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Charter School Performance in the State of Washington

2019

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Acknowledgements

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CREDO also acknowledges the support of the Bill & Melinda Gates Foundation for this research.

Disclaimers

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This research used data collected and maintained by the Washington State Office of Superintendent of Public Instruction (OSPI). Results, information and opinions solely represent the analysis, information and opinions of the author(s) and are not endorsed by, or reflect the views or positions of, grantors, OSPI or any employee thereof.

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List of Acronyms & Definitions

CREDO	Center for Research on Education Outcomes
OSPI	Office of Superintendent of Public Instruction
WWC	What Works Clearinghouse
EOC	End-of-Course Exam
ELA	English Language Arts
ELLs	English Language Learners
TPS	Traditional Public School
VCR	Virtual Control Record
NCES	National Center for Education Statistics
ALE	Alternative Learning Environment
HSC	Homeschooling Center
SpEd	Special Education
Feeder	A feeder school is a traditional public school whose students have transferred to a given charter school. We use students attending feeder schools as potential matches for students attending charter schools.
Growth	The year-to-year change in academic performance relative to one's peers. Growth can be positive or negative.

Charter School Performance in the State of Washington 2019

Introduction

Charter schools are among the education options in 44 states and the District of Columbia. From the first charter school opened in Minnesota in 1992 to the present day, these schools have operated semi-autonomously with public funding and discretion to design education programs that meet the needs of students, families and communities. In turn, charter schools are expected to deliver quality education or face consequences with the organization that has been tasked to authorize them and monitor their performance.

Controversy has been a constant companion to charter schools throughout their history. Charter school advocates hail the benefits of the sector such as increasing parental choice and introducing new school models. Opponents across the nation decry the reallocation of funds away from district schools as an existential threat to districts and raise questions about the commitment of charter schools to serve all students. Between these disagreements, little heed is paid to the actual performance of charter schools. Evidence about how well charter schools serve their students – and for which students the benefit is most pronounced – is largely absent from the debate.

The need for evidence about charter school performance is especially strong in Washington State, where charter schools have been fought over for more than a decade. Washington's initial charter school law, Chapter 28A.710 RCW, was originally enacted by public referendum with Initiative Measure No. 1240 and approved by the voters in the November 2012 general election. The first enabling law was passed in 2014, but met quickly with legal challenge. The Washington State Supreme Court, in League of Women Voters V. State of Washington, issued a decision on September 4, 2015, that invalidated the law in its entirety. The 2016 Legislature passed E2SSB 6194, which re-enacted the prior charter school law with amendments. The amended bill became law as Chapter 241, Laws of 2016, without the governor's signature. The new law was again challenged; in October 2018 the Washington State Supreme Court upheld the law as valid. With the legitimacy of charter schools no longer in question, their impact on their students' education takes on a more central focus.

This report studies charter students' performance in Washington State over three years of schooling, beginning with the 2014-2015 school year and ending with the 2016-2017 school year. Washington State's Office of Superintendent of Public Instruction (OSPI) authorized CREDO to use student level information to develop a

stringent analysis of the academic success of charter school students compared with traditional education experience. The support of the OSPI staff was critical to CREDO's understanding of the character and quality of the data we received. Additionally, the participants of the Washington State Charter Schools Association Conference held in April, 2018 provided invaluable information on the institutional arrangement of the educational landscape in the State. Though grateful for the help and support, CREDO independently developed the findings and conclusions presented here.

This report is the first in-depth examination of the impact of charter schools in Washington State on student performance. Others might judge this study as premature, given the small number of schools and the short history of school operations. Indeed, the small footprint of charter schooling in Washington plays a role in the results reported here. Regardless of the short and turbulent history, policy makers, funders and the schools themselves have been committed to transparency from the outset.

This report has two main benefits. First, it provides a rigorous and independent view of the recent performance of the state's charter schools. Second, while we take into account the unique features of Washington State, the overall study design is consistent with CREDO's reports on charter school performance in other locations, making Washington State's results amenable to benchmarking over time and against charter schools in other locations.

There are three areas of analyses contained within this report. The first type of analysis concerns the overall impact of charter schooling. The second type of analysis concerns the impact of charter schooling at the school level. Both legislation and public policy operate to influence school level decisions so it is important to understand the range of performance for these schools. These findings look at the performance of students by school and present average school results. Finally, the third set of analyses looks at the impact of charter school attendance on difference student subgroups.

The findings of this study show that on average, charter students in Washington State experience annual growth in reading and math that is on par with the educational gains of their matched peers who enroll in the traditional public schools (TPS) the charter school students would otherwise have attended. When we looked at school-level comparisons, we found important variation in performance. Two-fifths of charter schools had students showed academic progress that was significantly better than their local district options in math. In reading, three-fifths of the charter schools outpaced their local options. The analysis also reveals little differences in performance for students when examined by race/ethnicity groups or for students in designated student support programs. Specifically, English language learners enrolled in charter schools experience significantly higher learning growth that those enrolled in traditional public school settings.

Study Approach

This study of charter schools in Washington State focuses on the academic progress (growth) of enrolled and tested students in Washington State's charter schools. At the same time, whatever else charter schools may

provide their students, their contribution to their students' readiness for secondary education, high school graduation, and post-secondary life remains of paramount importance.

The current analysis examines whether students in charter schools in Washington State do better academically than their traditional public school (TPS) counterparts. This general question is then reframed to consider whether the observed charter school performance varies when the charter school population is dis-aggregated along a number of dimensions, such as race/ethnicity and years enrolled in a charter school. In order to answer these questions, it is necessary to isolate the effect of charter schools and traditional public schools from other potentially confounding influences. For this reason, the analysis includes controls for student characteristics: prior academic achievement, race/ethnicity, special education status, poverty (measured by participation in free or reduced price lunch program), English proficiency, grade level, and retention in grade.

Click here for an infographic about the Virtual Control Record method.

A fair analysis of the impact of charter schools requires a comparison group which matches the demographic and academic profile of charter students to the fullest extent possible. As in previous CREDO studies, this study employed the virtual control record (VCR) method of analysis developed by CREDO.[1] [2] The approach is a quasi-experimental study design with matched student records that are followed over time. The VCR approach creates a "virtual twin" for each charter student who is represented in the data. For each charter student, a "virtual twin" is constructed using student records that match the student's demographic and academic characteristics. Potential matches are obtained from traditional public schools that serve as "feeders". A traditional public school may serve as a feeder for a given charter school if its students transfer to that charter school. In theory, this "virtual twin" would differ from the charter student only on a single factor: attending a charter school. Thus, the VCR methodology produces a score for the test year of interest that corresponds to the expected result a charter student would have realized had he or she attended one of the traditional public schools. The VCR matching protocol has been assessed against other possible study designs and judged to be reliable and valuable by peer reviewers (Fortson, Verbitsky-Savitz, Kopa, & Gleason, 2012, Ackerman, & Egalite, 2017). Additional details of the matching methodology are provided in the Technical Appendix. In this study of Washington State, it was possible to create virtual matches for 89 percent of tested charter school observations in reading and 88 percent in math.

[1] Cremata, Edward, D. Davis, K. Dickey, K. Lawyer, Y. Negassi, M. Raymond and J.Woodworth. National Charter School Study (2013). http://credo.stanford.edu.
[2] CREDO, Urban Charter School Study (2015). http://urbancharters.stanford.edu/download/Urban%20Charter%20School%20Study%20Report%20on%2041%20Regions.pdf

For the purposes of this report, the impact of charter schools on student academic performance is estimated in terms of academic growth from one school year to the next. This increment of academic progress is referred to by policy makers and researchers as a "growth score" or "learning gains" or "gain scores."

With three years of student records in this study, it is possible to create two periods of academic growth. Each growth period needs a "starting score", (i.e., the achievement test score from the spring of one year) and a "subsequent score" (i.e., the achievement test score from the following spring) to create the growth measure. To simplify the presentation of results, each growth period is referred to by the year in which the second spring test score is obtained. For example, the growth period denoted "2014-2015" covers academic growth that occurred between the end of the 2013-2014 school year and the end of the 2014-2015 school year. Similarly, the growth period denoted "2015-2016" corresponds to the year of growth between the 2014-2015 and the 2015-2016 school years.

The VCR matching protocol described in this section has been used in previous CREDO publications. In this study, we make one noteworthy adjustment to the approach. In our previous reports, if a charter student could be tracked for multiple growth periods in the year span of the study, we matched the student for all the growth periods. In this study, we develop new matches for every growth period we observe. This change was made to conform to the new baseline equivalence criteria specified in Procedures Handbook Version 4.0 of What Works Clearinghouse (WWC).[3]

Washington State Charter School Landscape

Background of Charter Schools in Washington State

Washington became the 42nd state to allow charter schools when Washington State voters approved an initiative in 2012 that permitted a maximum of 40 charter schools in Washington State to open and operate. In 2015, the state Supreme Court ruled charter schools were not eligible for public education funding under the state constitution, which narrowly defines the types of education entities that qualify for those funds. In light of that decision, the Legislature in 2016 crafted an alternative flow of funds: charter schools would receive support via state lottery revenue instead of from the state's general fund. A King County judge ruled that, with the funding change, the state's charter-school law was constitutional. Despite the funding switch, Charter opponents felt that charter schools were still not held accountable for their public funding, because they did not operate under a locally elected school board. After hearing arguments from both sides, the state Supreme Court, in a 6-3 decision, found the Charter Schools Act constitutional in October 2018.

After the Washington Supreme Court ruled in 2015 that charter schools were unconstitutional, seven out of eight charters already serving students reorganized their administrative status in order to remain open. Most Washington charters were reclassified as Alternative Learning Environments (ALE) under state law. ALEs allow for

[3] What Works Clearinghouse (2017). Procedures Handbook Version 4.0. https://ies.ed.gov/ncee/wwc/Docs/referenceresources/wwc_procedures_handbook_v4.pdf.

off-campus instruction, with the schools reporting student progress to the district. A school district receives state money for students enrolled in an ALE program. A second reclassification, employed solely by those charter schools operated by Summit Public Schools, entailed the legal transformation of the Summit charter schools into homeschooling centers (HSC). These arrangements during the 2015-16 school year allowed charter schools to remain open and operational as legislators endeavored to redress the law to align with the state education law. The goal of these arrangements was to minimize any disruptions in the students' learning environments by allowing them to attend the same school continuously, even as the school's organizational status and funding mechanism changed.

Enrollment Trajectories of Charter Students

Charter schools in Washington State were deemed unconstitutional in the early days of the 2015-16 school year. As our evaluation of charter schools is based on students' scores in standardized assessments at the end of the school year, a question arises regarding the extent to which we can attribute the learning gains observed during the 2015-16 school year to charter school attendance in that year.

Our investigation revealed that a majority of students who began the school year in a charter school in 2015-16 remained in their school through one of alternative administrative classifications (i.e. HSC or ALE). It is important to note that from the students' perspective, transferring to an ALE/HSC was not a typical transfer out, but rather allowed them to stay in same school in which they had originally enrolled while the school's administrative structure changed around them.

More than 80 percent of the students that attended a charter/ALE in 2015-16 remained there for a length of at least 91 days, increasing our confidence that the learning gains of those students in that year can be attributed to their charter school attendance. To make sure we can attribute the learning growth of students to their charter school experience with confidence, we limit our analytic investigation of the academic impact of charter school attendance to this share of students. To consider the possibility of different learning gains for students with less or more than 90 days of charter attendance, we conducted a special analysis that included students with less than 90 days of charter attendance and compared the results. The results were equivalent for both groups of students in both subjects.

Washington State Charter School Demographics

The Washington State charter school sector has grown since its inception in 2014. According to the National Center for Education Statistics (NCES), there was only one charter school in Washington State in 2014-15; 9 in 2015-16, and 8 in 2016-17. Table 1 shows the charter schools that were in operation during the 2016-17 school year throughout Washington State. The intended grade span at capacity is reported in parentheses.

Table 1: Charter Schools in Washington by Location

Seattle	Tacoma	Spokane
Rainier (5-8)	Destiny (6-8)	Pride (6-12)
Excel (7-12)	SOAR (K-8)	Spokane International Academy (K-8)
Summit Sierra (9-12)	Summit Olympus (9-12)	

Charter schools are able to choose their location and thus the demographics of the charter sector may not mirror that of the TPS sector as a whole. Furthermore, charter schools offer different academic programs and alternate school models which may disproportionately attract particular groups of students. In addition, parents and students choose to attend charter schools for a variety of reasons, such as location, school safety, small school size, academic focus, or special interest programs. The cumulative result of all these forces is that the student populations at charter schools and their TPS feeders may differ.

Table 2 compares three student populations in the 2015-2016 school year: the full set of Washington traditional public schools, the subset of TPS from which charter schools draw students from, and the charter schools themselves. Table 3 shows the student profiles for the 8 charter schools in which students took reading and/or math assessments. Note that NCES reports nine charter schools open in 2015-16. The difference stems from missing demographic information for one charter school, First Place Charter School, that became a private school in the middle of the 2015-16 school year.

Table 2: Statewide Comparison of Student Characteristics in TPS, Feeders, and Charters

	Statewide TPS	Feeders	Charters
Number of schools	2,427	204	8
Average enrollment per school	447	553	140[4]
Total number of students enrolled	1,085,903	112,806	1,119
Students in Poverty	44%	58%	63%
English Language Leaners	11%	15%	7%
Special Education Students	13%	14%	12%
White Students	56%	46%	36%
Black Students	4%	11%	22%
Hispanic Students	22%	21%	21%
Asian/Pacific Islander Students	8%	12%	8%
Native American Students	1%	1%	2%
Multi-Racial Students	7%	10%	12%

Table 2 indicates that less than 10 percent of TPS in Washington State are feeder schools for the state's charters. The demographics for the feeders are different from the TPS population in Washington State as a whole in a number of ways. Feeder schools have higher percentage of students in poverty, a higher percentage of English language learners, a slightly higher percentage of special education students, and a lower percentage of white students. Based on these characteristics, the student makeup of charter schools is unlikely to look like that of the State. However, the charter school population in Washington State differs even from the feeder population on several demographic variables. Charter schools have a smaller share of White students than other Washington public schools. Conversely, the proportion of Black students, multi-racial students, and students in poverty enrolled in charter schools is noticeably larger than in traditional public schools. Asian/Pacific Islander students and English language learners are less prevalent in charter schools than in other public schools. Charter schools in Washington have a similar share of Hispanic students as the feeder schools and the traditional public schools.

Because charter schools in Washington State cluster in three municipalities (Seattle, Tacoma, Spokane), we also provide student demographic comparisons in each of those locales. Table 3 compares three student populations in Seattle in the 2015-2016 school year: the subset of TPS from which Seattle charter schools draw, and the charter schools themselves. Table 3 shows the student profiles for the three charter schools in Seattle in which students took reading and/or math assessments.

[4] It is worth clarifying that this number corresponds to average enrollment in the 2015-16 school year according to NCES, and not enrollment at capacity.

Table 3: Comparison of Student Characteristics in Feeders and Charters in Seattle

	Feeders	Charters
Number of schools	90	3
Average enrollment per school	659	138
Total number of students enrolled	53,516	413
Students in Poverty	56%	52%
English Language Leaners	23%	16%
Special Education Students	12%	11%
White Students	35%	23%
Black Students	14%	33%
Hispanic Students	25%	19%
Asian/Pacific Islander Students	17%	16%
Native American Students	1%	1%
Multi-Racial Students	8%	9%

Table 4 compares three student populations in Spokane in the 2015-2016 school year: the subset of TPS from which Spokane charter schools draw, and the charter schools themselves. Table 4 shows the student profiles for the three charter schools in Spokane in which students took reading and/or math assessments.

Table 4: Comparison of Student Characteristics in Feeders and Charters in Spokane

	Feeders	Charters
Number of schools	87	2
Average enrollment per school	494	155
Total number of students enrolled	42,829	309
Students in Poverty	54%	57%
English Language Leaners	6%	1%
Special Education Students	15%	8%
White Students	72%	74%
Black Students	3%	4%
Hispanic Students	10%	9%
Asian/Pacific Islander Students	3%	2%
Native American Students	1%	2%
Multi-Racial Students	11%	8%

Table 5 compares three student populations in Tacoma in the 2015-2016 school year: the subset of TPS from which Tacoma charter schools draw, and the charter schools themselves. Table 5 shows the student profiles for the two charter schools in Tacoma in which students took reading and/or math assessments.

Table 5: Comparison of Student Characteristics in TPS, Feeders, and Charters in Tacoma

	Feeders	Charters
Number of schools	64	3
Average enrollment per school	561	132
Total number of students enrolled	34,375	397
Students in Poverty	65%	79%
English Language Leaners	13%	4%
Special Education Students	14%	17%
White Students	39%	20%
Black Students	14%	25%
Hispanic Students	24%	31%
Asian/Pacific Islander Students	12%	4%
Native American Students	1%	2%
Multi-Racial Students	11%	18%

Charter schools in Seattle have a lower percentage of students in poverty than charter schools in Tacoma or Spokane. Charter schools in Tacoma have the higher percentage of students in poverty compared to the other two charter school locations (Seattle and Spokane). Charter schools in Tacoma serve a higher percentage of students in poverty than their feeder schools. Charter schools in Tacoma have a higher percentage of students with special education needs than charter students in Seattle or Spokane. Charter schools in Spokane (and their feeders) have a higher percentage of White students compared to the other two charter school locations (Seattle and Tacoma). Charter schools in Seattle (and their feeders) have a higher percentage of Black students compared to the other two charter school locations (Spokane and Tacoma). Charter schools in Tacoma (and their feeders) have a higher percentage of Hispanic students compared to the other two charter school locations: Seattle and Spokane. Charter schools in Seattle (and their feeders) have a higher percentage of English language learners (ELL) compared to Spokane and Tacoma. The difference in percentage of ELLs served by charters versus feeders in Seattle (-7 percent) is smaller than that difference in Tacoma and Spokane.

