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Charter School Performance in the State of Washington

2020

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List of Acronyms & Definitions

ALE	Alternative Learning Environment
CREDO	Center for Research on Education Outcomes
ELLs	English Language Learners
ELA	English Language Arts
EOC	End-of-Course Exam
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.
HSC	Homeschooling Center
NCES	National Center for Education Statistics
OSPI	Office of Superintendent of Public Instruction
TPS	Traditional Public School
VCR	Virtual Control Record
WWC	What Works Clearinghouse

Charter School Performance in the State of Washington 2020

Introduction

Charter schools have been offering educational choices to families across the nation for over two decades. At the same time, the charter school movement has received criticism in many states with supporters praising the charter autonomy and opponents protesting the allocation of public school resources to charters. Only a fraction of the debate is grounded in well-researched evidence about charter school practices and their impact on student outcomes. 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. This study continues CREDO's effort to expand the evidence base on charter school performance in Washington State. This report provides the second in-depth examination of the results for charter schools in Washington State by CREDO, following our first study in 2019.

Washington's initial charter school law, Chapter 28A.710 RCW, was 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. On September 4, 2015, the Washington State Supreme Court, in *League of Women Voters V. State of Washington*, issued a decision 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 four years of schooling, beginning with the 2014-2015 school year and ending with the 2017-2018 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 performance 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. Though grateful for the help and support, CREDO independently developed the findings and conclusions presented here.

This report is the second in-depth examination of the impact of charter schools in Washington State on student performance. Some people might judge our results as premature, given that the number of charter schools is still small and school operations are still expanding. Indeed, the small footprint of charter schooling in Washington plays a role in the results reported here. In general, the larger a charter sector is, the less sensitive the results are to the performance of individual schools. Despite the small charter sector and its short and turbulent history in Washington State, this study of charter school performance is valuable to policy makers, funders and the schools themselves, who have been committed to transparency from the outset.

Conducting a second study of charter school performance in Washington State only one year since the first one allows for close observation and documentation of the first steps of the charter sector in the state. Observing the early-days evolution of the charter sector in Washington State offers the opportunity to compare how the newly created charter school sector in the state looks relative to more mature charter sectors in other states.

The current report has two main benefits. First, it provides an updated rigorous and independent view of the state's charter schools, as the sector enlarges in the number of schools and the number of students served. Second, this study evaluates charter school performance using three growth periods, one more than our 2019 study, as do CREDO's reports on charter school performance in other locations, making the results amenable to being benchmarked against those nationally and in other states.

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 different student subgroups. In lieu of our traditional approach in presenting the learning gains of students in different race/ethnicities, this report offers a new way of presenting learning gains of students in different race/ethnicities. Contrary to traditional methods, our new approach estimates the full annual growth associated with each racial/ethnic group, allowing for the direct comparison of student growth across race/ethnicities without benchmarking performance against any particular race/ethnicity. Throughout the report, we highlight any differences between the current findings and the findings of our 2019 study on charter school performance in Washington State.

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) that the charter school students would otherwise have attended. These results are consistent with the findings in CREDO's 2019 study of Washington State charter schools. When we look at school-level comparisons, we find important variation in performance. Three out of nine charter schools showed significantly stronger academic progress than their local district options in both reading and math. The analysis also reveals little differences in performance for students when examined by race/ethnicity groups or for students in designated student support programs. In particular, the only statistically significant findings concern English

language learners and Hispanic English language learners. Charter attendance is associated with positive learning gains for ELL students in both subjects and positive gains for Hispanic ELL students in math.

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.

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

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, gender, and grade level.[1]

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.[2] [3] 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

[1] Usually, our methodology also controls for retention in grade but there are very few retained charter students with scores from two or more consecutive years. Consequently, we could not obtain a VCR match for any of the retained charter school students in Washington State during the years studied.

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

[3] CREDO, Urban Charter School Study (2015). http://urbancharters.stanford.edu/download/Urban%20Charter%20School%20Study%20Report%20on%2041%20Regions.pdf

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 87 percent of tested charter school observations in reading and 88 percent in math.

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 four years of student records in this study, it is possible to create three 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 "2016-2017" covers academic growth that occurred between the end of the 2015-2016 school year and the end of the 2016-2017 school year. Similarly, the growth period denoted "2017-2018" corresponds to one year of growth between the 2016-2017 school year and the 2017-2018 school year.

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).[4]

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

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 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 lasted only during the 2015-16 school year and 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.

Our investigation revealed that a majority of students who began the 2015-16 school year in a charter school remained in their school through one of the alternative administrative classifications (i.e., HSC or ALE). More than 80 percent of the students that attended a charter or an 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.[5] 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 the share of records with more than 90 days of charter attendance.

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, 8 in 2016-17, and 10 in 2017-18. Two more charter schools opened in 2018-19: Impact Public Schools:

[5] More recently, in 2017-18, 92% of students who enrolled in a charter school remained there for a length of at least 91 days.

Puget Sound Elementary and Willow Public School. The charter school sector in Washington State had been expanding until the 2018-19 school year. The 2018-19 school year was the last year of operation for three charter schools in Washington State. In particular, SOAR, Destiny Middle School and Excel Public Charter School discontinued their operation before the start of the 2019-20 school year. This 25-percent decrease in the number of charter schools in Washington State in one year demonstrates how dynamic the charter school sector in Washington State is.

Table 1 shows the charter schools that were in operation during the 2017-18 school year. The intended grade span at capacity is reported in parentheses. The two new schools that opened in 2017-18 and were not included in our 2019 study of charter school performance in Washington State are marked as "NEW" in table 1. Both new schools are included in this study.

Table 1: Charter Schools in Washington by Location

Seattle	Spokane	Tacoma
Rainier Prep (5-8) Excel (7-9) Summit: Sierra (9-11) Rainier Valley (6-9) NEW Summit: Atlas (6-12) NEW	Pride (6-12) Spokane International Academy (K-6)	Destiny (6-8) SOAR (K-8) Summit: Olympus (6-11)

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 2017-2018 school year: the full set of Washington traditional public schools, the subset of TPS from which charter schools draw students which we call *feeder schools*, and the charter schools themselves.

Table 2: Statewide Comparison of Student Characteristics in TPS, Feeders, and Charters (2017-2018 data)

	Statewide TPS	Feeders	Charters
Number of schools	2,423	208	10
Average enrollment per school	458	566	250
Total number of students enrolled	1,109,937	117,744	2,498
Students in Poverty	46%	56%	59%
English Language Leaners	12%	15%	8%
Special Education Students	15%	15%	16%
White Students	54%	45%	40%
Black Students	4%	12%	26%
Hispanic Students	23%	19%	15%
Asian/Pacific Islander Students	9%	13%	6%
Native American Students	1%	1%	2%
Multi-Racial Students	8%	10%	11%

Table 2 indicates that 8.5 percent of TPS in Washington State are feeder schools. Based on this slim proportion alone, we could not expect them to mirror the full state student profile. 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, 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 either the feeder schools they draw from or Washington public school students as a whole. Asian/Pacific Islander students and English language learners are also less prevalent in charter schools than in the other two groups of public schools. Conversely, the proportion of black students and multi-racial students enrolled in charter schools is larger than in traditional public schools. Charter schools in Washington have a share of students in poverty that is higher than the average traditional public school in Washington but close to the share of students in poverty of the feeder schools. Charter schools in Washington have a smaller share of Hispanic students than the other public schools.

