspension					
	Grade 3	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
Received a planning grant during current year	-0.003	0.040	0.008	0.035	-0.014	0.074
	(0.031)	(0.037)	(0.037)	(0.051)	(0.053)	(0.057)
Constant (β0)	-0.074	-0.078	-0.071	-0.171	-0.197	-0.104
	(0.047)	(0.049)	(0.067)	(0.119)	(0.144)	(0.159)
Random Effects						
Variance: School	0.003	0.002	0.006	0.008	0.012	0.011
Variance: Cohort	0.002	0.003	0.003	0.003	0.003	0.004
Variance: Residual	0.061	0.074	0.094	0.140	0.150	0.148
Sample Size						
N of observation	18347	17898	17358	25328	28202	28628
N of Cohort	269	270	270	192	170	169
N of School	39	39	39	30	26	26

Note. Standard errors are in parentheses. All models include school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

Table D13. CITS Regression Coefficients and Standard Errors for Suspension, Subgroup Effects

	Suspension		
	Low-Income	**Special Education**	**LEP**
WAZ (β1)	0.059 ***	0.114 ***	0.122 ***
	(0.018)	(0.017)	(0.017)
Time (β2)	0.001	0.001	0.001
	(0.003)	(0.003)	(0.003)
WAZ * Time (β3)	-0.009	-0.008	-0.008
	(0.005)	(0.005)	(0.005)
Post Year 1 (β4)	-0.001	-0.000	-0.001
	(0.013)	(0.013)	(0.013)
Post Year 2 (β5)	0.010	0.011	0.011
	(0.015)	(0.015)	(0.015)
Post Year 3 (β6)	0.005	0.006	0.005
	(0.019)	(0.019)	(0.019)
WAZ * Post Year 1 (β7)	0.015	0.003	0.002
	(0.021)	(0.018)	(0.018)
WAZ * Post Year 2 (β8)	-0.004	-0.031	-0.032
	(0.023)	(0.021)	(0.021)
WAZ * Post Year 3 (β9)	0.012	-0.019	-0.013
	(0.030)	(0.027)	(0.027)
Subgroup * WAZ (β10)	0.073 ***	0.044 ***	0.003
	(0.005)	(0.004)	(0.004)
Subgroup * WAZ * Post Year 1 (β11)	-0.007	0.020 *	0.015 *
	(0.011)	(0.008)	(0.007)
Subgroup * WAZ * Post Year 2 (β12)	-0.026 *	0.005	0.008
	(0.011)	(0.008)	(0.007)
Subgroup * WAZ * Post Year 3 (β13)	-0.024	0.034 **	0.004
	(0.014)	(0.011)	(0.010)

	Suspension		
	Low-Income	**Special Education**	**LEP**
Female	0.078 ***	0.078 ***	0.078 ***
	(0.002)	(0.002)	(0.002)
Free or reduced-price lunch program	0.016 ***	0.044 ***	0.044 ***
	(0.003)	(0.002)	(0.002)
Special education	0.066 ***	0.040 ***	0.066 ***
	(0.002)	(0.003)	(0.002)
Racial minority	0.042 ***	0.043 ***	0.043 ***
	(0.002)	(0.002)	(0.002)
Limited English proficient (LEP)	-0.023 ***	-0.023 ***	-0.026 ***
	(0.002)	(0.002)	(0.003)
Percent female	0.244 *	0.249 *	0.251 *
	(0.107)	(0.106)	(0.107)
Percent students in free or reduced price lunch program	0.085	0.066	0.065
	(0.049)	(0.049)	(0.049)
Percent students in special education program	-0.072	-0.075	-0.076
	(0.074)	(0.074)	(0.074)
Percent LEP	-0.060	-0.059	-0.058
	(0.044)	(0.043)	(0.044)
Percent racial minority	-0.015	-0.014	-0.014
	(0.058)	(0.058)	(0.059)
Received a planning grant during current year	0.010	0.010	0.010
	(0.022)	(0.022)	(0.022)
Constant (β0)	-0.077	-0.095 *	-0.100 *
	(0.040)	(0.040)	(0.040)
Random Effects			
Variance: School	0.002	0.002	0.002
Variance: Cohort	0.002	0.002	0.002
Variance: Residual	0.105	0.105	0.105

	Suspension		
	Low-Income	**Special Education**	**LEP**
Sample Size			
N of observation	174795	174795	174795
N of Cohort	389	389	389
N of School	56	56	56

Note. Standard errors are in parentheses. All models include school-pair fixed effects.
** p < 0.05. ** p < 0.01. *** p < 0.001.*

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