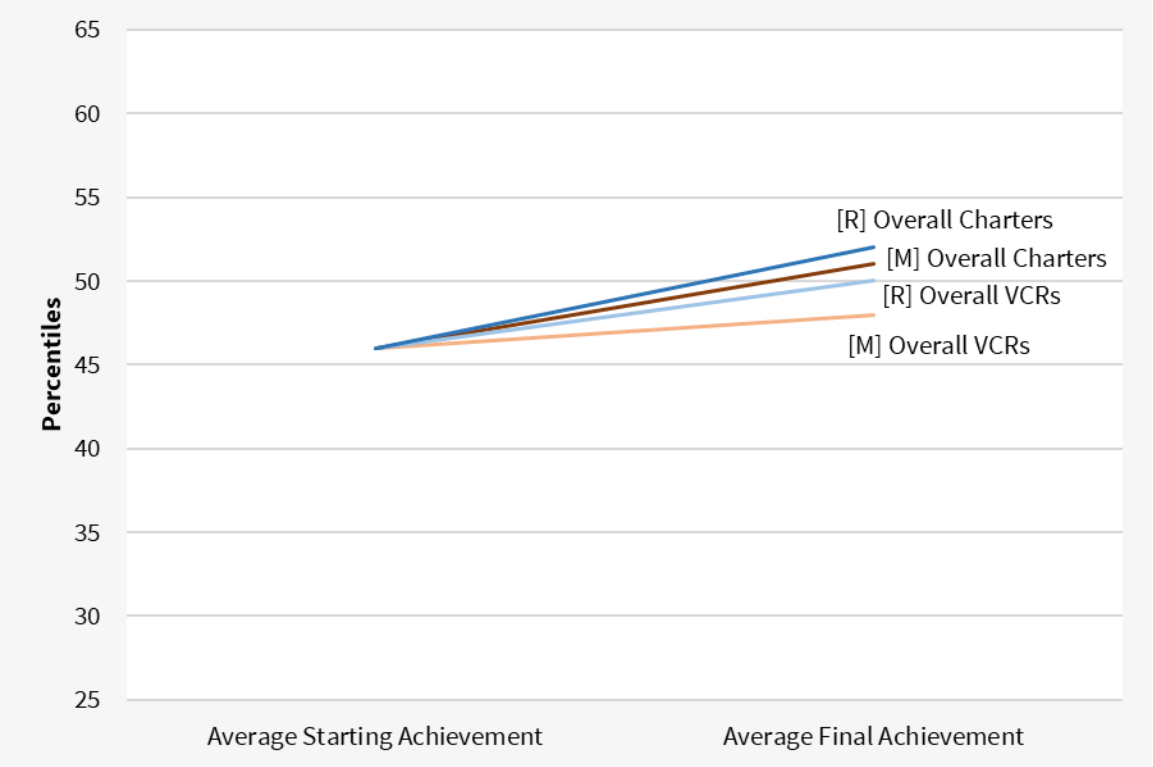
Policymakers and stakeholders continue to examine the degree to which students with special needs enroll in charter schools. The proportion of students in charter schools who are receiving Special Education services is a particular topic of debate. Table 3 shows roughly 13 and 14 percent of students in TPS overall and feeders, respectively, have Special Education needs. At the same time, 12 percent of the Washington State charter school population has a designated Special Education status. This difference in percentages is smaller in Washington State than in other states5, suggesting that charter schools in Washington State may be closer to serving the special needs population in their State than charter schools in other States.

TPS and Charter Average Achievement

Since the analytic approach of this study compares the performance of charter school students to that of their TPS peers, shifts in the overall charter school performance gains could potentially arise if the TPS students' performance changes, even if the absolute performance of the charter students stays constant. The performance of TPS VCRs is always converted to the 0.00 baseline, masking any possible trends. To check this possibility, we graphed the achievement (in percentiles based on student achievement across the state) of charter students and their TPS VCRs using the distribution of achievement in percentiles, to calculate reading and math trends across the years of the study (from 2014-15 to 2016-17).

[5] CREDO's National Charter School Study II (2013), using data from 2010-11, found that 11 and 12 percent of students in feeders and TPS in 27 States, respectively, had Special Education needs. At the same time, 8 percent of the charter school population in those 27 States had a designated Special Education status.

Figure 1: Overall Achievement of Charter and TPS Schools in Math and Reading



Since the matching methodology requires the first-observed achievement scores of TPS and charter school students to align, the starting achievement is identical. Figure 1 shows that achievement improved for both groups, a gratifying finding. With improved achievement in the TPS VCRs, the possibility that charters' relative performance was a function of weakening TPS is eliminated. In this analysis, charter schools had to post gains over and above the increment of TPS improvement to reach levels that were superior.

Figure 2: Achievement of Charter and TPS Schools in Seattle in Math and Reading

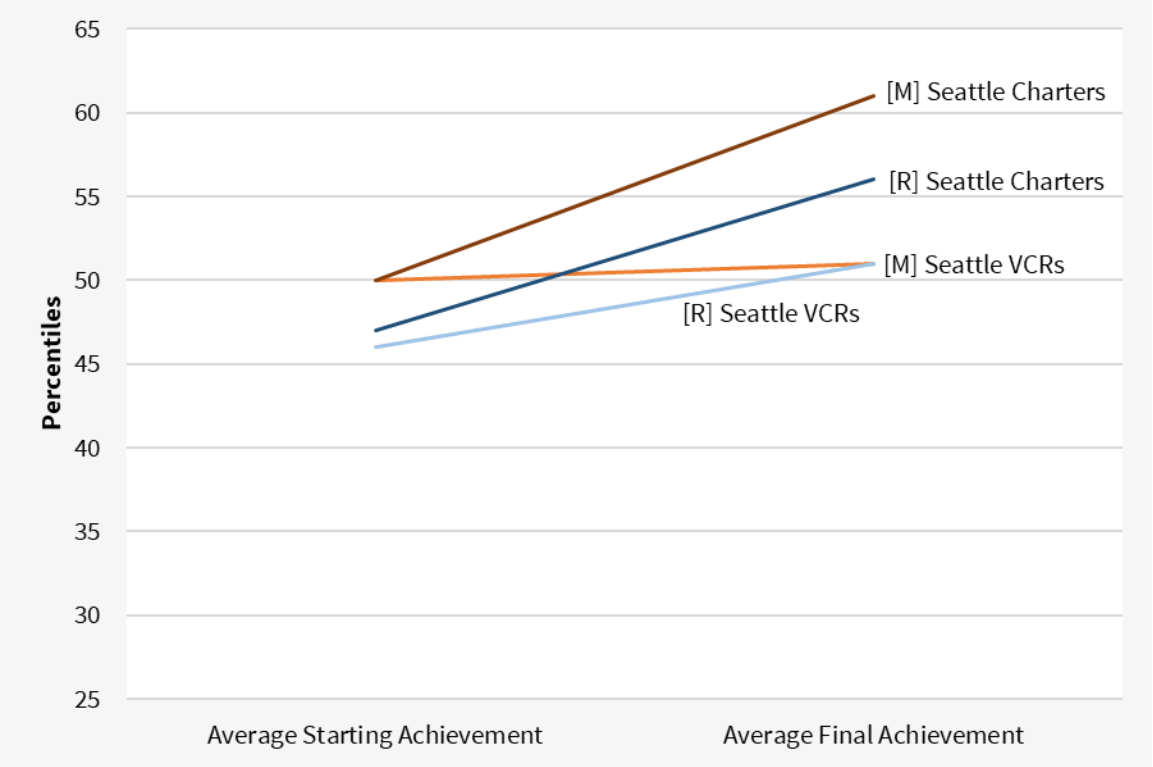


Figure 2 tells a similar story when students in Seattle are examined separately. Charter students in Seattle and their VCRs exhibit similar achievement in the first period. The starting achievement for reading is similar to the statewide figure but is higher in math. By the second period, charter achievement has outpaced that of TPS VCRs, though the VCRs exhibit increased reading achievement in the final period.

Figure 3: Achievement of Charter and TPS Schools in Tacoma in Math and Reading

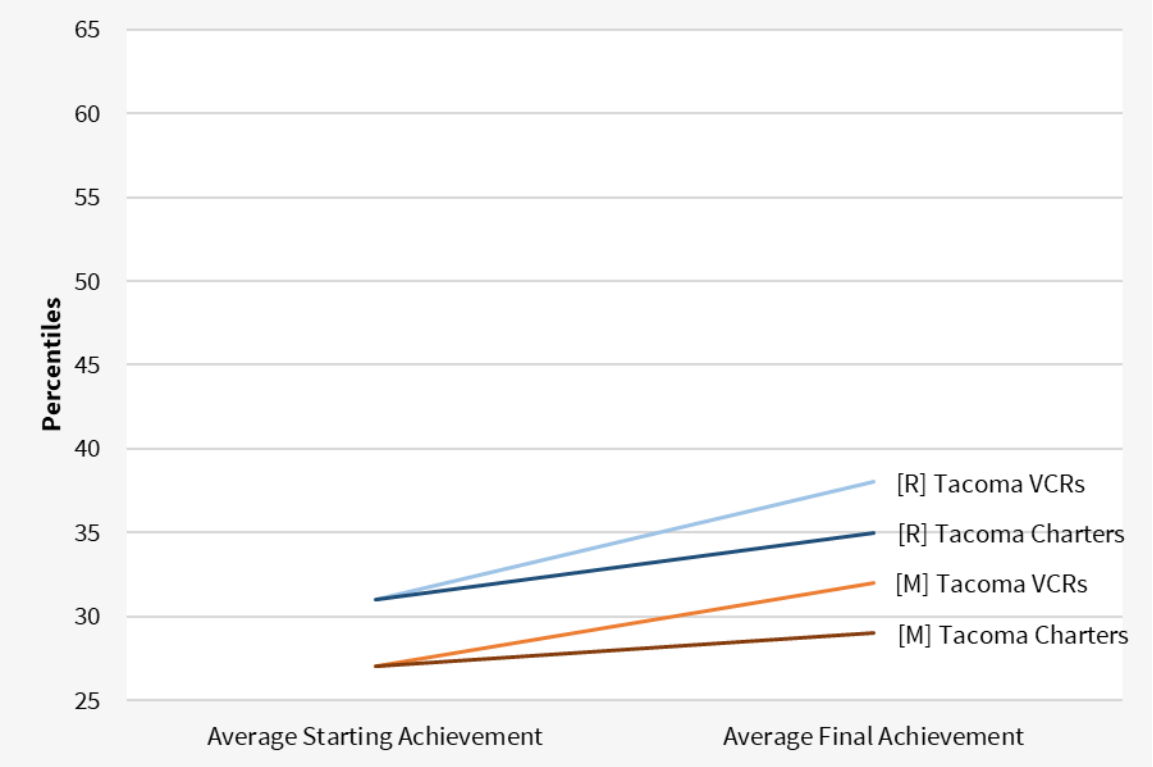


Figure 3 tells the story for Tacoma, which differs from Seattle, Spokane, and the statewide findings. The starting achievement of students in Tacoma is lower than the statewide average starting achievement. Over time, all groups improve, a finding that masks differences by school, which will be addressed later in the report. By the second period, TPS achievement in Tacoma has outpaced that of charter students, though the charter students exhibit increased achievement in both reading and math in the second period.

Figure 4: Achievement of Charter and TPS Schools in Spokane in Math and Reading

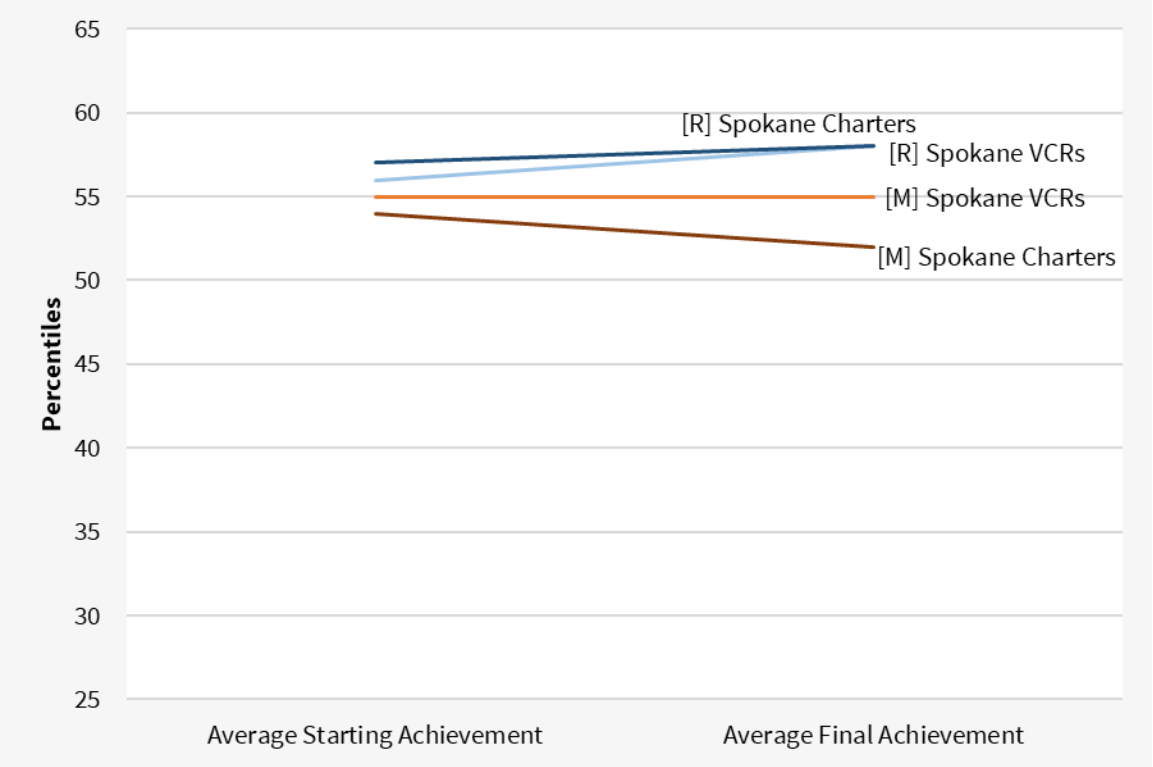


Figure 4 tells the story for Spokane only. Compared to the state average, overall starting achievement levels are higher in Spokane in both subjects. By the second period, charter achievement in math has fallen below TPS achievement in math, though the TPS students exhibit a rather constant math achievement in the second period. At the same time, charter achievement in reading is the second period is similar to that of TPS students, although both have slightly improved when compared to the first period.

When comparing the starting and final achievement of charter schools and TPS in different locations, we observe that charter schools in Seattle experience the highest one-year growth (without taking into account any influences such as differential student characteristics), compared to TPS in Seattle. The size of the spread of the "fork" in Seattle suggests that charter schools in Seattle are more likely to contribute to an overall positive charter school learning growth than charter schools in the other two locations.

Analytic Findings of Charter School Impacts

Overall Charter School Impact on Student Progress

The primary question of this study is whether charter schools differ overall from traditional public schools in how much their students learn. To answer this question, we examine academic gains of students from the Spring of one school year to the Spring of the next year on state standardized assessments. This increment of learning is referred to as academic growth or gains. To estimate the impact of charter schooling in general, we average all the one-year gains for all students attending Washington charter schools over two growth periods and compare the resulting average gain with that of the VCR students.

In our analysis, we estimate the impacts of attending charter schools in terms of learning growth, associated with charter school attendance so that the results can be assessed for statistical differences. Unfortunately, the units of measurement for tests of significance do not have much meaning for the average reader. Transforming the results into more accessible units is challenging and can be done only imprecisely. Table 6 below presents a translation of standard deviation units to Days of Learning. While we can be confident of the transformation of values close to the zero mean, extreme values in excess of .25 standard deviations may be less accurate.[6]

Graphics Roadmap No. 1

The graphics in this report have a common format.

Each graph presents the average performance of charter students relative to their **pertinent comparison student**. The reference group differs depending on the specific comparison. Where a graph compares student subgroup performance, the pertinent comparison student is the same for both subgroups. Each graph is labeled with the pertinent comparison group for clarity.

We show two vertical axes on the graphs to help the reader get a sense of learning gains. Both axes display learning gains of charter students relative to their comparison students. The ***left axis*** measures learning gains in units of standard deviations, while the ***right axis*** displays the same learning gains in days of learning. Statistical tests use measures expressed in units of the left axis.

The **height** of the bars in each graph reflects the magnitude of difference between traditional public school and charter school performance over the period studied.

Stars are used to reflect the level of statistical significance of the difference between the group represented in the bar and its comparison group of similar students in TPS. The absence of stars means that the schooling effect is not statistically different from zero.

[6] The Days of Learning computation uses 4th and 8th grade test scores from the National Assessment of Educational Progress and individual state test results. The values in Table 3 are updated from past reports using 2017 NAEP scores, which show slower absolute annual academic progress than earlier administrations.

Table 6: Transformation of Average Learning Gains to Days of Learning

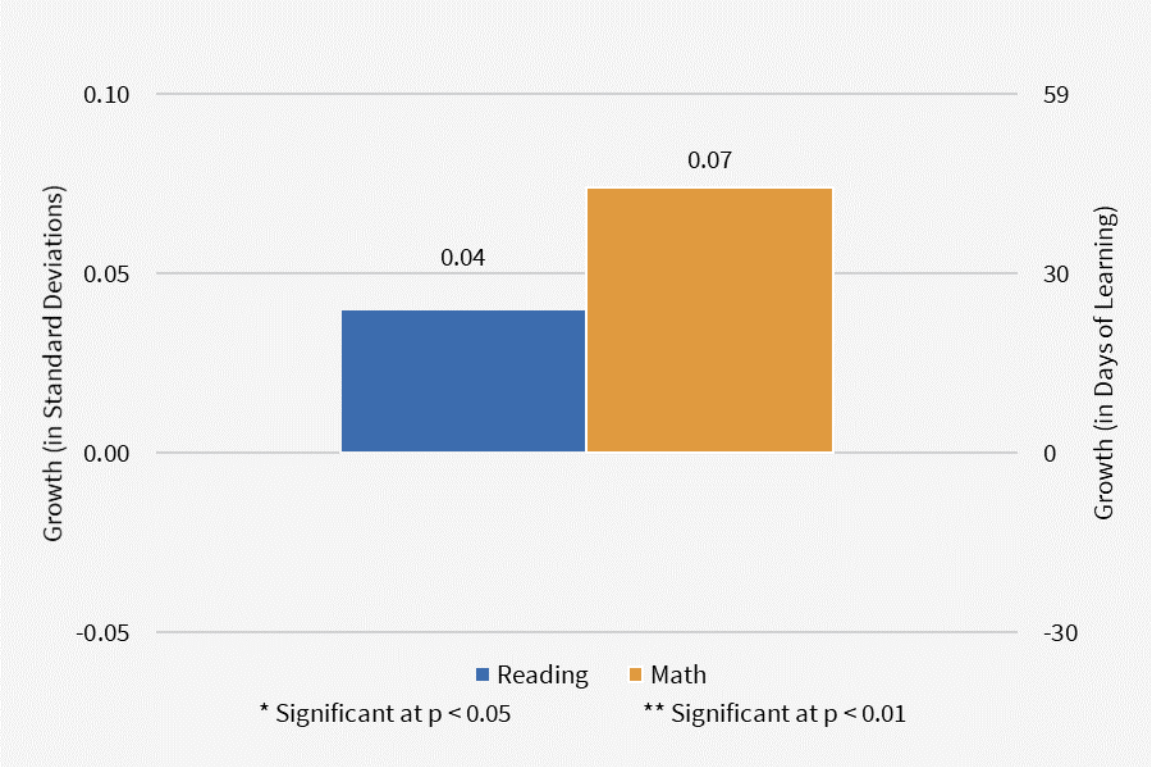
Standard Deviations	Days of Learning
0.05	30
0.10	59
0.15	89
0.20	118
0.25	148
0.30	177
0.35	207

In order to understand "days of learning," picture a student whose academic achievement is at the 50th percentile in one grade and also at the 50th percentile in the following grade. The progress from one year to the next represents the average learning gain for a student between the two grades. The amount of progress is fixed as 180 days of effective learning based on the typical 180-day school year.