Compared with our first study which used student demographics from the 2015-16 school year, we find that the demography of charter schools in 2017-18 has changed. Charter schools served slightly more white and fewer minority students in 2017-18 than in 2015-16. At the same time, the share of students in poverty in charter schools in 2017-18 was 4 percentage points lower than in 2015-16. The percentage of students in charter schools that are English Language learners or students in Special Education in 2017-18 is slightly higher than seen in 2015-16. It is worth highlighting that the average number of enrolled students per charter school in 2016-17 increased by 64 percent over the average school size in 2015-16.

Policymakers and stakeholders continue to examine the degree to which students with special needs enroll in charter schools. An earlier study found that charter schools in 27 States serve a lower percentage of special education students than feeder schools. [6] This is not the case in Washington State. Table 2 shows that roughly 15 percent of students in TPS overall and feeders receive special education services. At the same time, 16 percent of the Washington State charter school population has a designated special education status, up by 4 percentage points since our 2019 study of charter school performance in Washington State, which reported student characteristics during the 2015-16 school year.

Because charter schools in Washington State cluster in three municipalities (Seattle, Spokane, and Tacoma), we also provide student demographic comparisons in each of those locations. Table 3 compares two student populations in Seattle in the 2017-2018 school year: the subset of TPS from which Seattle charter schools draw, and the charter schools themselves.

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

	Feeders	Charters
Number of schools	73	5
Average enrollment per school	667	215
Total number of students enrolled	48,682	1,073
Students in Poverty	58%	58%
English Language Leaners	21%	15%
Special Education Students	13%	15%
White Students	34%	26%
Black Students	15%	42%
Hispanic Students	24%	15%
Asian/Pacific Islander Students	18%	8%
Native American Students	1%	1%
Multi-Racial Students	8%	9%

Table 4 compares two student populations in Spokane in the 2017-2018 school year: the subset of TPS from which Spokane charter schools draw, and the two Spokane charter schools themselves.

[6] 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, received special education services. At the same time, 8 percent of the charter school population in those 27 States had a special education designation.

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

	Feeders	Charters
Number of schools	103	2
Average enrollment per school	492	401
Total number of students enrolled	50,710	801
Students in Poverty	56%	49%
English Language Leaners	6%	1%
Special Education Students	18%	14%
White Students	71%	71%
Black Students	3%	6%
Hispanic Students	10%	7%
Asian/Pacific Islander Students	3%	2%
Native American Students	1%	3%
Multi-Racial Students	11%	11%

Table 5 compares two student populations in Tacoma in the 2017-2018 school year: the subset of TPS from which Tacoma charter schools draw, and the three Tacoma charter schools themselves.

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

	Feeders	Charters
Number of schools	49	3
Average enrollment per school	597	208
Total number of students enrolled	29,234	624
Students in Poverty	56%	73%
English Language Leaners	12%	7%
Special Education Students	15%	20%
White Students	35%	26%
Black Students	15%	26%
Hispanic Students	24%	23%
Asian/Pacific Islander Students	13%	6%
Native American Students	1%	2%
Multi-Racial Students	12%	17%

Charter schools in Tacoma serve a higher percentage of students in poverty than their feeder schools, while this is not the case in Seattle or Spokane. Charter schools in Spokane have a lower percentage of students in poverty than charter schools in Tacoma or Seattle. At the same time, charter schools in Tacoma have a higher percentage of students in poverty compared with the other two charter school locations (Seattle and Spokane). In our 2019 study of charter school performance in Washington State, Seattle charter schools had the lowest percentage of students in poverty (52%) and Tacoma had the highest (79%).

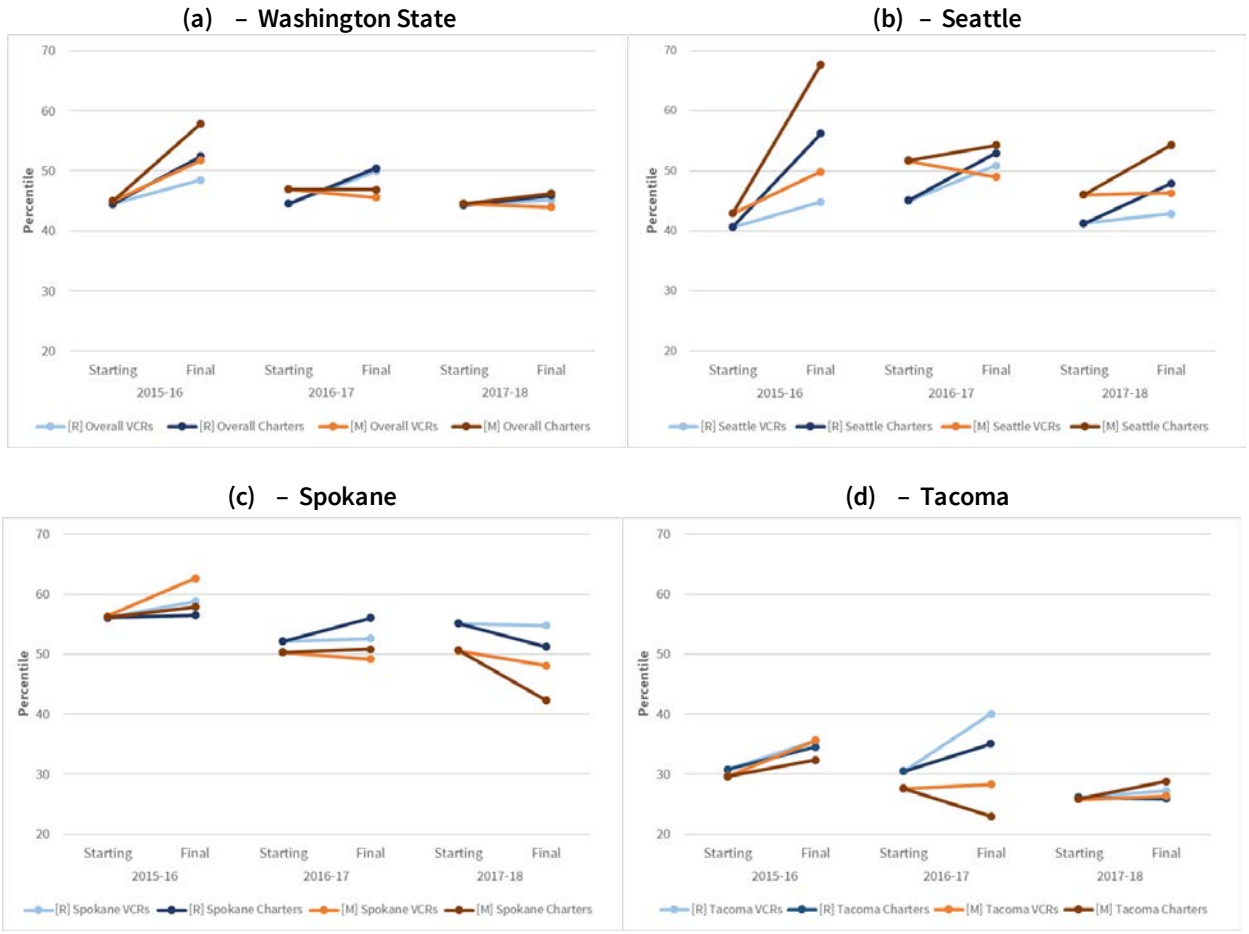
Charter schools in Tacoma have a higher percentage of students with special education designations than charter schools in Seattle or Spokane. In Seattle, charter schools (and their feeders) have a higher percentage of English language learners (ELL) compared with Spokane and Tacoma. The difference in percentage of ELLs served by charters versus feeders in Seattle (-6 percentage points) is similar to the corresponding difference in Tacoma and Spokane (-5 percentage points). In our 2019 study, the difference in the percentage of ELLs served by charters versus feeders in Seattle (-7 percentage points) was greater than the corresponding difference in Spokane (-5 percentage points) but smaller than the corresponding difference in Tacoma (-9 percentage points).

Charter schools in Seattle have a higher percentage of black students compared with charter schools in the other two charter school locations (Spokane and Tacoma). In Spokane, charter schools (and their feeders) have a higher percentage of white students compared with the other two charter school locations (Seattle and Tacoma). Charter schools in Tacoma have a higher percentage of Hispanic students compared with charter schools in the other two charter school locations: Seattle and Spokane. The racial makeup patterns of different charter school locations are consistent with the patterns found in our 2019 study of charter school performance in Washington State.

TPS and Charter Average Achievement

When presenting the estimated impact of charter attendance each period, the performance of charter school students is computed *relative to that of their* TPS Virtual Control Records (VCRs). This is important to note, since the VCR performance is equated to zero for computational purposes. Accordingly, the analysis cannot discern if there are significant trends in the achievement in TPS over time. For example, overall charter school performance could potentially increase if the TPS students' performance declines, even if the absolute performance of the charter students stays constant. To check this possibility, we graphed the achievement of matched charter students and their TPS VCRs using the percentile distribution of achievement across the state to calculate reading and math trends across the years of the study (from 2014-15 to 2017-18). The 50th-percentile line in Figure 1 corresponds to the growth of the average student in Washington State.

Figure 1: Achievement of Matched Charter Students and TPS VCRs in Math and Reading by Location



Since the matching methodology requires the first-observed achievement scores of TPS and charter school students to align, their starting achievement is identical in each growth period. Figure 1 (a) shows that final achievement in reading improved compared with starting achievement for both groups in every growth period, a gratifying finding. Achievement in math increased in absolute terms for charter students during the 2015-16 and 2017-18 growth periods, while it remained flat during the 2016-17 growth period. VCR achievement in math increased during the 2015-16 growth period while it declined slightly during the 2016-17 and 2017-18 growth periods. With improved or relatively steady 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. This pattern relieves any concern that charter school performance was artificially inflated by the trends in VCR performance.

Figure 1 (b) tells the story when students in Seattle are examined separately. Charter students in Seattle and their VCRs exhibit similar starting achievement in each subject in every growth period. Compared with the state average (50th percentile), overall starting achievement levels are lower in Seattle in both subjects in the first and

third growth period. In the second growth period, charter students in Seattle and their VCRs exhibit lower starting achievement than the state average in reading. The starting achievement of charter students and VCRs is slightly above the state average in math in the second growth period. TPS VCRs in Seattle show higher final than starting achievement in every subject and every growth period, with the exception of math in the 2016-17 growth period. Charter students in Seattle exhibit higher final achievement than their own starting achievement and the final achievement of their VCRs matches in every growth period in both subjects. The difference in final achievement in either subject of charter students and VCRs is higher in the 2017-18 growth period than what it was in the 2016-17 growth period, but not as high as in the 2015-16 growth period.

Figure 1 (c) tells the story for Spokane only. By construction, the starting achievement of VCRs in Spokane matches the starting achievement of charter students in Spokane in every growth period in either subject. Compared with the state average (50th percentile), overall starting achievement levels are higher in Spokane in both subjects in every growth period. In the first (2015-16) and third (2017-18) growth period, TPS VCR final achievement exceeds the final achievement of charter students in both subjects. Only in the second growth period (2016-17) is the final achievement of charter students higher than the final achievement of their VCRs in either subject. In the 2017-18 growth period, the final achievement of charter students is lower than their own starting achievement in both reading and math, which was not the case in any of the previous growth periods.

Figure 1 (d) tells the story for Tacoma, which differs from Seattle, Spokane, and the statewide findings. The starting and final achievement of students in Tacoma is lower than the corresponding statewide average starting and final achievement in every growth period in both reading and math. The final achievement of TPS VCRs exceeds the final achievement of charter schools in every subject and growth period, with the exception of math in the 2017-18 growth period. Charter student's final achievement falls behind the final achievement of TPS VCRs in either subject the most during the 2016-17 growth period.

When comparing the starting and final achievement of charter schools and TPS across different locations and growth periods, we observe that Seattle charter students experience the highest one-year growth (without accounting for differential student characteristics) compared with TPS VCRs in Seattle in both reading and math. The higher achievement of charter students in Seattle compared with their VCRs across subjects and growth periods and the share of charter students in Seattle suggest 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. In particular, charter students in Seattle, the only location where charter students outpace their VCRs in both subjects in the 2017-18 growth period, are likely to be the chief driver of an increased overall impact of charter attendance of the 2017-18 growth period relative to the earlier growth periods.

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 three 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.[7]

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 across TPS and charter schools, the pertinent comparison student is the same for TPS and charter students. 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.

[7] The Days of Learning computation uses 4th and 8th grade test scores from the National Assessment of Educational Progress and individual state test results, following the methodology of Hanushek, Eric A., Paul E. Peterson, and Ludger Woessmann in "Achievement Growth: International and US State Trends in Student Performance." Program on Education Policy and Governance, Report No.: 12-03, Harvard University (2012). The values in Table 6 are updated from past reports using 2017 NAEP scores, which show slower absolute annual academic progress than earlier administrations. Additional information can be found here.

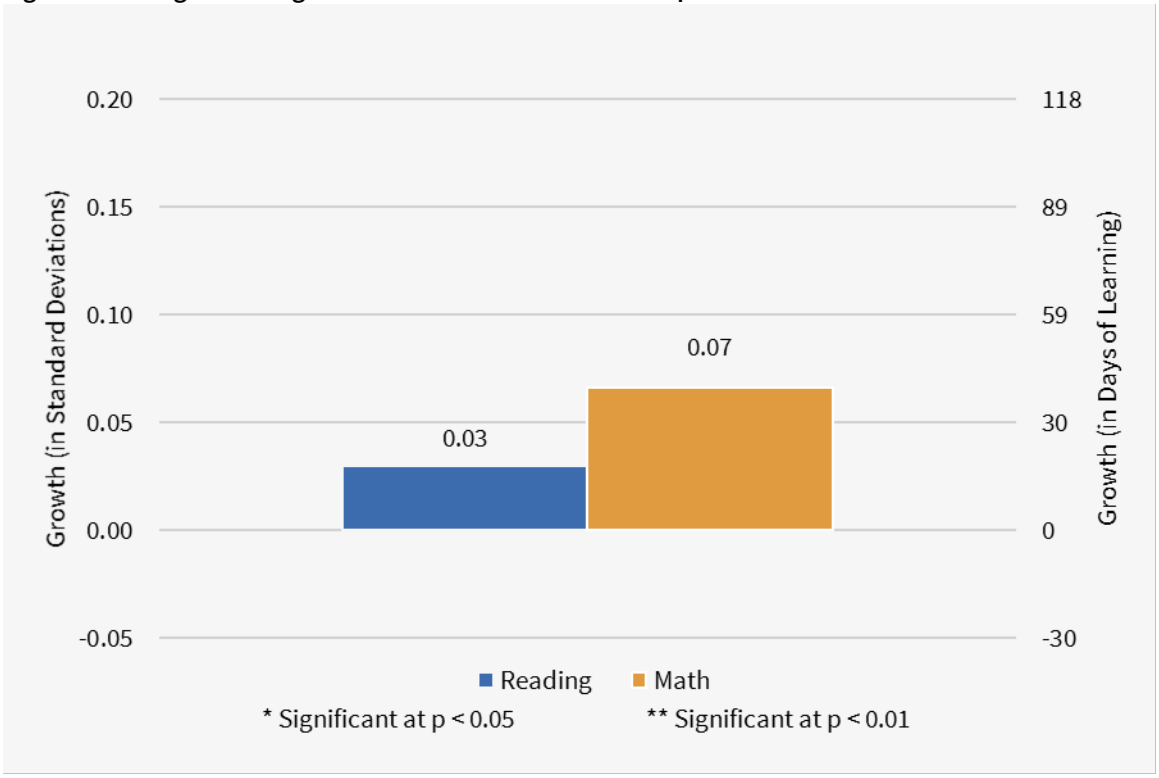
Table 6: Transformation of Average Learning Gains to Days of Learning

Standard Deviations	Days of Learning
0.00	0
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 made in a year is fixed as 180 days of effective learning based on the typical 180-day school year. Thus, a student performing at the 50th percentile in two consecutive years would be considered to exhibit learning gains equivalent to zero additional days of learning beyond the progress typically made in a school year. We 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 the 180 days.