We then translate the measures of academic growth from our analysis based on that 180-day average year of learning, so that students with positive results are considered to have received additional days of learning while those with negative results have days subtracted from 180 days.

The bars in Figure 5 represent the typical difference in the annual growth of charter school students compared to their VCR peers from the feeder schools. On average, students in Washington charter schools experience similar growth to students (VCR) in traditional public schooling settings in Washington State in both reading and math.

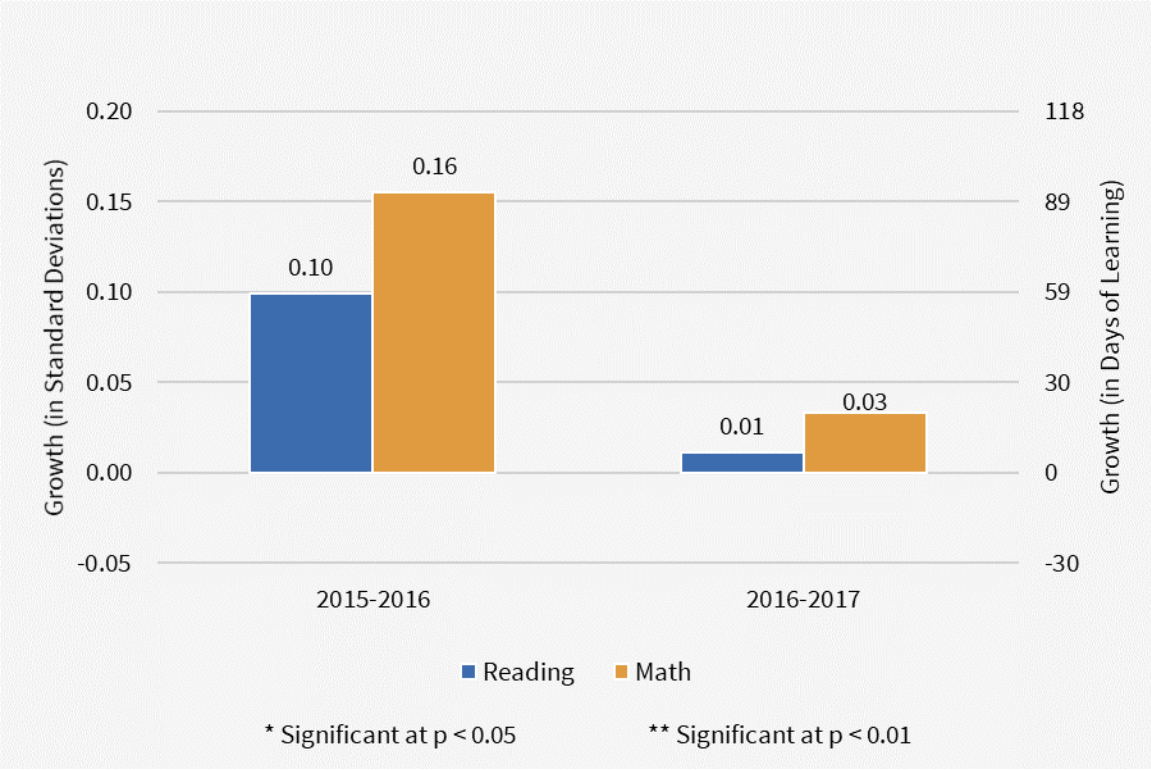
Figure 5: Average Learning Gains in WA Charter Schools Compared to Gains for VCR Students



Charter School Impact by Growth Period

To determine whether performance was consistent over recent time, the average charter school impacts were disaggregated into the two growth periods of this study. Results are shown in Figure 6.

Figure 6: Average Learning Gains in WA Charter Schools Compared to Gains for VCR Students by Growth Period, 2015-2017



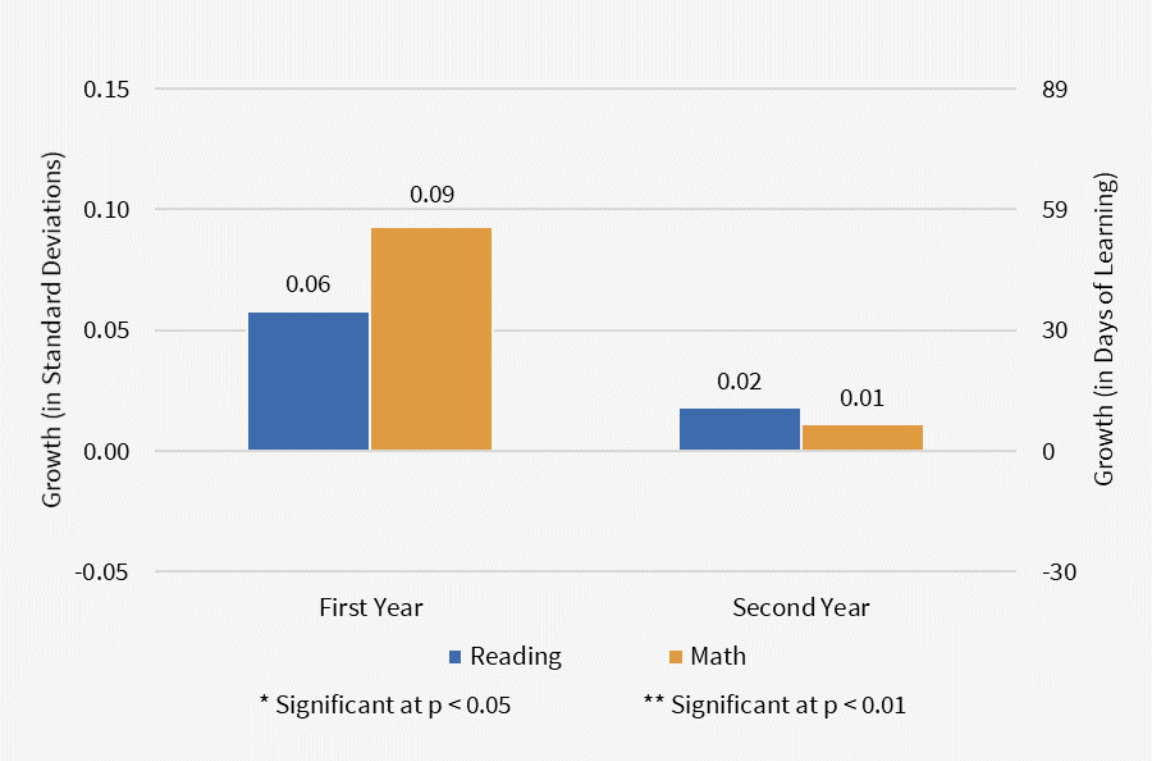
The gains of Washington charter school students in both the 2015-2016 or the 2016-2017 growth period do not differ statistically from the performance of their TPS peers. During the 2015-2016 growth period, charter students demonstrate growth of approximately 59 more days of learning in reading and 94 additional days in math compared to their TPS peers, although these gains are not statistically different from those of their TPS counterparts. In the 2016-2017 growth period, charter students continue to experience positive but not statistically significant learning gains compared to their TPS counterparts. The learning gains associated with charter school attendance in the 2016-2017 growth period are smaller than those in the 2015-2016 growth period.

Charter School Impact by Students' Years of Enrollment

Students' academic growth may differ depending on how many years they enroll in a charter school. To test the relationship between progress and the length of enrollment in a charter school, we group students by the number of consecutive years they were enrolled in charter schools. In this scenario, the analysis is limited to the charter students who enroll for the first time in a charter school between the 2015-16 and 2016-17 school years and their corresponding TPS VCRs. Although this approach reduces the number of students included, it ensures an accurate

measure of the effect of continued enrollment over time. The results for this subset of the full study sample should not be directly compared with other findings in this report. The results are shown below in Figure 7.

Figure 7: Average Learning Gains in WA Charter Schools Compared to Gains for VCR Students by Years in Charter

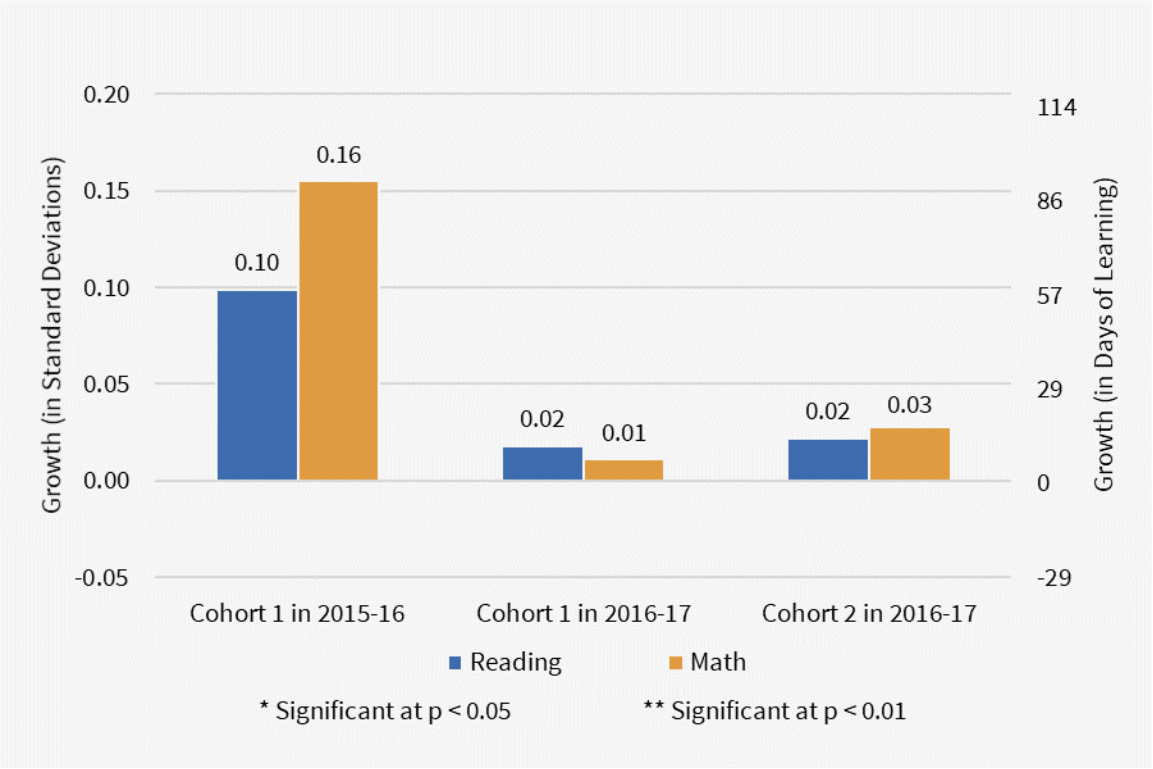


As Figure 7 shows, Washington State charter school students experience learning growth in the first and the second year of charter attendance that is not statistically different from that of students (VCR) enrolled in traditional public school settings. Drawing from CREDO's National Charter School Study II (2013), we find that the learning gains associated with the second year of charter school attendance in Washington State are not too far below the average learning gains associated with the second year of charter school attendance. At the same time, in the earlier national study, the second year of charter school attendance is associated with higher learning growth when compared to the first year of charter school attendance. This pattern is reversed in Washington State, although this trajectory is short, given the limited year span of this study.

Charter School Impact by Students' Years of Enrollment and Growth Period

To gain a better understanding of the differential learning gains we observe associated with charter school attendance for different numbers of years, we look more closely at growth gains by both cohort and the number of consecutive years of enrollment in a charter school. Figure 8 reports our estimated learning gains for each cohort and years of charter enrollment. Cohort 1 is the cohort that first enrolled in a Washington charter school in 2015-16. Given the short time frame of our study, only Cohort 1 has two years of charter enrollment. The second year effect of Cohort 1 is denoted as "Cohort 1 in 2016-17." We find that learning gains associated with charter attendance of Cohort 2 in 2016-17 are smaller in size than those of Cohort 1 in 2015-16 but similar to those of Cohort 1 in 2016-17, suggesting that we currently do not have evidence of any positive impact of the number of years spent in charter school on academic growth. The estimated charter learning gains are not statistically different from those of students in traditional public school settings for any cohort by years in charter configuration.

Figure 8: Average Learning Gains in WA Charter Schools Compared to Gains for VCR by Years in Charter and Growth Period



School-Level Analysis

While the numbers reported in the previous sections represent the typical learning gains at the student level across the state, the results do not let us discern if some charter schools are better than others. Since school-level results are of interest to policy makers, parents and the general public, we roll up the performance to the school level for each charter school in the state with sufficient number of tested students to make a reliable inference on performance.

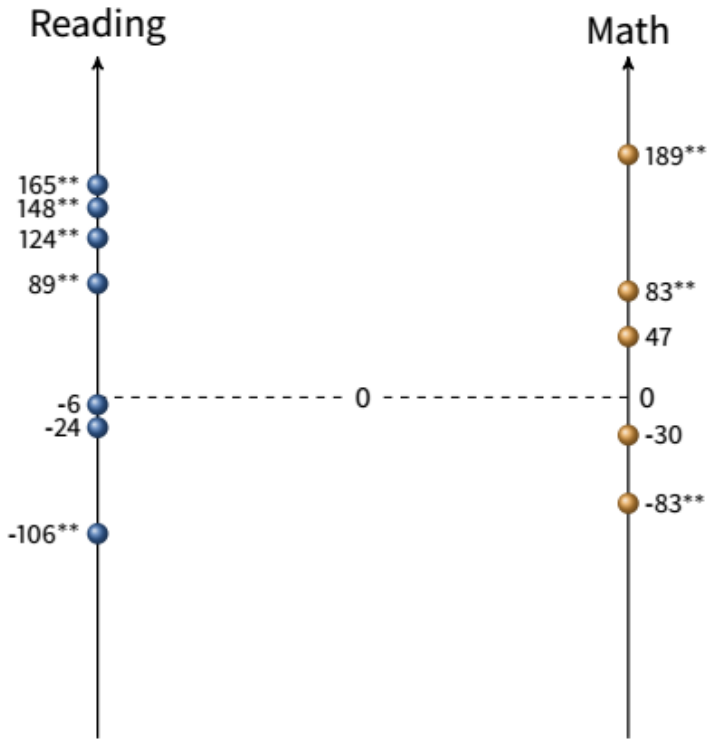
It is important to understand the counterfactual used in this section. As shown in Table 3 earlier in the report, the student populations within the typical charter school and their feeder schools differ, making whole-school to whole-school comparisons unhelpful. Instead, we use the VCRs developed from the array of feeder schools to roll up to a simulated TPS school and to serve as the control condition for testing the performance of charter schools. This simulated TPS reflects a precise estimate of the alternative local option.

In order to determine the distribution of charter school performance, the per-year learning impact of each charter school over all the growth periods included in this study (growth periods 2015-2016 and 2016-2017)[7] was estimated. Using the learning impact of each charter school, we infer its quality relative to the quality of traditional public schools. The estimated learning impact for each charter school can be statistically zero, negative or positive. When the estimated learning impact of a charter school is statistically zero, we infer that the charter school under consideration is no different than the traditional public school students in that charter school would have potentially attended if they had not attended a charter school. In a similar manner, when the estimated learning impact of a charter school is statistically positive (i.e. statistically different from zero with a positive sign), we infer that that charter school is associated with higher learning growth relative to the traditional public schools its students would have alternatively attended. Lastly, when the estimated learning impact of a charter school is statistically negative (i.e. statistically different from zero with a negative sign), we can infer that the charter school is associated with lower learning growth relative to the traditional schooling alternatives of its students.

As noted in Table 3, charter schools are smaller on average than their corresponding feeder schools and some charter schools elect to open with a single grade and add an additional grade each year thereafter. Researchers must be careful when making school-level comparisons to ensure the number of tested students in a school is sufficient to provide a fair representation of the school's impact. Our criteria for including any school in this analysis were at least 60 matched charter student records over the two growth periods under examination or at least 30 matched charter records for new schools with only one growth period. Our total sample consists of 7 schools with reading test scores and 5 schools with math scores in the 2016 and 2017 growth periods.

[7] Growth period 2016 represents growth between spring of 2015 and spring of 2016. Growth period 2017 represents growth between spring of 2016 and spring of 2017.

Figure 9: Range of School-Level Learning Gains



Notes: Each dot represents a charter school.
Learning gains are shown in Days of Learning.
** Significant at the 0.01 level

The varying levels of learning gains by school are depicted in Figure 9. Each dot represents the learning gains in days of learning associated with attendance in a specific charter school. Each charter school in Washington State is represented by a dot on a vertical axis for reading and as another dot on the vertical axis for math. The statistical significance associated with the learning gains of each school is represented by stars. We find that the learning gains in reading of a charter school in Washington State range from 106 fewer days of learning to 165 additional days of learning, when compared to traditional public schooling alternatives. In math, the learning gains of a charter school in Washington State are found to range from 83 fewer days of learning to 189 additional days of learning, when compared to traditional schooling alternatives. Table 7 summarizes the performance comparison of charter schools in Washington State relative to traditional public schooling options in reading and math, respectively.