The bars in Figure 2 shows that across all communities and years of study, charter school students posted larger academic gains in a year's time than their VCR peers. However, in both tested subjects, these differences were not statistically significant, meaning the differences could have results from random chance. We conclude, then, that there is no appreciable difference in academic gains for students in charter schools compared to their TPS counterparts.

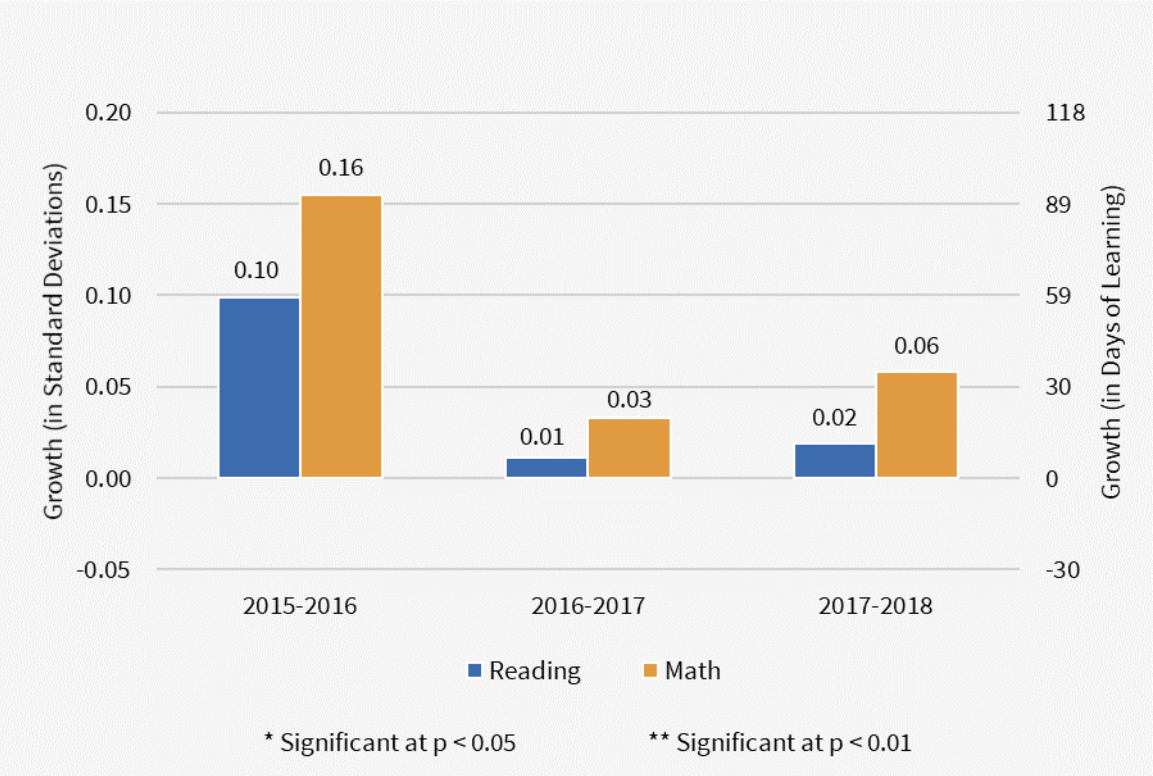
Figure 2: Average Learning Gains in WA Charter Schools Compared with Gains for VCR Students



Charter School Impact by Growth Period

To determine whether performance was consistent the years of this study, the average charter school impacts were disaggregated into the three growth periods of this study. Results are shown in Figure 3.

Figure 3: Average Learning Gains in WA Charter Schools Compared with Gains for VCR Students by Growth Period, 2015-2016 to 2017-2018



The gains of Washington charter school students during the 2015-2016, the 2016-2017, and the 2017-18 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 with their TPS peers, although these gains are not statistically different from those of their TPS counterparts. During the 2016-2017 and 2017-18 growth periods, charter students continue to experience positive but not statistically significant learning gains compared with 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. The learning gains associated with charter school attendance in the 2017-18 growth period are slightly higher than those in the 2016-17 growth period but smaller than the learning gains of charter students in the 2015-16 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 academic 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 2017-18 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 in Figure 4.

Figure 4: Average Learning Gains in WA Charter Schools Compared with Gains for VCRs by Students' Years of Enrollment in Charter Schools

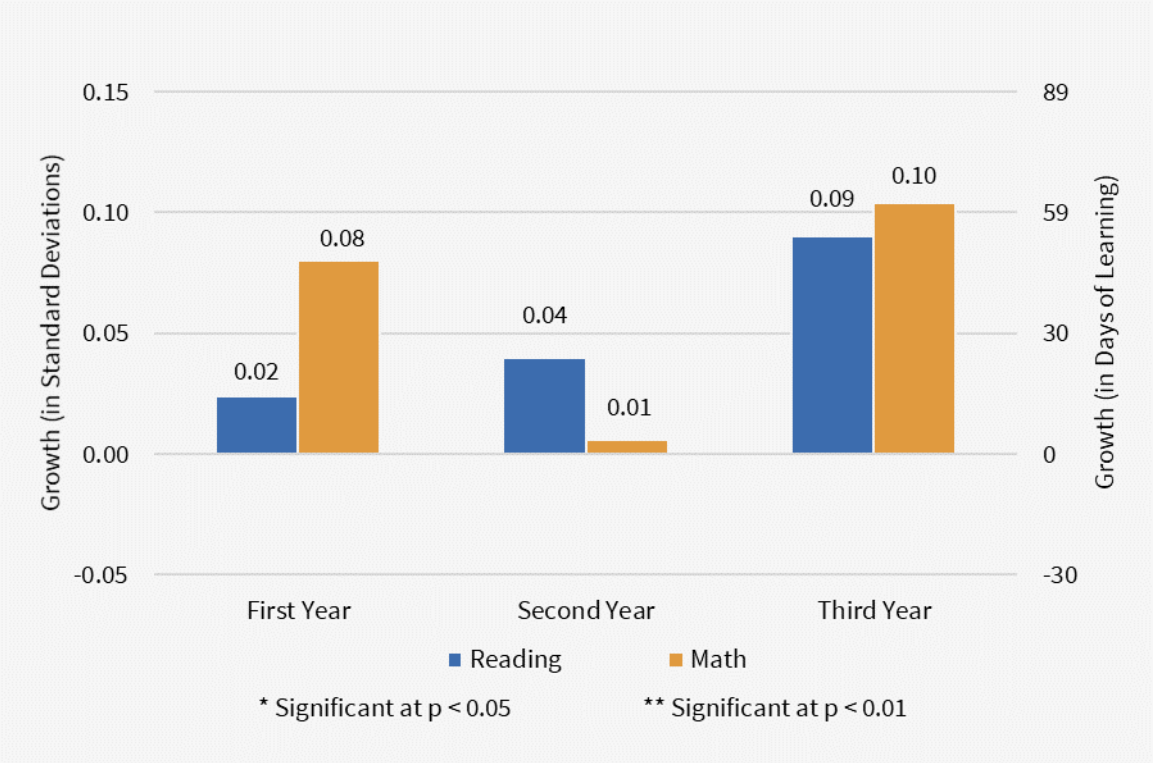
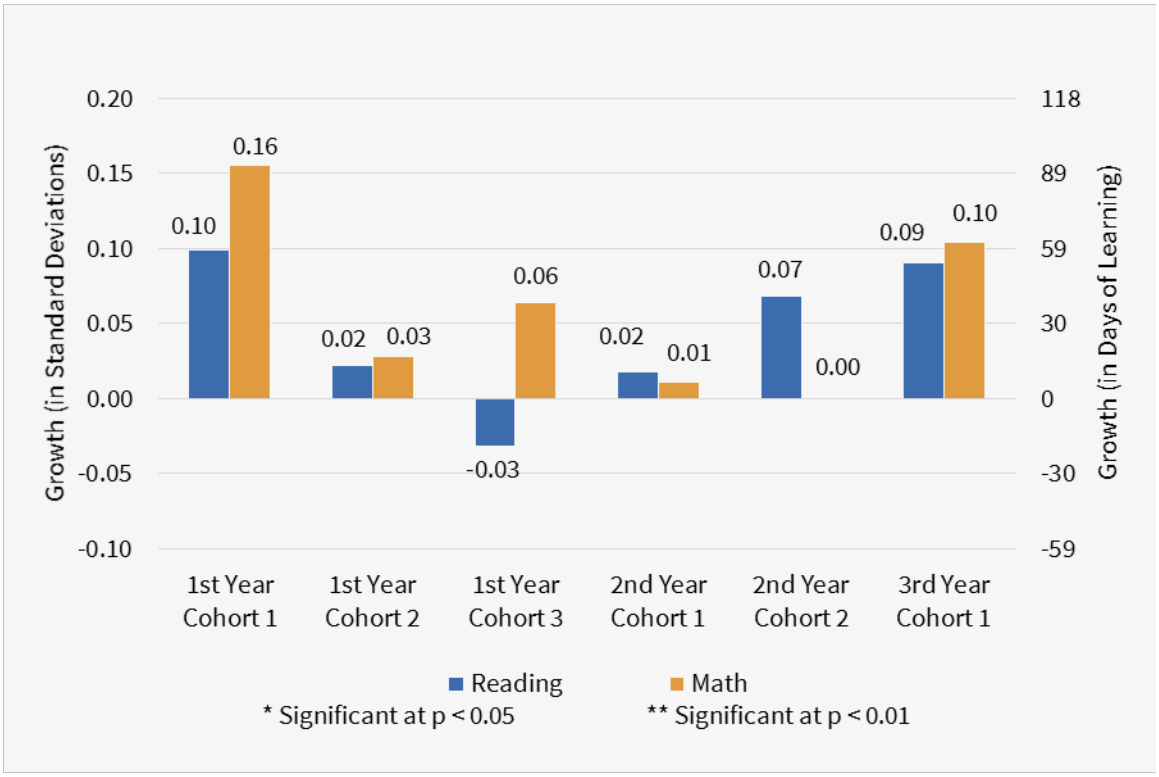


Figure 4 shows that Washington State charter school students experience learning growth in the first, second, and third year of charter attendance that is not statistically different from that of students (VCR) enrolled in traditional public school settings. Drawing from CREDO's National Charter School Study II (2013), we find that learning gains increase with every additional year of charter school attendance.

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

As mentioned earlier, each academic year has witnessed the mix of charter schools change in Washington State. At the same time, results for some schools appear in later years as their students begin to participate in state testing programs or new students enroll in charter schools. Thus, results of school performance by growth period or years of charter school enrolment alone may mask the evolution of the growth of different cohorts of new students in charter schools over time. This section explores the growth differences between charter students and their VCRs by both the year first enrolled in a charter school (i.e., entry year cohort) and the number of consecutive years of enrollment in a charter school. Figure 5 reports our estimated learning gains for each entry year cohort and years of charter enrollment. Cohort 1 is the cohort that first enrolled in a Washington charter school in 2015-16. Cohort 2 is the cohort that enrolled in a Washington charter school in 2016-17. Cohort 3 enrolled in a charter schools in Washington State in 2017-18. In our study, only Cohort 1 has three years of charter enrollment. We find that learning gains of charter students are not statistically different from those of students in traditional public school settings for any cohort by years in charter configuration.

Figure 5: Average Learning Gains in WA Charter Schools Compared with Gains for VCRs by Students' Years of Enrollment in Charter Schools 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 Washington charter sector, the results do not let us understand if some charter schools perform better than others. Since school-level results are of interest to policy makers, parents and the general public, we study the performance of charter schools at the school level. We compute the overall performance for a charter school by taking the average academic growth of all tested students, conditional on there being a sufficient number of tested students to make a reliable inference on performance.[8]

It is important to understand the counterfactual used in this section. As shown in Table 2 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–level average provides a precise estimate of the alternative local option.

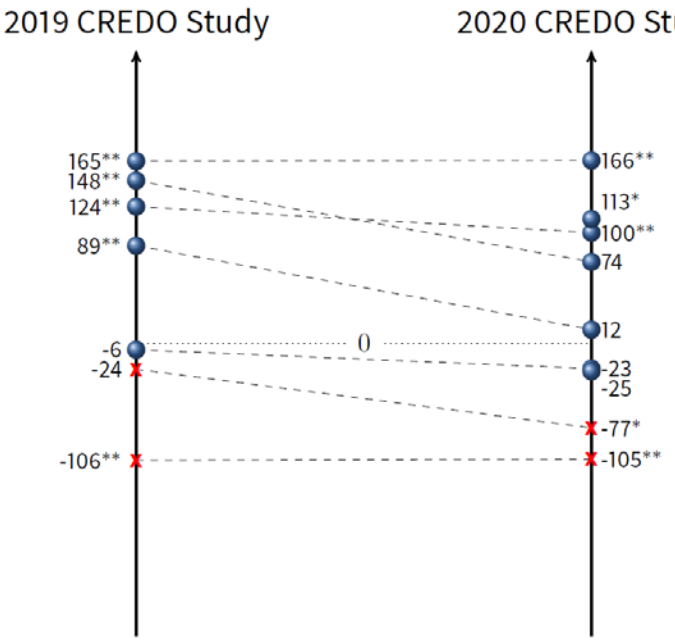
In order to determine the distribution of charter school performance, the per-year learning impact of each charter school over the last two growth periods included in this study (growth periods 2016-2017 and 2017-2018)[9] was estimated. Using the learning impact of each charter school, we infer its quality relative to the quality of traditional public schools. The estimated learning impact for each charter school can be zero, negative or positive. When the estimated learning impact of a charter school is zero, we infer that the charter school under consideration is no different than the traditional public school that students in that charter school would have 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 public schooling alternatives of its students.

As noted in Table 2, 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 9 schools with reading and math test scores in the 2016 and 2017 growth periods.

[8] The number of students required to produce an adequate measure of performance depends on the number of students in each school taking tests and the number of years in which testing occurred.