Table 7: Performance of Charter Schools Compared to Traditional Schooling Alternatives in Washington State

	Significantly Worse		Not Significantly Different		Significantly Better	
Subject	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Reading	1	14%	2	29%	4	57%
Math	1	20%	2	40%	2	40%

In reading, four of seven or 57 percent of charter schools in Washington perform significantly better that the traditional schooling environments of the compared students. In math, two of five or 40 percent of charter schools post growth that is significantly higher than that of their traditional public schooling counterparts. Each of these results shows growth ahead of the national average. To benchmark these figures at the national level using the 2013 National Charter Study II, 25 percent of charter schools outperform the traditional schooling alternatives in reading and 29 percent do so in math.[8]

One of seven or 14 percent of Washington charter schools have reading performance that is significantly weaker than the traditional public schooling option as compared to the national figure of 19 percent. In math, one out of five or 20 percent of charter schools post growth results weaker than the traditional public schooling option compared to the 2013 national figure of 31 percent.

In reading, two of seven or 29 percent of charters in Washington State do not differ significantly from the traditional public school option. In math, two out five or 40 percent of charter schools have growth results that is indistinguishable from the traditional public school option. It is important to emphasize that "no difference in growth" does not reflect the actual level of growth, as it is possible for charter schools to have high levels of growth that are similar to that of the traditional schooling alternative, and the reverse is also true.

[8] CREDO (2013). National Charter School Study 2013. http://credo.stanford.edu.

Academic Performance of Student Subgroups

Charter School Impact for Students by Race/Ethnicity

Graphics Roadmap No. 2

The graphics in this section have a common format. For each student subgroup we present two graphs:

The **first graph** displays the growth of TPS students and charter students in the particular **subgroup of interest** compared to the growth of the "average White TPS student." In this comparison, the White TPS student is male and does not qualify for subsidized school meals, special education services, or English Language Learner support and is not repeating his current grade. The graph sets the performance of the average White TPS student to **zero** and shows how learning of students in the subgroup compares.

The **stars** indicate the level of statistical significance. Thus, if there are no stars, we interpret the difference in learning gains as similar to the white TPS comparison student. If there is no difference in the learning gains, the bar would be missing entirely. If the learning of the student group in question is not as great as the comparison baseline, the bar is negative. If the learning gains exceed the comparison, the bar is positive.

Graphs labeled "a" display the results of a second comparison testing whether the learning gains in the charter school student subgroup differ significantly from their VCRs in the same student subgroup. In these graphs, the performance of the TPS peers in the subgroup are set to **zero** and the learning gains of the charter school students in the subgroup are measured against that **baseline**. As with the first graph, stars denote statistical significance.

Academic achievement is a static measure of what students know at a point in time. Achievement is influenced by many factors, among them student background, natural endowments, differences in maturation rates or quality of schooling. It is well known that gaps in achievement between students of different groups have persisted for many years. Difference in school quality has been a major public policy concern. Since the federal government's passage of the No Child Left Behind Act in 2001 and the subsequent Every Student Succeeds Act of 2015, stakeholders have had consistent information to examine the gaps in achievement levels for students of different racial and ethnic backgrounds. This study is particularly germane to charter schools, as part of their rationale has been to build education options to lessen those achievement gaps.

In this aim, many charter school providers may locate their schools to serve communities where educationally disadvantaged students have not been well served. Such decisions prompt questions of how well students are served compared to other settings, and in terms of the progress on reducing achievement gaps.

Table 3 showed that Washington charter schools serve a diverse student population. In order for the academic achievement levels of different racial groups to converge, given the prevalence of gaps today, students in disadvantaged groups need to exhibit higher year-to-year learning gains than those of the non-disadvantaged students. This section of our study specifically investigates the impact of charter school attendance on learning gains of students of diverse racial backgrounds compared to their same-group peers in

traditional settings. We also assess the extent to which the learning gains of students from diverse backgrounds are sufficient to start mitigating the corresponding achievement gap.

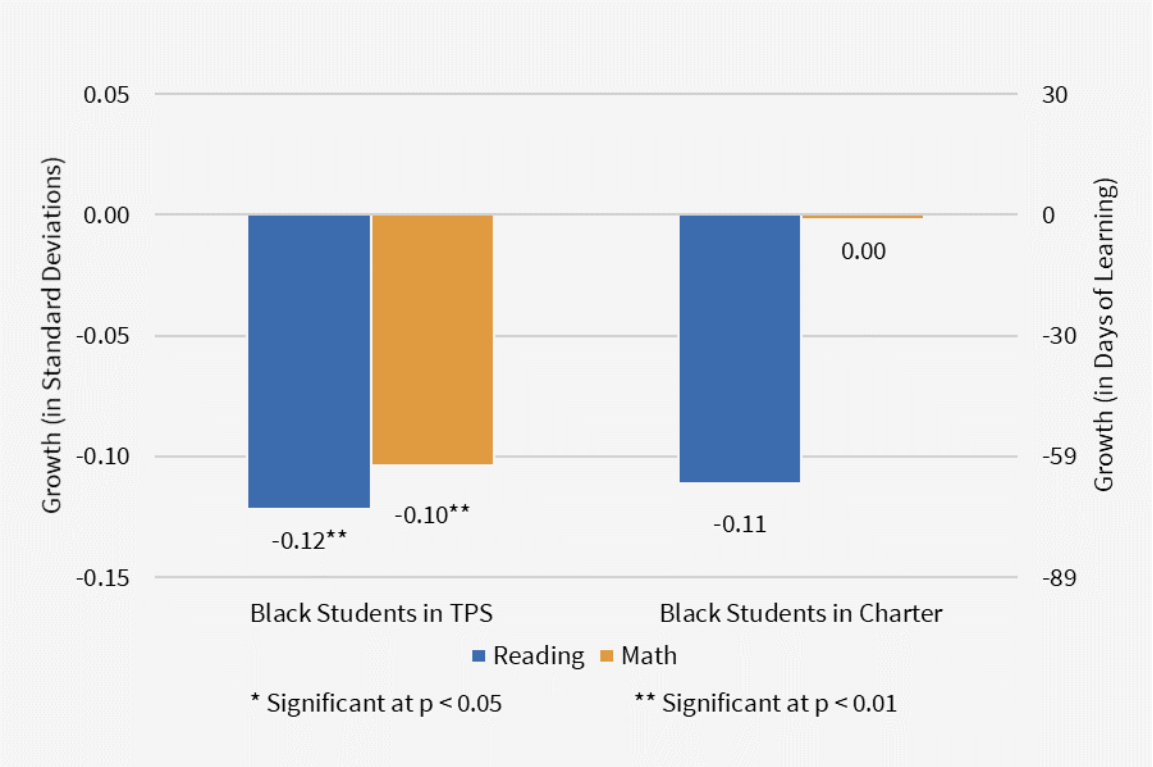
The National Center for Education Statistics has anchored its analysis of achievement gaps using White students as a reference group and measures the achievement of Black and Hispanic students against it.[9] Indeed it is hard to construct any comparison without using the historically advantaged group as the base. [10] In the present comparisons, we use as a reference point a composite (VCR) White male student attending TPS who does not qualify for subsidized school meals, Special Education services, or English Language Learner support, and is not repeating his current grade. For students in poverty, as measured by Free or Reduced Price Lunch eligibility, the reference group is non-poverty students in TPS. For ELL students, the benchmark is students in TPS who are not ELL. For students with Special Education requirements, the benchmark is non-Special Education students in TPS. Each of these comparisons illustrate the year-to-year ways that student academic trajectories diverge to create the learning gain gap and achievement gap.

Before discussing the findings, is it useful to explain the layout of the results. For each student subgroup, we present two related graphs. Graphics Roadmap No. 2 describes the graphs and their relation to each other.

The impact of charter schools on the academic gains of Black students is shown in Figures 10 through 10a below. Black students account for roughly 22 percent of the charter school population in Washington State.

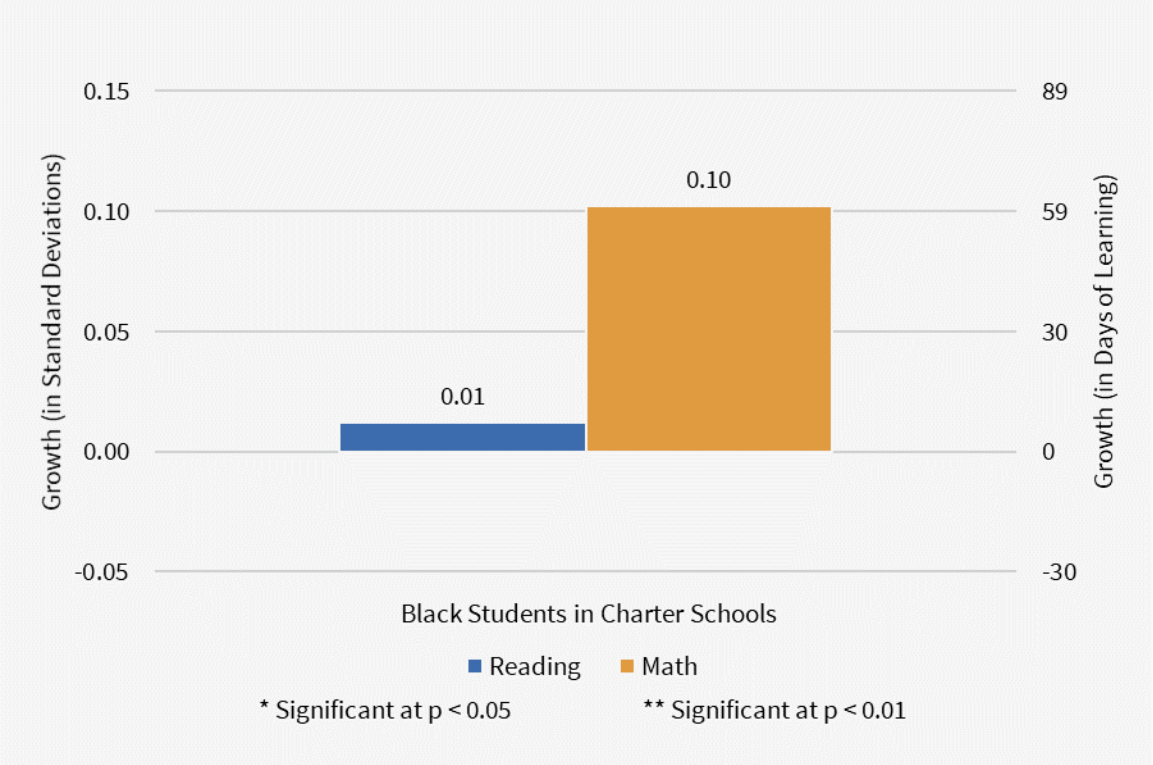
[9] National Center for Education Statistics, **"NAEP 2009 High School Transcript Study,"** 2009.
[10] National Center for Education Statistics, **"Condition of Education 2011,"** 2011.

Figure 10: Learning Gains of Black Students Benchmarked Against Learning Gains of White TPS Students



Black students in TPS have made significantly smaller annual academic learning gains in reading and math when compared to the average White TPS (VCR) student. Figure 10 shows that Black TPS students in Washington State exhibit 71 fewer days of learning in reading and 59 fewer days of learning in math compared to White TPS students, and these differences are statistically significant. Despite the apparent gap in learning for Black charter school students in reading, the result is not statistically significant. Accordingly, Black charter school students exhibit statistically similar learning growth to White TPS students in both math and reading.

Figure 10a: Relative Learning Gains of Black Charter Students Benchmarked Against their Black TPS Counterparts



A second comparison examines the learning gains for the same student group across the two school settings to see whether the student group, in this case Black students, fare better in one or the other environment. Figure 10a displays the differences in learning growth between Black students enrolled in TPS and Black students enrolled in charter schools. In Washington State, Black charter school students experience similar growth to their Black TPS counterparts in reading and math.

An equivalent analysis for Hispanic students is presented in Figures 11 and 11a. Hispanic students account for 21 percent of charter school students in Washington State. Hispanic students in TPS are found to have significantly weaker academic growth in both reading and math compared to the average White TPS student, amounting to 47 fewer days of learning in reading and 53 fewer days of learning in math in a year. Because the difference is not significant in either subject, Hispanic students in charter schools have similar learning growth in math and reading, when compared to White TPS students over the same time period.

Figure 11: Learning Gains of Hispanic Students Benchmarked Against Learning Gains of White TPS Students

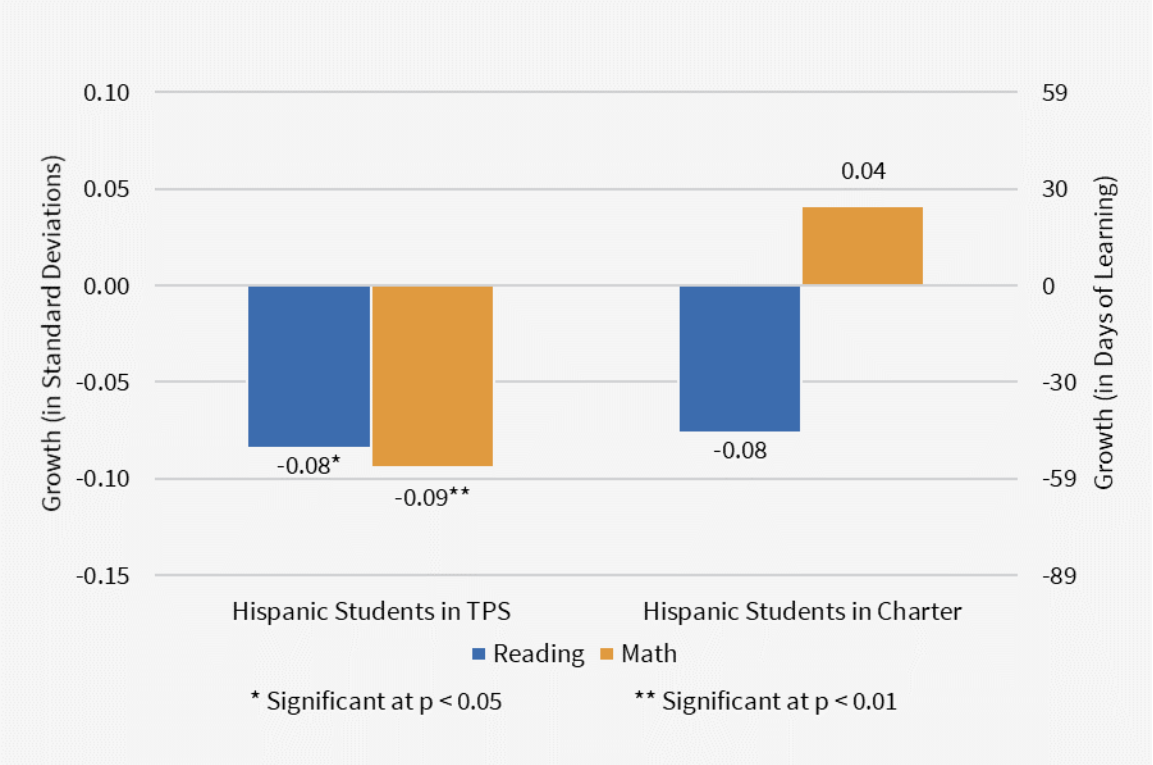
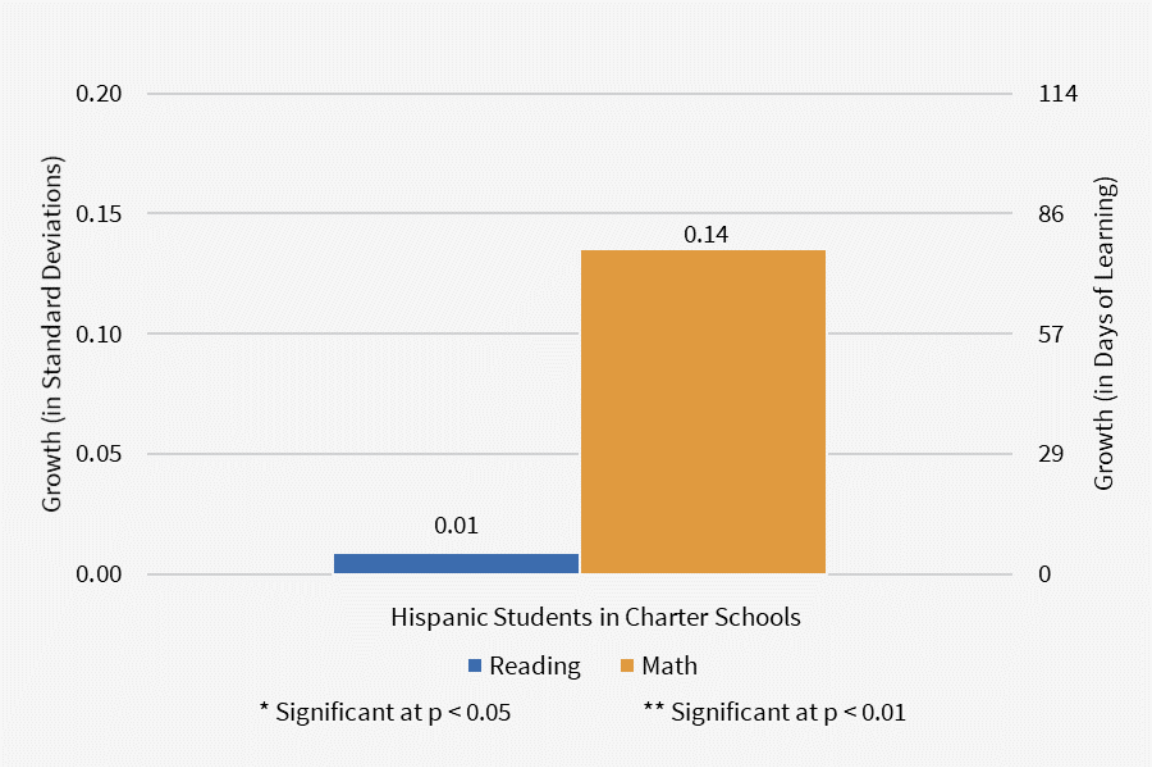


Figure 11a displays the relative differences in learning between Hispanic students enrolled in TPS and Hispanic students enrolled in charter schools. Hispanic students in charter schools show similar learning growth to Hispanic students attending traditional public school settings in math and reading.