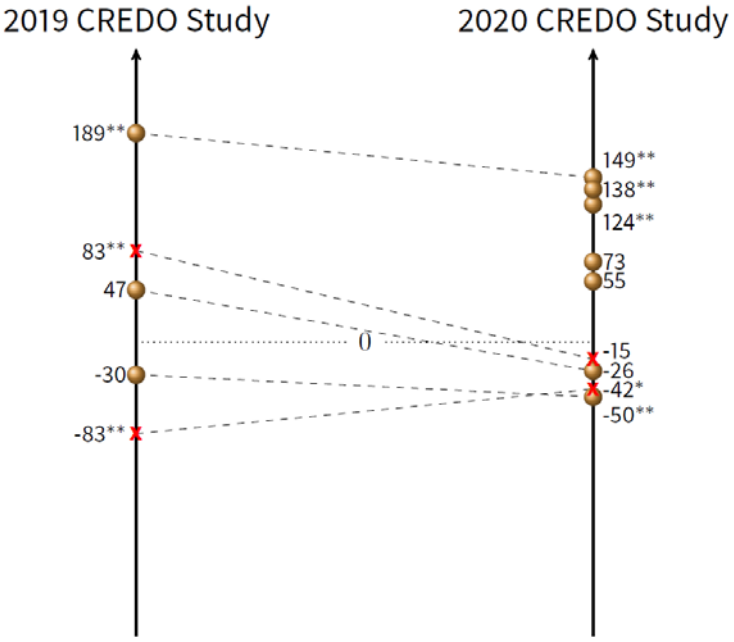
[9] Growth period 2017 represents growth between Spring of 2016 and Spring of 2017. Growth period 2018 represents growth between Spring of 2017 and Spring of 2018.

Figure 6: Range of Learning Gains in Reading in WA Charter Schools Compared with Gains for VCRs



Notes: Learning gains for each charter school shown in Days of Learning. Sufficient data available for two out of three schools that closed in 2019-20 (represented with red x's). * (**) Significant at the 0.05 (0.01) level.

Figure 7: Range of Learning Gains in Math in WA Charter Schools Compared with Gains for VCRs



Notes: Learning gains for each charter school shown in Days of Learning. Sufficient data available for two out of three schools that closed in 2019-20 (represented with red x's). * (**) Significant at the 0.05 (0.01) level.

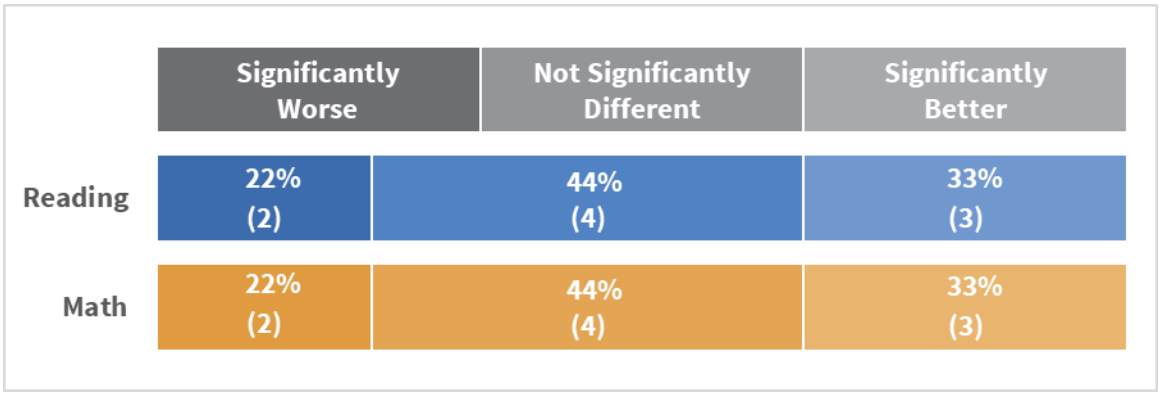
The varying levels of learning gains by school are depicted in Figures 6 and 7 for reading and math, respectively. Each ball represents the learning gains in days of learning associated with attendance in a specific charter school. Each charter school in Washington State is represented by a ball on the vertical axis for reading and as another ball on the vertical axis for math. The statistical significance associated with the learning gains of each school is represented by stars. We report the school-level growth estimates from our 2019 study as a point of reference.

In our current round of study, the learning gains in reading of a charter school in Washington State range from 105 fewer days of learning to 166 additional days of learning, when compared with traditional public schooling alternatives. In math, the learning gains of a charter school in Washington State are found to range from 50 fewer days of learning to 149 additional days of learning, when compared with traditional schooling alternatives. Comparing the learning gains by school in this report with the gains by school in our 2019 Washington State report, we find that the range of school-level gains in reading has remained roughly the same, while the range of school-level gains in math has decreased. The lowest performing school in math in this study exhibits average learning gains that are higher by 33 additional days of learning than the lowest-performing school in math in our 2019 study. At the same time, the highest performing school in math in this study posts lower average learning gains by 40 fewer days of learning compared with the highest-performing school in math in our 2019 study.

We obtained sufficient test score information to estimate the academic growth associated with attendance of the two out of three charter schools in Washington State that discontinued their operation before the start of 2019-20 school year. The learning gains of those two schools are represented with red balls in Figures 6 and 7 for reading and math, respectively. The two schools that closed had some of the weakest average gains across the 2016-17 and 2017-18 growth periods (2020 CREDO study) among charter schools in Washington State in both reading and math.

Figure 8 summarizes the performance comparison of charter schools in Washington State relative to traditional public schooling options in reading and math in the current study, respectively.

Figure 8: Performance of Charter Schools Compared with Traditional Public Schooling Alternatives in Washington State



Note: The number of charter schools in each category is reported in parenthesis.

In both reading and math, three out of nine or 33 percent of charter schools post growth that is significantly higher than that of their traditional public schooling counterparts. Each of these results shows growth slightly above the national average. To benchmark these figures at the national level using the 2013 National Charter Study II, 25 percent of charter schools nationally outperform the traditional schooling alternatives in reading and 29 percent do so in math.[10]

Two out of nine or 22 percent of Washington charter schools have reading performance that is significantly weaker than the traditional public schooling option as compared with the 2013 national figure of 19 percent. In math, two out of nine or 22 percent of charter schools post growth results weaker than the traditional public schooling option compared with the 2013 national figure of 31 percent.

In both reading and math, four out of nine or 44 percent of charters in Washington State do not differ significantly 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 and the traditional schooling alternative to have similarly high levels of growth, and the reverse is also true.

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

Academic Performance of Student Subgroups

With 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 emphasized that public schools must offer high-quality learning for all students. This intention has been reflected in the creation of charter schools, whose part of the rationale has been to build education options that allow all students to learn.

Earlier views of charter school performance in this report do not answer whether the impact of charter school performance is evenly spread across all groups of students. This section of our study specifically investigates the impact of charter school attendance on the learning gains of students of different racial backgrounds, students in poverty, and students receiving support services (special education services, or English language support).

How much a student learns in a year's time – measured as learning gains or progress – influences the cumulative stock of knowledge and cognitive skills the students has at the end of that year, which is captured by achievement metrics. Over time, when progress consistently differs across groups of students, gaps in their respective levels of achievement materialize. Schools play a significant role in how much their students learn and whether the learning is equivalent across all student groups. There is a strong policy interest in seeing if some student groups fare better in particular environments, so the analysis in this section also considers educational settings.

For each group or subgroup of students, we are interested in two questions.

The first question is whether the annual gains in learning are the same across all student subgroups. In a departure from conventional practice we present an alternate approach to showing learning gaps between different race/ethnicities. Relying on the traditional analysis of using one group of students as benchmark (white male students in TPS who do not qualify for subsidized school meals, special education services, or English Language Learner support and is not repeating the current grade), we configure the results differently to show the **total** annual learning gains of each race/ethnicity in traditional public school settings and charter schools.

The second question examines whether there are differences in learning *for the same student subgroup* between those educated in TPS settings and those in charter schools. This question aims to discover if some student subgroups have learning advantages in one type of school or another. The question is especially pertinent for disadvantaged student groups, as many charter schools are created to target these students. To address this question, the TPS-enrolled students in each student subgroup are treated as the baseline and the learning of charter students in the subgroup are compared to it.

Academic Performance of Students by Race/Ethnicity

Table 2 showed that Washington charter schools serve a demographically diverse student population. In particular, the two largest racial minorities in the charter school population, black and Hispanic students, account for 26 and 15 percent of the charter school population, respectively. At the same time, Asian/Pacific Islander students make up six percent of the charter school population in Washington State. This section shows the learning gains of students in different race/ethnicities in charter schools and traditional public school settings. We also show the impact of charter school attendance on the learning gains of students in different race/ethnicities.

Learning Gains by Race/Ethnicity: A New Approach without a Benchmark Race/Ethnicity

In this section, we offer a new way of presenting how much students in different race/ethnicities learn in a year in different school settings. We depart from the conventional approach of measuring learning gaps in minority racial/ethnic groups against white students in traditional public school settings. Instead, the **total** annual learning gains of each race/ethnicity in traditional public school settings and charter schools are reported.

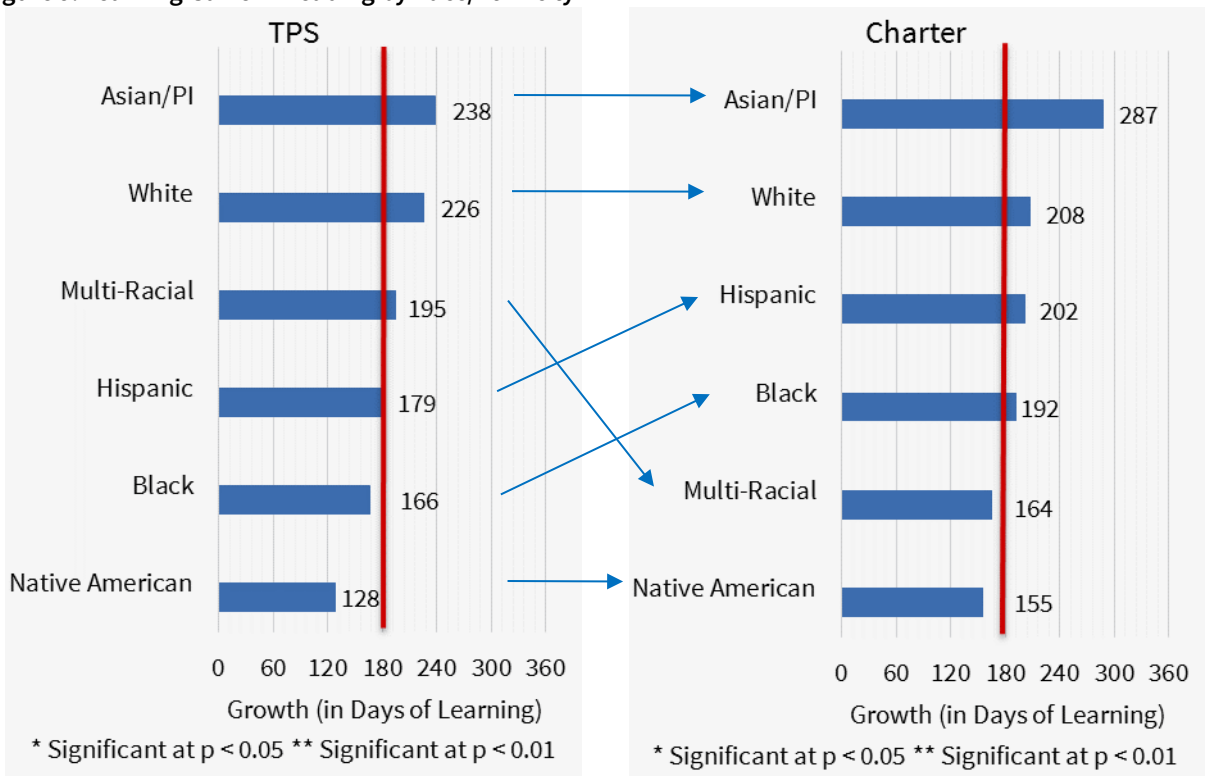
Fair comparisons of performance across race/ethnicity groups should consider only the distinct effect of race/ethnicity. A student has many characteristics. For example, they may be part of a particular racial/ethnic group and they may be in poverty or receive special education services. A particular student's growth may be additively affected by their individual characteristics. By accounting for other student characteristics (i.e., past endowments, services received, timing), we isolate the learning gains associated with being part of each racial/ethnic group. Thus, we are able to compare the learning gains in different school settings of students who differ only in the racial/ethnic group they are part of.[11]

Figures 9 and 10 show the average annual growth of students in each race/ethnicity in traditional public school settings and charter schools in reading and math, respectively. In each figure, the growth for students in each race/ethnicity group is shown in rank order. For reference, the annual growth of the average student in Washington State – considered to be 180-days of learning – is presented as a vertical red line in Figures 9 and 10. We tested whether the distance between the red line and the performance of each race/ethnicity group was significant in a statistical manner, but none reached the level of statistical significance. In addition, in this section, we discuss the results of tests of statistical equivalence of the annual growth of students across different race/ethnicities in the same school setting as well as of the growth of students in the same race/ethnicity across TPS and charter schools.[12]

Figure 9 shows the average growth in reading of students in traditional school settings and charter schools.

[11] A technical description of our methodology is provided in Appendix B.
[12] Technical details on our statistical tests are provided in Appendix B.

Figure 9: Learning Gains in Reading by Race/Ethnicity



Note: the vertical red line represents the one-year academic growth of the average student in Washington State.

Figure 9 shows that Asian/Pacific Islander students in both TPS and charter schools have the highest average annual growth in reading compared with students in other race/ethnicities in the respective school setting, followed by white students. The learning gains in reading of Asian/Pacific Islander students are statistically equivalent to the gains of white students in either school setting. Asian/Pacific Islander students outpace every other minority race/ethnicity in TPS by at least 43 additional days of learning in reading and these differences are statistically significant. Asian/Pacific Islander students outpace every other minority racial/ethnic group in charter schools as well by at least 85 additional days of learning in reading, while the difference is statistically significant only with respect to black, Hispanic, and multi-racial students in charter schools. Native American students post the lowest average annual growth in reading compared with students in other race/ethnicities in TPS and charter schools, respectively, but the differences are statistically significant only in the traditional public school context and only with respect to white and Asian/ Pacific Islander students in the same setting.