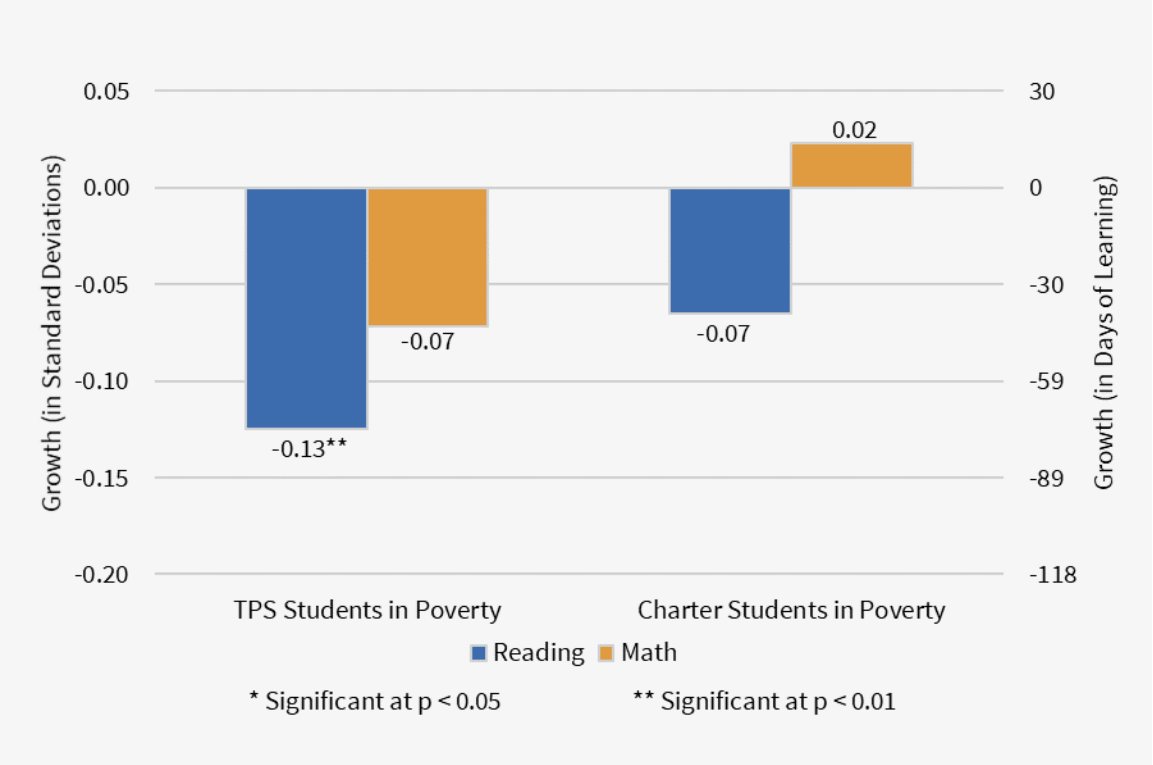
Figure 11a: Relative Learning Gains of Hispanic Charter Students Benchmarked Against their Hispanic TPS Counterparts



Charter School Impact for Students in Poverty

CREDO's 2013 National Charter Study found students in poverty comprise 53 percent of the national charter school population.[11] In Washington State, 63 percent of charter school students are eligible for subsidized school meals, a proxy for low income households, compared to 44 percent of TPS students. Figure 12 presents the academic growth gains for students in poverty. In this figure, the comparison group consists of TPS students who are not eligible for free or reduced-price school meals.[12]

Figure 12: Overall Learning Gains for Students in Poverty Compared to Students not in Poverty, TPS and Charter

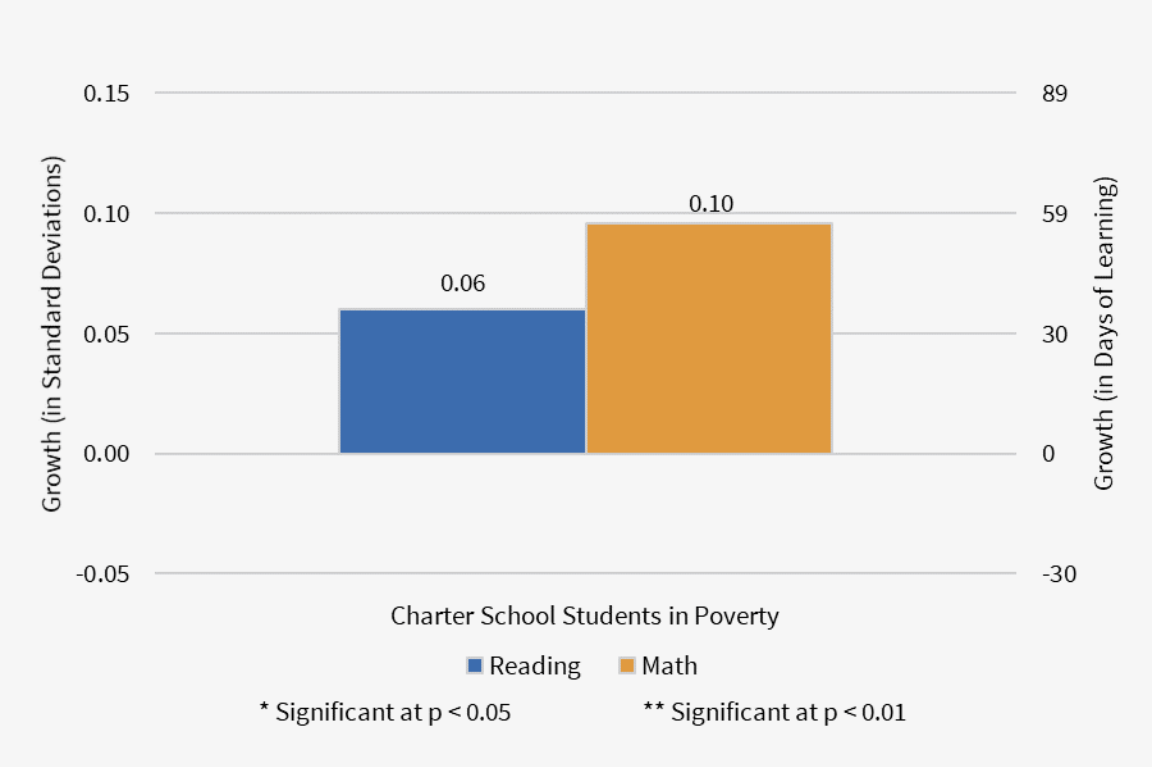


Since the standard for comparing students in poverty in both TPS and charter schools is a non-poverty TPS peer, the figure for charter students in poverty involves two sources of difference. First, TPS students in poverty make less progress than their non-poverty TPS peers in reading, but the difference in math is not significant. Charter school students in poverty make similar progress to that of their non-poverty TPS peers in math and reading since both differences are insignificant. The second comparison is between charter students in poverty and TPS students in poverty. Figure 12a shows that the difference in education setting is not significant.

[11] Cremata, Edward, D. Davis, K. Dickey, K. Lawyer, Y. Negassi, M. Raymond and J.Woodworth, *National Charter School Study* (2013). https://credo.stanford.edu/documents/NCSS%202013%20Final%20Draft.pdf

[12] Free and Reduced Price Lunch (FRL) has been used as an indicator of poverty in education research for decades. Although we acknowledge that FRL is not as sensitive as we would desire, FRL is currently the best available proxy for poverty.

Figure 12a: Relative Learning Gains for Charter School Students in Poverty Benchmarked Against their TPS Peers in Poverty

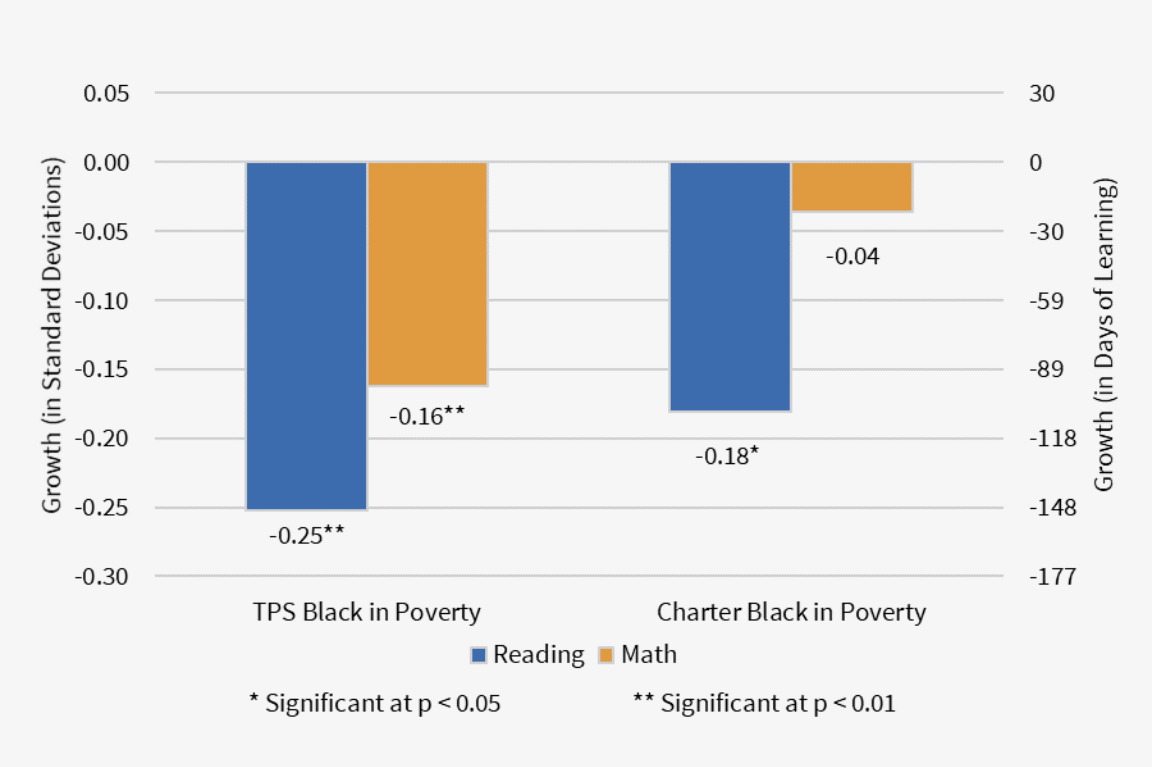


Charter School Impact for Students in Poverty by Race/Ethnicity

According to the National Center for Education Statistics, Black and Hispanic students comprise the two race/ethnicity subgroups with the largest percentages of school-aged poverty. In 2015, 36 percent of Black students and 31 percent of Hispanic students were living in poverty, respectively.[13] These groups have the largest gaps in achievement compared to White non-poverty students. We focus on the subsets of Black and Hispanic students in poverty to highlight the difference in impact for these particular students in charter schools and their VCR counterparts and examine the extent to which gaps are being lessened.

The impact of Washington charter schools on the academic gains of Black students living in poverty is presented in Figures 13 and 13a. The impact of charter schools on Hispanic students living in poverty is presented in Figures 14 and 14a below. Adding the variable of poverty to the race/ethnicity analysis produced similar results to the earlier analysis on race/ethnicity alone.

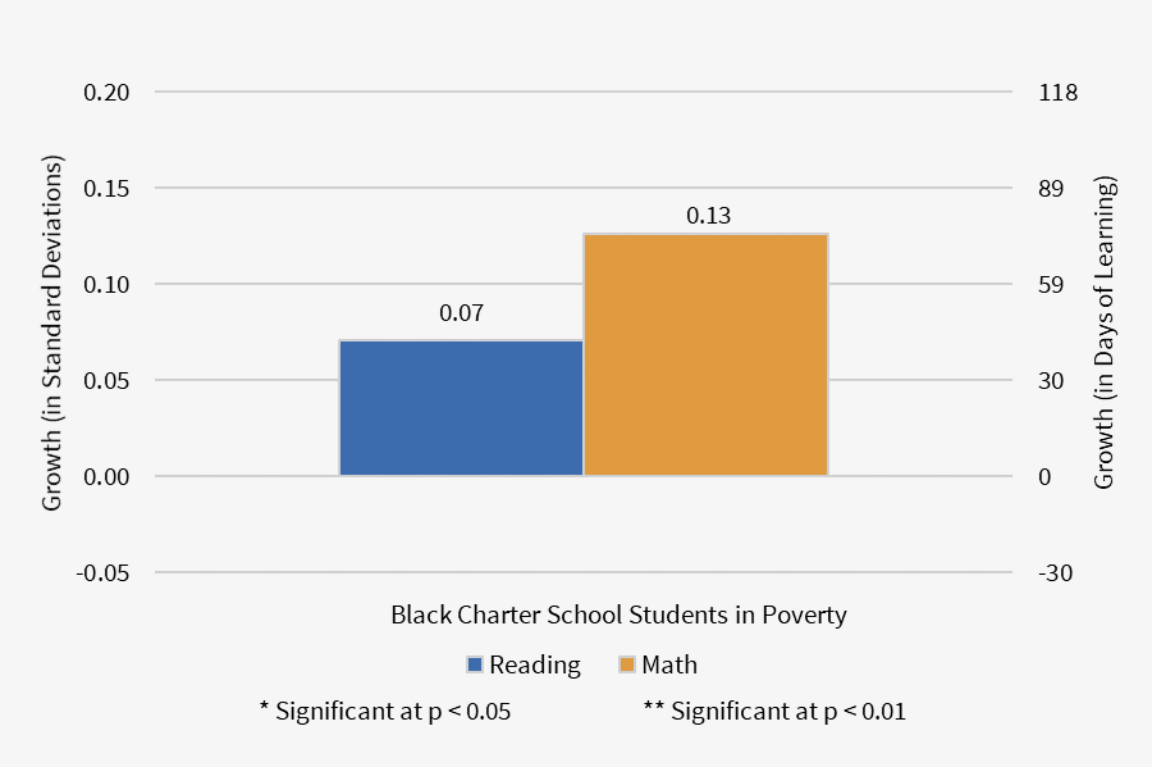
Figure 13: Learning Gains of Black Students in Poverty Compared to Learning Gains of White TPS Students not in Poverty, TPS and Charter



[13] Kids Count Data Center, Annie E. Casey Foundation (2016). http://datacenter.kidscount.org/data/tables/44-children-in-poverty-by-race-and-ethnicity#detailed/1/any/false/573,869,36,868,867/10,11,9,12,1,185,13/324,323

The comparison student for Figure 13 is a White TPS student who is not in poverty. As shown in Figure 13, Black students in poverty attending TPS or charter schools have weaker growth in reading and math than non-poverty White students. In Washington State, Black TPS students in poverty experience approximately 148 fewer days of learning in reading and 94 fewer days of learning in math than White TPS students. Black charter students in poverty experience 106 fewer days of learning in reading than White TPS students not in poverty. Black charter students in poverty experience a learning growth that is on par with that of non-poverty White TPS. Figure 13a shows Black charter students living in poverty experiencing similar growth gains in both subjects to those of Black TPS students living in poverty.

Figure 13a: Relative Learning Gains of Black Charter School Students in Poverty Benchmarked Against their Black TPS Counterparts in Poverty



The comparison student for Figure 14 is a White TPS student who is not in poverty. Figure 14 shows Hispanic TPS students living in poverty exhibit weaker learning growth in reading and math than non-poverty White TPS students. Hispanic TPS students living in poverty experience, on average, the equivalent of 142 fewer days of learning in reading and 89 fewer days of learning in math compared to White TPS students not living in poverty. Hispanic charter school students in poverty experience similar learning growth to that of non-poverty White TPS students.

Figure 14: Learning Gains of Hispanic Students in Poverty Compared to Learning Gains of White TPS Students not in Poverty, TPS and Charter

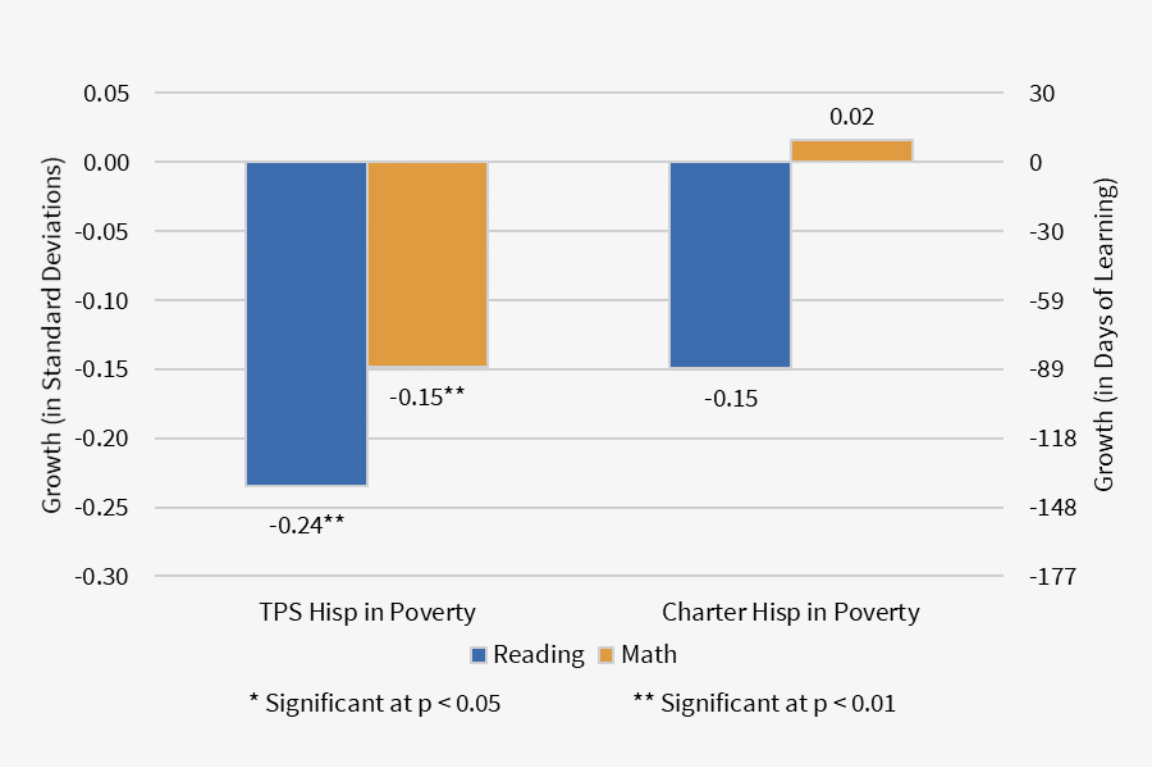


Figure 14a: Relative Learning Gains of Hispanic Charter School Students in Poverty Benchmarked Against their Hispanic TPS Counterparts in Poverty

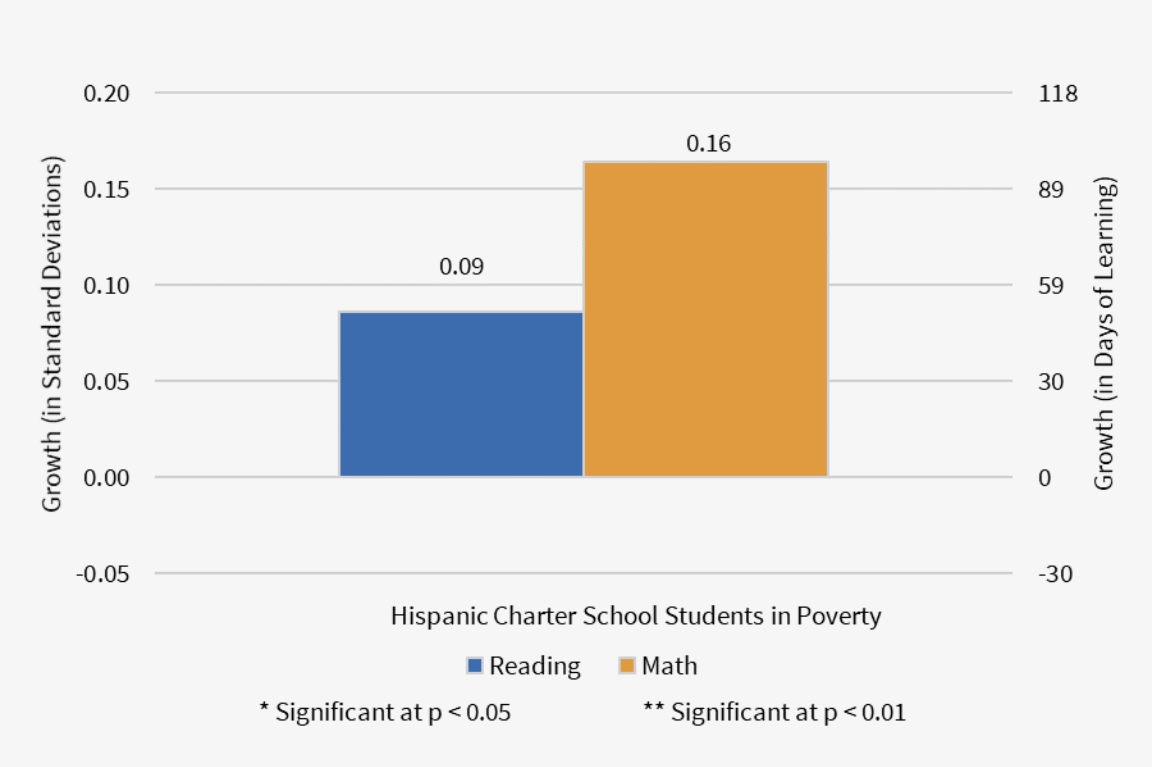


Figure 14a shows the difference in learning growth between Hispanic charter students living poverty and Hispanic TPS students living in poverty. In Washington, Hispanic charter students in poverty experience learning growth in reading and math similar to that of Hispanic TPS students in poverty.

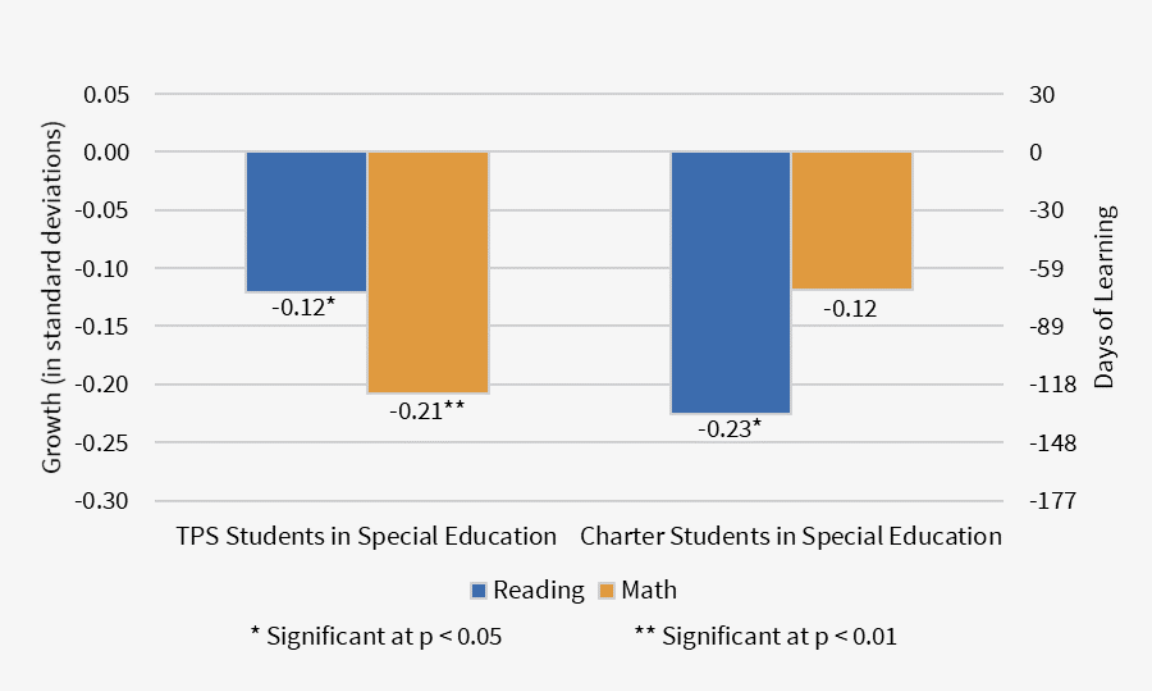
For Black or Hispanic TPS students living in poverty, academic progress is weaker by significant margins in both subjects, when compared to White TPS students not living in poverty. Charter school enrollment produces learning gains for Black and Hispanic students in poverty, that are statistically indistinguishable from those of TPS Black and Hispanic students in poverty, respectively, for both math and reading.

Charter School Impact for Special Education Students

Twelve percent of the charter school population in Washington receives Special Education services. In TPS and in feeder schools across Washington, the Special Education populations is 13 and 14 percent of total enrollment, respectively. Compared to national proportions, the proportions in Washington seem to be on par.[14]

It is difficult to compare the outcomes of Special Education students, regardless of where they enroll, as these services vary widely. In the ideal, we would compare outcomes for each Individual Education Program (IEP) designation. That approach is, unfortunately, not feasible due to the large number of categories and the relatively small number of students in each. Faced with this challenge, we aggregate across all categories of Special Education. Therefore, the results of this section should be interpreted with caution. Figure 15 uses non-Special Education students in TPS as benchmark to show relative learning gains for students with Special Education requirements in TPS and Charter.

Figure 15: Overall Learning Gains for Students in Special Education Compared to Non-Special Education Students, TPS and Charter

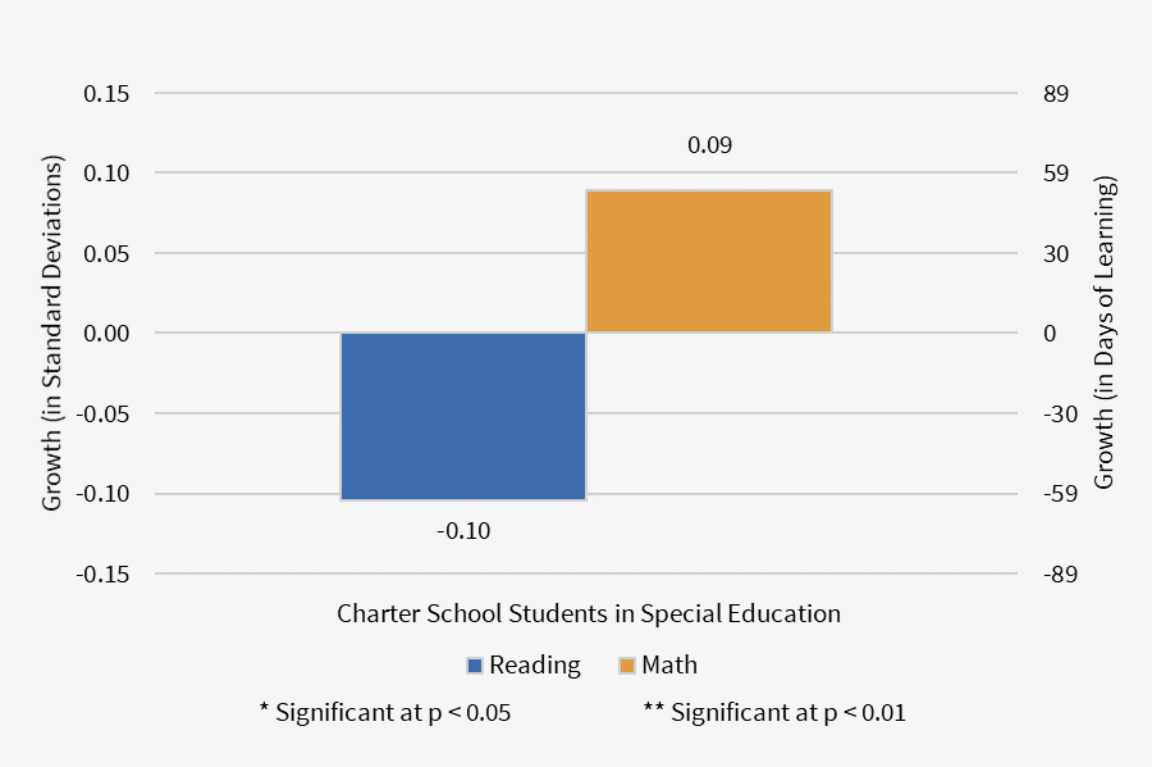


In Figure 15, we firstly compare students in Special Education in TPS and charter to students in TPS not receiving Special Education services. TPS students in Special Education experience a weaker learning growth of 71 days and 124 days of learning in reading and math, respectively, when compared to non-SpEd TPS students. Charter students in Special Education exhibit a learning growth that is lagging by 136 days of learning in reading, when

[14] Cremata, Edward, D. Davis, K. Dickey, K. Lawyer, Y. Negassi, M. Raymond and J.Woodworth, *National Charter School Study* (2013). http://credo.stanford.edu.

compared to non-SpEd TPS students. Charter students in Special Education exhibit a learning growth in math that is statistically indistinguishable from that of non-SpEd TPS students. The second comparison is between charter students in Special Education and TPS students in Special Education. Figure 15a shows that charter students in Special Education fare as well as their TPS VCRs in reading and math, as the differences are not statistically significant.

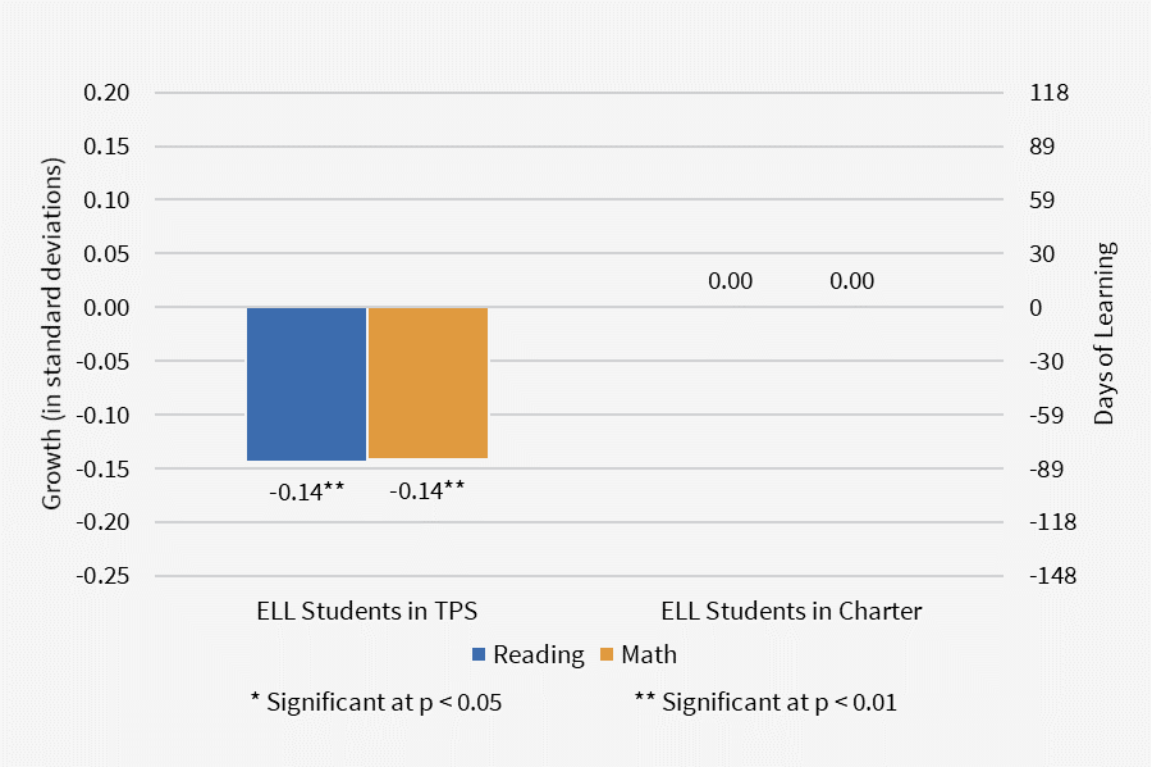
Figure 15a: Relative Learning Gains for Charter School Students in Special Education Benchmarked Against their TPS Peers in Special Education



Charter School Impact for English Language Learners

The 2015 National Assessment of Education Progress documents a performance gap between English language learners (ELL) and their English proficient peers.[15] This national trend is relevant in Washington, where 11 percent of the student population in TPS are English language learners.

Figure 16: Learning Gains for Students with ELL Designation Compared to non-ELL Students, TPS and Charter



The comparison student for Figures 16 is a TPS student who is English proficient. Figure 16 demonstrates that ELL students in TPS make significantly less annual academic progress than non-ELL students in traditional school settings. ELL students in charter schools have similar academic progress to that of non-ELL students in traditional school settings in both subjects. For both reading and math, we witness the closing of the learning growth gap between ELL students and non-ELL students, associated with charter school attendance. The differences between the ELL TPS learning growth and the ELL charter learning growth are statistically significant, as shown in Figure 16a. In particular, English language learners in charter schools experience higher learning growth of the size of 83 days of learning in both reading and math, when compared to English language learners in TPS.

[15] The Nation's Report Card. (2016) 2015 Mathematics and Reading Assessments http://www.nationsreportcard.gov/reading_math_2015/#mathematics/groups?grade=4

Figure 16a: Relative Learning Gains for ELL Charter School Students Benchmarked Against their TPS ELL Peers

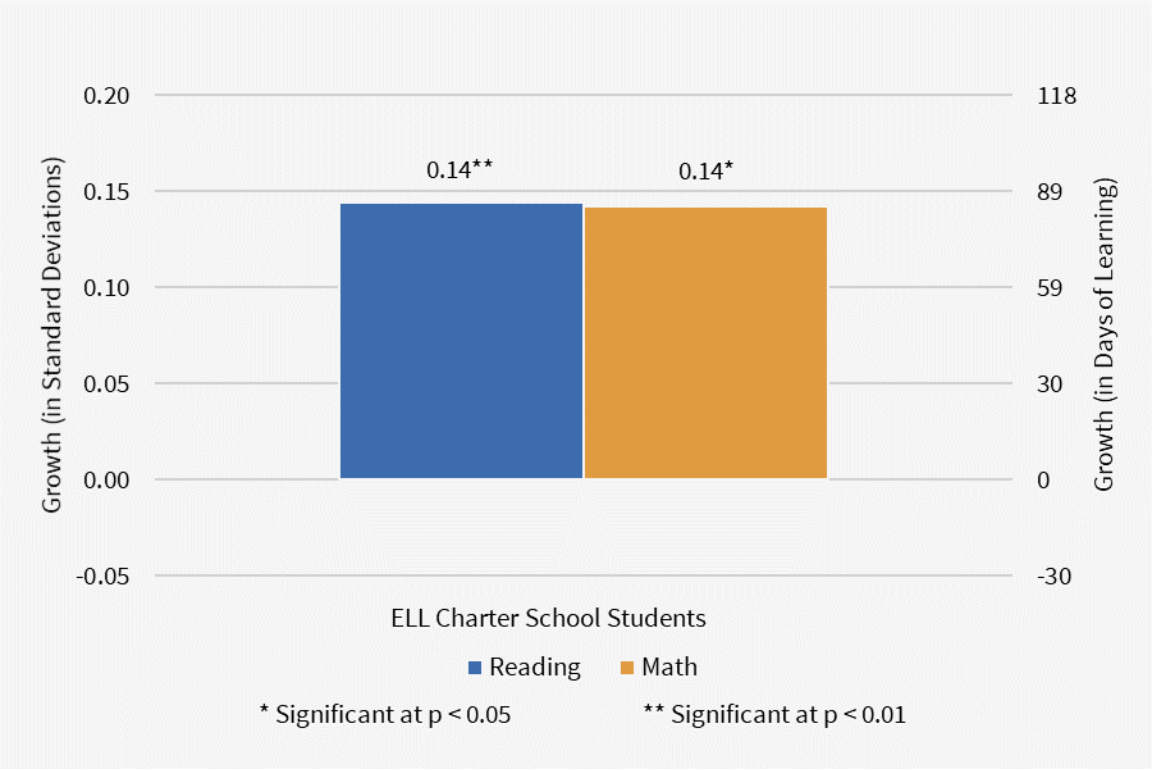
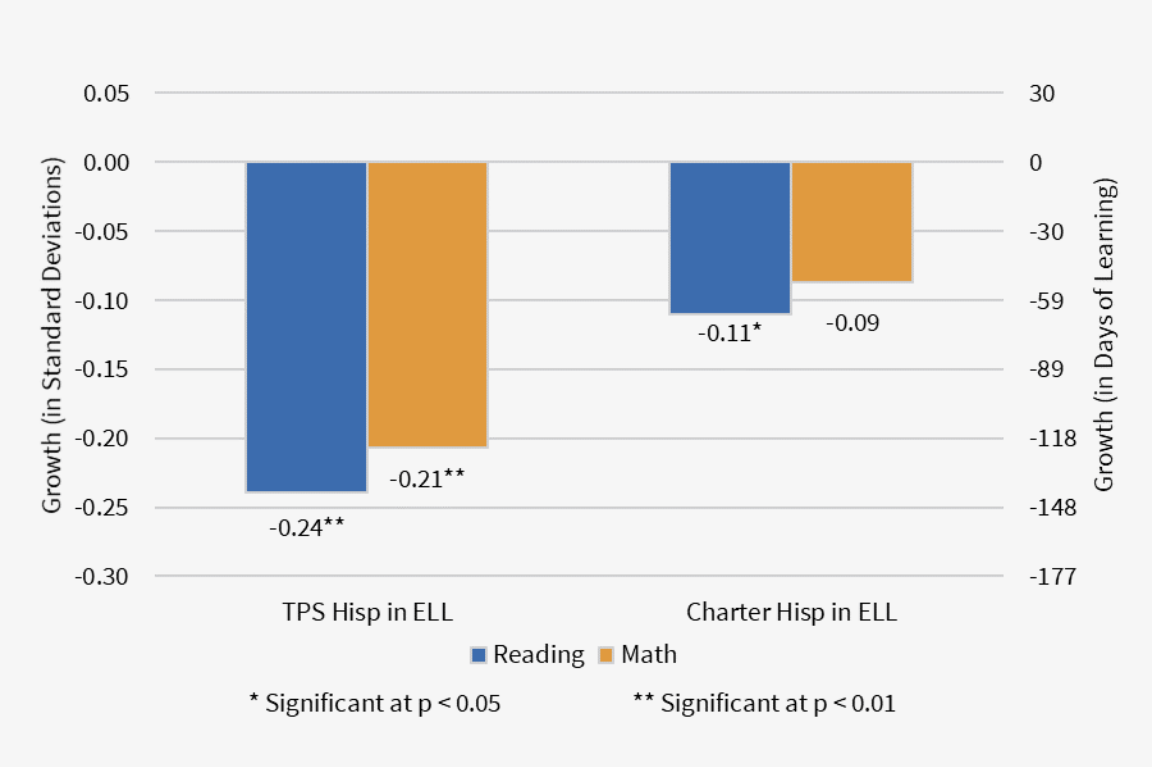


Figure 17: Learning Gains of Hispanic Students with ELL Designation Compared to Learning Gains of White TPS Students without ELL Designation, TPS and Charter



The comparison student for Figure 17 is a White TPS student who is English proficient. Figure 17 demonstrates that Hispanic ELL students in TPS make significantly less annual academic progress than non-ELL White students in traditional school settings in both math and reading. Hispanic ELL students experience a learning growth that is weaker by 142 day and 124 days of learning in reading and math, respectively, when compared to the learning growth of non-ELL TPS students. Hispanic ELL students in charter schools have similar academic progress in math but weaker academic progress by 65 days in reading compared to the academic progress of non-ELL White students in traditional school settings. Figure 17a shows that the learning growth of Hispanic ELL students in charter is statistically indistinguishable from the learning growth of Hispanic ELL students in TPS.

Figure 17a: Relative Learning Gains for Hispanic Charter School Students with ELL Designation Benchmarked Against their Hispanic TPS Peers with ELL Designation

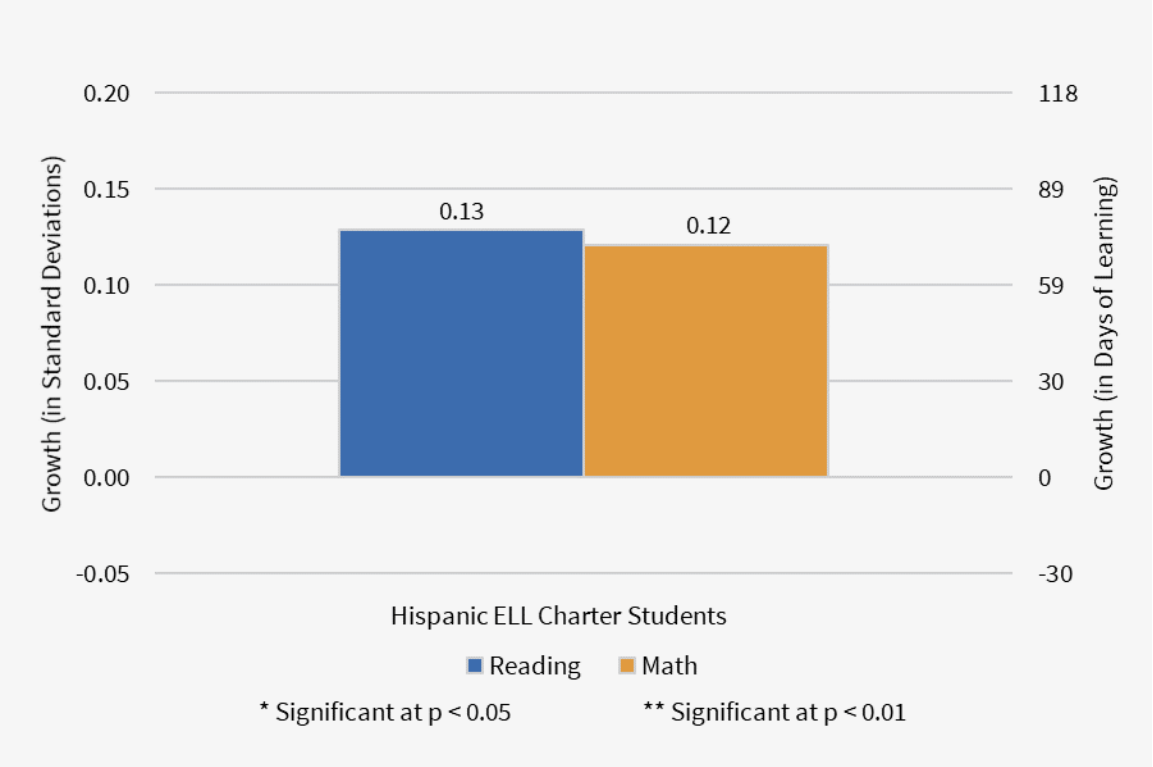


Table 8 summarizes the effect that charter schools have on student group populations. The coefficients represent the growth of each group relative to their counterpart group in TPS. The only significant findings here concern ELL students, who experience an additional 83 days of growth in both reading and math.

Table 8: Charter School Impact on Student Subgroup Performance

Student Group	Charter Effect on Student Groups Benchmarked against their TPS Peers	
	Reading	Math
Charter School Students in Poverty	0.06	0.10
Black Charter Students	0.01	0.10
Black Charter Students in Poverty	0.07	0.13
Hispanic Charter Students	0.01	0.14
Hispanic Charter Students in Poverty	0.09	0.16
Special Education Charter Students	-0.10	0.09
English Language Learner Charter Students	0.14**	0.14*
Overall Charter Effect	0.04	0.07

* Significant at the 0.05 level, **Significant at the 0.01 level

Summary and Discussion

This study examined the academic progress of charter school students in Washington over a three-year period. The report focused particularly on the gains in learning associated with charter school attendance in Washington. Our data window ranges from 2014-15 to the 2016-17 school year, amounting to two one-year growth periods.

Over that time, the typical charter school student in Washington demonstrated no statistically different academic growth in reading and math when compared to their exact-match counterpart in nearby district schools (TPS). The trend across the two growth periods shows a slight downward trend in reading and math as the number of students served grew. The finding of no meaningful difference in learning gains held across most of the different student groups within the charter population. Only English language learners experience significantly higher learning gains associated with charter school attendance. Other student subgroups such as students in poverty, Black students, and Hispanic students experience non-significant positive gains on average.

Our school-level analysis reveals important differences in the learning gains from charter school to charter schools in Washington. We observe schools with significantly positive impacts, as much as 165 and 189 more days of learning in reading and math, respectively, compared to the learning they would have realized in TPS. Conversely, some charters significantly underperformed their local school options by as much as 106 and 83 fewer days of learning in reading and math, respectively. The number of schools with significant positive results is larger than the number of significant negative schools, and is an important finding in these early years of charter school operations.

For the reader's convenience, the following table summarizes the key findings of this report.

Table 9: Summary of Statistical Significance of Findings for Washington Charter School Students Benchmarked Against Comparable TPS Students

	Reading	Math
Washington Charter Students (compared to TPS)	Similar	Similar
Charters in 2015-16 (compared to TPS in 2015-16)	Similar	Similar
Charters in 2016-17 (compared to TPS in 2016-17)	Similar	Similar
First Year Enrolled in Charter School (compared to TPS)	Similar	Similar
Second Year Enrolled in Charter School (compared to TPS)	Similar	Similar
Black Charter School Students (compared to Black TPS students)	Similar	Similar
Hispanic Charter School Students (compared to Hispanic TPS students)	Similar	Similar
Special Education Charter School Students (compared to non-SpEd TPS students)	Similar	Similar
English Language Learner Charter School Students (compared to non-ELL TPS students)	Positive	Positive
Charter Students in Poverty Students (compared to TPS Students in Poverty)	Similar	Similar
Black Charter Students in Poverty (compared to Black TPS Students in Poverty)	Similar	Similar
Hispanic Charter Students in Poverty (compared to Hispanic TPS students in poverty)	Similar	Similar
Hispanic English Language Learner Charter School Students (compared to Hispanic ELL TPS Students)	Similar	Similar

It should perhaps not be surprising that the present analysis did not find significant differences overall in the performance of charter schools. Given the small number of schools and the small share of the state's school children who attend them, it would take exceptionally large differences to trigger significance in a statistical sense. The findings point in hopeful directions, which future updates will attempt to examine in greater detail. In the meantime, there are promising examples of stronger performance that are worth attention as well as examples where concern is warranted. Future study will also be able to check if the fundamental bargain that underlies the presence of charter schools – autonomy for accountability – is fully observed in Washington State.

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APPENDICES

Appendix A: Sample Size in Each Subgroup

The numbers in the table below represent the number of charter observations associated with the corresponding results in the report. An equal number of VCRs were included in each analysis.

Appendix Table 1: Number of Observations for All Results

Student Group	Matched Charter Student Records	
	Reading	Math
Washington Charter Students	1,306	1,149
Charters in 2015-16	425	388
Charters in 2016-17	881	761
First Year Enrolled in Charter School	912	758
Second Year Enrolled in Charter School	307	278
Black Charter School Students	279	247
Hispanic Charter School Students	308	270
Special Education Charter School Students	125	108
Charter Students in Poverty	863	755
Black Charter Students in Poverty	221	195
Hispanic Charter Students in Poverty	253	220

Appendix B: Technical Appendix

Source of Student-Level Data

For the purpose of this study, student-level data were provided by Washington State's Office of Superintendent of Public Instruction (OSPI). CREDO has no power to audit or control the quality of records held by OSPI. Therefore, we recognize that there is a level of data specificity that is beyond the means CREDO can control.

Power Analysis

Due to the clustering of students within schools, we chose to use a two-level hierarchical analytic model for this analysis. This means the total N of the sample will be reduced by the clustering effect, the proportion of variance shared by students within the same schools. We conducted the power analysis using data for a two-level hierarchical model without covariates. We chose to use this more conservative power analysis rather than two-level hierarchical model with covariates, as we did not have strong estimates of R^2 values and did not want to overestimate the power of this new model.

The power analysis was computed using the *power onemean* command in Stata14. This process is based on the following equation:

$$\pi = \Phi(\sqrt{n}\delta - z1-\alpha/2) + \Phi(-\sqrt{n}\delta - z1-\alpha/2) \quad (1)$$

where Φ is the cdf of the standard normal distribution and $\delta = (\mu_a + \mu_0)/\sigma$ is the effect size.

Because the study uses students clustered within schools, the total N for the power analysis was reduced to an effective sample size (ESS) based on the interclass correlation. The formula used to reduce the total N to ESS was[16]:

$$ESS = \frac{mk}{1+\rho(m-1)} \quad (2)$$

where m is the total number of clusters, k is the average number of students per cluster, and ρ is the intraclass correlation.

The intraclass correlation is computed per Statistical Power Analysis in Education Research[17] using the formula:

$$\rho = \frac{\sigma_S^2}{\sigma_S^2+\sigma_W^2} = \frac{\sigma_S^2}{\sigma_T^2} \quad (3)$$

The resulting ESS are then used as the sample size to estimate of the power of the analyses of the study models.

[16] https://www.healthknowledge.org.uk/public-health-textbook/research-methods/1a-epidemiology/clustered-data

[17] Hedges, Larry and Rhoads, Christopher (2009). Statistical Power Analysis in Education Research (NCSER 2010-3006). Washington, DC: National Center for Special Education Research, Institute of Education Sciences, U.S. Department of Education. This report is available on the IES website at http://ies.ed.gov/ncser/.

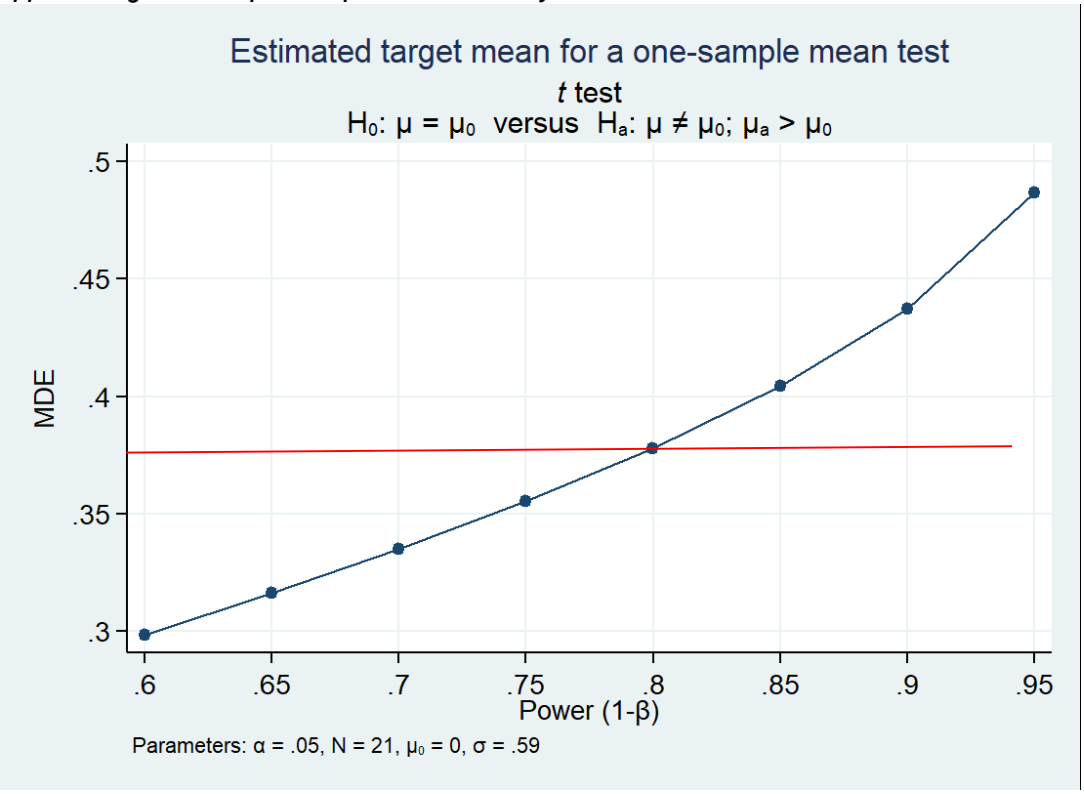
For the overall impact analysis, the minimum detectable effect size is around 0.38 given the number of schools and students in the sample. This estimate is based on the effective sample size of 21 derived from the total of matched students used in the study. Appendix Table 2 includes the numbers used to compute the ESS as well as the minimum detectable effect size. Results in Appendix Table 2 assume a power of .80 (power = 1-β), α=.05 and standard deviation of .59.

Appendix Table 2: Minimum Detectable Effect Sizes, Overall

Number of clusters	**7**
Average N students per cluster	187
Intra-Class Correlation	0.32588
Actual Number of Students	1306
Effective Sample Size	21
Minimum Detectable Effect	0.38

Appendix Figure 1 includes the graphed output of the power onemean command used in Stata 14. The minimum detectable effect (MDE) is shown on the *y-axis* and the power is shown on the *x-axis*. The MDE in Table 1 is based on a power of .80 and is marked with a red line. As can be seen in Figure 1, increasing the power to .90 would result in an increase in MDE to .44.

Appendix Figure 1: Graphic Output of Power Analysis



Selection of Comparison Observations

To create a reliable comparison group for our study, we strive to build a VCR for each charter school student. A VCR is a synthesis of the actual academic experiences of students who are identical to the charter school student, except for the fact that the VCR students attend a TPS that each charter school's students would have attended if not enrolled in the charter school. Appropriate matches for the Virtual Control Record (VCR) for each student are obtained in each growth period. We refer to the VCR as a "virtual twin" because it consolidates the experience of multiple "twins"' into a single synthesis of average academic performance. This synthesized record is then used as the counterfactual condition to the charter school student's performance.

Our approach is displayed in Appendix Figure 2. We identify all the traditional public schools whose students transfer to a given charter school; each of these schools is designated as a "feeder school." Once a TPS qualifies as a feeder school for a particular charter school, all the students in that traditional public school become potential matches for a student in that particular charter school. All the student records from all the feeder schools are pooled to become the source of records for creating the virtual match. Using the records of the students in those schools in the year prior to the test year of interest (t_0), CREDO selects all of the available TPS students that match each charter school student. The feeder school method provides a strong counterfactual as residential school assignment commonly used to place students in TPS has been shown to group

demographically and socio-economically similar students into schools. This practice increases the likelihood that students assigned to similar schools have similar backgrounds, knowledge of school choice programs, and school choice options. Once a school is identified as a feeder school for a particular charter, all the students in that TPS become potential matches for students in that particular charter school. All of the student records from all of a charter's feeder schools were pooled – this became the source of records for creating the virtual twin match[18].

The VCR matching method then eliminates any of the TPS students from the match pool whose demographic characteristics do not match exactly to the individual charter student. As part of the match process, we also drop from the TPS match pool any students who ever enrolled in a charter.

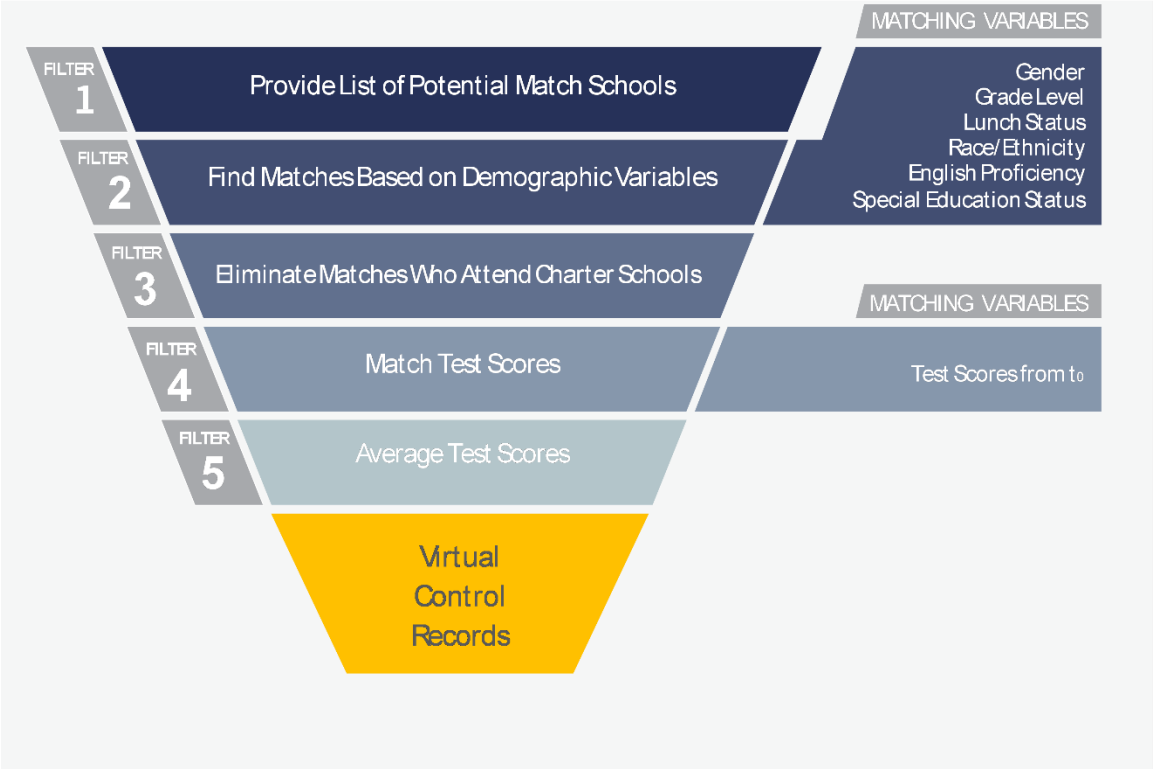
Using the records of TPS students at feeder schools in the year *prior* to the year of growth, CREDO randomly selects up to seven TPS students with identical values on the matching variables in Appendix Figure 2, including identical or very similar prior test scores. Students with similar test scores were used only when there were not enough TPS students with exact test score matches. The values for the selected TPS students are then averaged to create values for the virtual twin. As all other observable characteristics are identical, the only observable characteristic that differs between the charter student and their VCR is attendance in a charter school. The prior test score represents the impact on academic achievement of both the observable and unobservable student characteristics up to the time of the match, the year before the growth measurement. Since we matched on observable characteristics and the prior test score, we concluded that any differences in the post-test scores are primarily attributable to charter school attendance.

Match factors include:

- Grade level
- Gender
- Race/Ethnicity
- Free or Reduced Price Lunch Status
- English Language Learner Status
- Special Education Status
- Prior test score on Washington State achievement tests

[18] Each charter school has its own independent feeder list, and thus a unique pool of potential VCR matches.

Appendix Figure 2: CREDO VCR Methodology



Note: Using the VCR approach, a "virtual twin" was constructed for each charter student. The VCR method draws on the available records of the TPS that the students in a given charter school would have likely attended if they were not in that charter school. These schools are called feeder schools. From the feeder schools for each charter school, we match individual charter students to TPS students with identical traits and identical or very similar19 prior test scores.

At the point of selection as a VCR-eligible TPS student, all candidates are identical to the individual charter school student on all observable characteristics, including prior academic achievement. The focus then moves to the subsequent year, t_1. The scores from this test year of interest (t_1) for as many as seven VCR-eligible TPS students are then averaged to produce a Virtual Control Record. The VCR provides the counterfactual "control" for this analysis.

The What Works Clearinghouse of the Institute of Education Sciences is a central source of scientific evidence about what works in education in the U.S. The What Works Clearinghouse publishes every three years a handbook of research procedures and standards that meet quality research design standards. As described in the Study Approach section of this report, our matching protocol is in compliance with the updated standards described in the most recent version (version 4.0) of the What Works Clearinghouse Procedures and Standards Handbook, published in October 2017.

[19] Achievement scores were considered similar if they were within 0.1 standard deviations of the charter student's pre-charter achievement.

Demographic Composition of Charter Students in the Study

This study examines the performance of students in charter schools who participated in annual accountability testing in Washington, occurring in grades 3-8, 11 and in whatever grade the end-of-course assessments were taken. The test scores allow us to use a common measure of performance across schools and over time. However, in each growth period of the study, students who are enrolled in non-tested grades are not included in the analysis of performance. This partially accounts for the differences in school and student counts in our analysis data compared to other published figures about the charter school population in Washington State. Appendix Tables 2-3 present the student profiles of all and matched Washington State charter students tested in math in each matching period.

Appendix Table 3: Demographic Composition of Charter Students in the Study: Period 1

Student Group	All Charter Students Tested		Matched Charter Students	
	Number	Percent	Number	Percent
Washington State Charter Students	1,190		1,044	
% Matched	88%			
Black Students	284	24%	239	23%
Hispanic Students	256	22%	229	22%
White Students	424	36%	394	38%
Students in Poverty	799	67%	702	67%
Special Education Students	167	14%	107	10%
English Language Learners	101	8%	81	8%
Grade Repeating Students	8	1%	0	0%

Appendix Table 4: Demographic Composition of Charter Students in the Study: Period 2

Student Group	All Charter Students Tested		Matched Charter Students	
	Number	Percent	Number	Percent
Washington State Charter Students	336		304	
% Matched	90%			
Black Students	70	21%	64	21%
Hispanic Students	85	25%	75	25%
White Students	117	35%	113	37%
Students in Poverty	220	65%	199	66%
Special Education Students	31	9%	22	7%
English Language Learners	24	7%	18	6%
Grade Repeating Students	2	1%	0	0%

Note: Appendix Tables 3 and 4 refer to every student that attended any charter school for at least one day and tested in Math.

For this study, we match a total of 1,044 charter school students from five charter schools in math for as many years as data are available.[20] Some of these students attended a charter school for less than 91 days during a school year. Our estimates of learning gains associated with charter school attendance focus on students who attended a charter school for at least 91 days. We impose this restriction as it improves our confidence that the estimated learning gains can be associated with the charter schools attended. This restriction has a limited impact on the sample size. Also, our results remain largely unaffected by this restriction.

Students are drawn from grades 3-11, the grades covered by the state achievement testing program for reading and math or by the state end-of-course assessments. High school students are included for reading and math whenever they take the end-of-course assessment sequence in consecutive years, e.g., Algebra I, Geometry, and Algebra II. An identical number of virtual comparison records are included in the analysis in each subject. In Washington State, it was possible to obtain virtual matches for 88 percent of the tested charter school students in both reading and math.[21] This proportion assures the results reported here representative of the overall performance of charter schools in the state. The total number of observations is large enough to have confidence that the tests of effect detect real differences between charter school and TPS student performance at the statistically acceptable standard of p-value<0.05. Each student subgroup examined also had an acceptable number of observations, as reported in Appendix Tables 3 and 4.

Comparison of Starting Scores of Matched Students and VCRs

The VCR method used in this study of Washington State provided matches for 89 percent of tested charter school observations in reading and 88 percent in math. To assess the quality of the matches, we compare the starting scores of matched charter students and the Virtual Control Records obtained from the matches in both reading and math. The statistical tests of equality of means are shown in Appendix Figures 3 and 4 for math and reading, respectively. We find that the starting scores of matched students and the "Virtual Twins" used as point of comparison are almost identical. As matched students and their "Virtual Twins" have identical starting points in terms of learning in the beginning of a growth period, we can be confident that any difference in their final scores and therefore their learning growth can be attributed to charter school attendance, as the only observed way in which matched students and VCRs differ is that the former attend a charter school, while the latter consist of students attending a traditional public school.

[20] Schools that have fewer than two growth periods of experience are still included in the analysis for the years in which data are available.

[21] This match compares favorably with the 85 percent match rate in CREDO's most recent National Charter School Study (2013). See https://credo.stanford.edu/documents/NCSS%202013%20Final%20Draft.pdf. p.18.

Appendix Figure 3: Comparison of Starting Math Scores of Matched Charter Students and VCRs

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
TPS	1,149	-.1316457	.0268288	.9094142	-.1842847	-.0790066
Charter	1,149	-.1320164	.0269185	.9124523	-.1848313	-.0792015
combined	2,298	-.131831	.0189984	.9107362	-.1690869	-.0945752
diff		.0003707	.0380051		-.0741572	.0748986

diff = mean(TPS) - mean(Charter) t = 0.0098
Ho: diff = 0 Welch's degrees of freedom = 2297.97

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.5039 Pr(|T| > |t|) = 0.9922 Pr(T > t) = 0.4961

Appendix Figure 4: Comparison of Starting Reading Scores of Matched Charter Students and VCRs

Two-sample t test with unequal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
TPS	1,306	-.1768931	.0252257	.9116215	-.2263805	-.1274058
Charter	1,306	-.1761691	.0253072	.9145656	-.2258162	-.1265219
combined	2,612	-.1765311	.0178627	.9129199	-.2115575	-.1415047
diff		-.000724	.0357322		-.0707902	.0693422

diff = mean(TPS) - mean(Charter) t = -0.0203
Ho: diff = 0 Welch's degrees of freedom = 2611.97

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.4919 Pr(|T| > |t|) = 0.9838 Pr(T > t) = 0.5081

Measuring Academic Growth

With three years of data, each subject-grade-year group of scores has slightly different mid-point averages and distributions. For end-of-course assessments (EOCs) there are only subject-year groups because EOCs are not grade specific. This means a student takes this assessment after completing the

course, no matter what grade they are in. In our study, scores for all these separate tests are transformed to a common scale. All test scores have been converted to standardized scores to fit a "bell curve", in order to allow for year-to-year computations of growth.[22]

When scores are standardized, every student is placed relative to their peers in the entire state of Washington. A student scoring in the 50th percentile in Washington receives a standardized score of zero, while a standardized score of one would place a student in the 84th percentile. Students who maintain their relative place from year to year would have a growth score of zero, while students who make larger gains relative to their peers will have positive growth scores. Conversely, students who make smaller academic gains than their peers will have negative growth scores in that year.

Model for the Analysis of the Academic Impact of Charter Schools

After constructing a VCR for each charter student, we then set out to develop a model capable of providing a fair measure of charter impact. The National Charter School Research Project provided a very useful guide to begin the process[23]. First, it was useful to consider student growth rather than achievement. A growth measure provided a strong method to control for each student's educational history as well as the many observable differences between students that affect their academic achievement. The baseline model included controls for each student's grade, race, gender, free or reduced price lunch status, special education status, English language learner status, and whether they were held back the previous year. The literature on measuring educational interventions[24] found that the best estimation techniques must also include controls for baseline test scores. Each student's prior year test score is controlled for in our baseline model. Additional controls are also included for year, and period (first year in charter, second year in charter, etc.). The study's baseline model is presented below.

$$\Delta A_{i,t} = \theta A_{i,t-1} + \beta X_{i,t} + \rho Y_t + \gamma C_{i,t} + \varepsilon_{i,t} \qquad (1)$$

where the dependent variable is

$$\Delta A_{i,t} = A_{i,t} - A_{i,t-1} \qquad (2)$$

And A_{it} is the state-by-test z-score for student i in period t; A_{it-1} is the state-by-test z-score for student i in period t – 1; $X_{i,t}$ is a set of control variables for student characteristics and period; Y_t is a year fixed effect; C is a vector of

[22] For each subject-grade-year set of scores, scores are centered around a standardized midpoint of zero, which corresponds to the actual average score of the test before transformation. Then each score of the original test is recast as a measure of variation around that new score of zero, so that scores that fall below the original average score are expressed as negative numbers and those that are larger receive positive values.

[23] Betts, J. and Hill, P. et al. (2006). "Key Issues in Studying Charter Schools and Achievement: A Review and Suggestions for National Guidelines." National Charter School Research Project White Paper Series, No. 2.

[24] Betts, J. and Tang, Y. (2011) "The Effect of Charter Schools on Student Achievement: A Meta-Analysis of the Literature." National Charter School Research Project.

variables for whether student i attended a charter school and what type of charter school in period t; and ε is the error term. Errors are clustered around charters schools and their feeder patterns as well. The parameters of interest are estimated using Ordinary Least Squares (OLS) in STATA 14.

The baseline model above was extended to explore additional interactions beyond a simple binary to indicate charter enrollment. One type of extension included both "double" and "triple" interactions between the charter variable and student characteristics. For example, to identify the impact of charter schools on different racial groups, we estimate models that break the charter variable into "charter_black," "charter_hispanic," etc. To further break down the impact of charters by race and poverty, the variables above were split again. For example, black students in charter schools are split further into students that qualify for free and reduced price lunches ("charter_black_poverty") and those that do not ("charter_black_nonpoverty").

Presentation of Results

In this report, we present the impacts of attending charter schools in terms of standard deviations. The base measures for these outcomes are referred to in statistics as z-scores. A z-score of 0 indicates the student's achievement is average for his or her grade. Positive values represent higher performance while negative values represent lower performance. Likewise, a positive effect size value means a student or group of students has improved relative to the students in the state taking the same exam. This remains true regardless of the absolute level of achievement for those students. As with the z-scores, a negative effect size means the students have on average lost ground compared to their peers.

It is important to remember that a school can have a positive effect size for its students (students are improving) but still have below-average achievement. Students with consistently positive effect sizes will eventually close the achievement gap if given enough time; however, such growth might take longer to close a particular gap than students spend in school.

While it is fair to compare two effect sizes relationally (i.e., 0.08 is twice 0.04), this must be done with care as to the size of the lower value. It would be misleading to state one group grew twice as much as another if the values were extremely small such as 0.0001 and 0.0002.

Finally, it is important to consider if an effect size is significant or not. In statistical models, values which are not statistically significant should be considered as no different from zero. Two effect sizes, one equal to .001 and the other equal to .01, would both be treated as no effect if neither were statistically significant.

To assist the reader in interpreting the meaning of effect sizes, we include an estimate of the average number of days of learning required to achieve a particular effect size. This estimate was calculated by Dr. Eric Hanushek and Dr. Margaret Raymond based on the latest (2017) 4th and 8th grade test scores from the National Assessment of Educational Progress (NAEP). Using a standard 180-day school year, each one standard deviation (s.d.) change in effect size was equivalent to 590 days of learning in this study. The values in Table 6 are updated from past

reports using more recent NAEP scores, which show slower absolute annual academic progress than earlier administrations.[25]

In order to understand "days of learning," consider a student whose academic achievement is at the 50th percentile in one grade and also at the 50th percentile in the following grade the next year. The progress from one year to the next equals the average learning gains for a student between the two grades. That growth is fixed as 180 days of effective learning based on the typical 180-day school year.

We then translate the standard deviations of growth from our models based on that 180-day average year of learning, so that students with positive effect sizes have additional growth beyond the expected 180 days of annual academic progress while those with negative effect sizes have fewer days of academic progress in that same 180-day period of time.

[25] Hanushek, Eric A. P.E. Peterson, & L. Woessmann. Achievement Growth: International and U.S. State Trends in Student Performance. *Education Next*, (2012) Vol. 12, 1–35.

Regression Output for the Overall Academic Impact of Charter Schools

In Appendix Table 5 we report the regression output for the analysis of impact of charter school attendance on learning growth in reading and math.

Appendix Table 5: The Overall Impact of Washington State Charter Schools on Learning Growth

	Reading		Math	
Variable	Coefficient	SE	Coefficient	SE
Starting Score	-0.22**	0.02	-0.21**	0.02
Charter Student (1=yes)	0.04	0.06	0.07	0.09
Black	-0.12**	0.02	-0.03	0.06
Hispanic	-0.08	0.04	0.00	0.07
Asian/Pacific Islander	0.09	0.05	0.10	0.06
Native American	0.03	0.10	-0.09	0.06
Multi-racial	-0.05	0.03	0.00	0.05
Is in Poverty	-0.10**	0.02	-0.04*	0.02
Is English Learner	-0.09	0.05	-0.11*	0.04
Is Special Ed	-0.20**	0.05	-0.20**	0.06
Female	0.06**	0.02	0.00	0.02
Year 2016	-0.16*	0.06	-0.24**	0.05
Second Growth Period	0.06	0.04	0.04	0.03
Grade 06	-0.08	0.08	-0.11	0.11
Grade 07	-0.12	0.07	-0.13	0.11
Grade 08	-0.11	0.07	-0.12	0.10
Grade 10	1.12**	0.10		
Constant	0.27**	0.09	0.32*	0.13
Observations	2,612		2,298	
R-Squared	0.40		0.21	