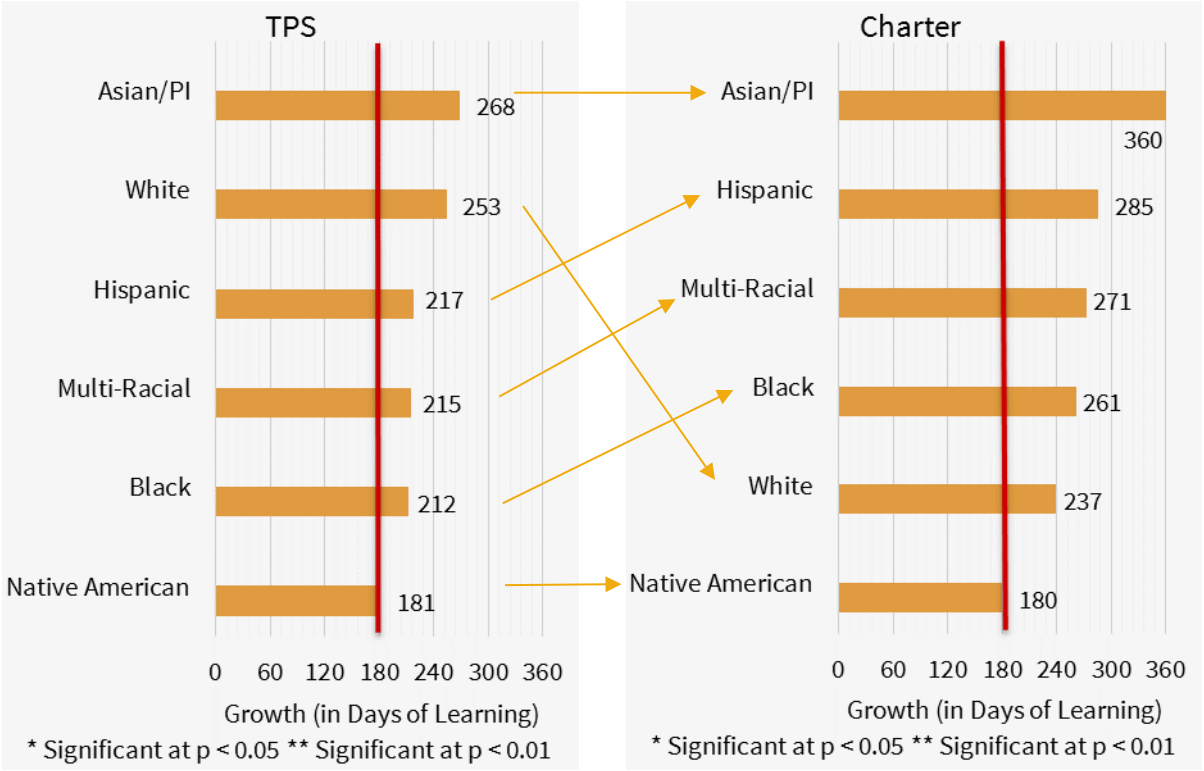
Asian/Pacific Islander, white, and multi-racial students in TPS post gains equivalent to 58, 46, and 15 days of learning in reading above the learning gains of the average student in the state, respectively. Native American and black students in TPS exhibit growth in reading that is equivalent to 52 and 14 fewer days of learning below the growth of the average student in the state, respectively. Hispanic students in TPS post average growth in reading that is roughly equal to the growth of the average students in the state. In charter schools, Asian/Pacific Islander, white, Hispanic, and black students exhibit growth in reading that is equivalent to 107, 28, 22, and 12 additional

days of learning above the growth of the average student in the state, respectively. Native American and multi-racial students in charter schools report growth in reading that is equivalent to 25 and 16 fewer days of learning below the growth of the average student in the state, respectively. Despite the differences in the average growth of students in the various racial/ethnic groups and the growth of the average student in the state, the learning gains of each race/ethnicity in reading in either school setting are statistically similar to the learning gains of the average student in the state.

The results in Figure 9 can also address intra-group comparisons across school settings. Apart from white and multi-racial students, students in every other race/ethnicity in charter schools post a higher average annual growth in reading compared with their counterparts in traditional public school settings. The average annual growth in reading of white and multi-racial students in charter schools is slightly lower than the growth of their counterparts in traditional public school settings. Among race/ethnicities with a positive charter school impact on growth, Asian/Pacific Islander students exhibit the strongest charter school impact with 49 additional days of learning in reading on average as a result of their charter school attendance. This is nearly double the amount of additional days of learning students in every other racial/ethnic group post as a result of their charter school attendance. Despite the differences in average growth, the learning gains in reading of charter students in each racial/ethnic group are statistically equivalent to the gains of students in the respective racial/ethnic group in TPS.

Figure 10 shows the average growth in math of students in traditional public school settings and charter schools.

Figure 10: Learning Gains in Math by Race/Ethnicity



Note: the vertical red line represents the growth of the average student in Washington State.

Figure 10 shows that Asian/Pacific Islander students have the highest average annual growth in math compared with students in other race/ethnicities in either TPS or charter schools. Asian/Pacific Islander students outpace every other minority race/ethnicity in TPS by at least 15 additional days of learning in math, while the difference is statistically significant only with respect to Hispanic, Native American, and multi-racial students in the same school setting. In charter schools, Asian/Pacific Islander students outpace every other minority racial/ethnic group by at least 75 additional days of learning in math and these differences are statistically significant. Conversely, Native American students post the lowest average annual growth in math compared with students in other race/ethnicities in TPS and charter schools, respectively. The differences in growth in math of Native American students with the growth of other racial/ethnic groups are statistically significant in the TPS context only with respect to Asian/Pacific Islander and white students and in charter schools only with regard to Asian/Pacific Islander students.

Every racial/ethnic group in TPS except for Native American students reports growth in math above the growth of the average student in the state by between 32 (black students) and 88 (Asian/Pacific Islander students) additional days of learning. Native American in TPS exhibit average growth in math that is roughly equal to the growth of the average student in the state. In charter schools, students in every race/ethnicity except for Native American students again exhibit gains in math above the gains of the average student in the state by between 57 (white students) and 180 (Asian/Pacific Islander students) additional days of learning. Native American students

in charter schools report growth in math that is equal to the growth of the average student in the state. Despite the differences in the average growth in math of students in the various racial/ethnic group and the growth of the average student in the state, the learning gains of each race/ethnicity in either school setting are statistically equivalent to the learning gains of the average student in the state.

Figure 10 also allows for the comparison of growth in math of students in the same racial/ethnic group across school settings. Apart from white and Native American students, students in every other race/ethnicity in charter schools post a higher average annual growth in math compared with their counterparts in traditional public school settings. The average annual growth in math of white and Native American students in charter schools is slightly lower than the growth of their counterparts in traditional public school settings. Among race/ethnicities with a positive impact on growth associated with their charter school attendance, Asian/Pacific Islander students exhibit the strongest charter school impact with 92 additional days of learning in math on average as a result of their charter school attendance. This is nearly 50 percent higher than the additional days of learning students in every other racial/ethnic group exhibit as a result of their charter school attendance. Despite the differences in average growth, the learning gains in math of charter students in each racial/ethnic group are statistically equivalent to the gains of students in the respective racial/ethnic group in TPS.

This new manner of presentation offers policy makers, funders, and schools a full view of student growth for all racial/ethnic groups. This new presentation does not use any particular race/ethnicity as benchmark, allowing for the direct—rather than relative—measurement of learning gaps of students in different race/ethnicities. The main take-away is that despite nominally large differences in learning gains across the groups, none are statistically significantly different from the state average for all students.

Charter School Impact on Learning Gains by Student Race/Ethnicity

Tables 7a and 7b highlight the difference in learning gains between charter schools and TPS for each student racial/ethnic group in reading and math, respectively. The overall impact of charter attendance on the learning gains across all students is also included as a reference point.

Readers' tip for tables below: If the learning gains were equivalent between TPS and charter school students, the values in the "Standard Deviation Units" column would be 0.00.

Table 7a: Charter School Impact on Learning Gains in Reading by Student Racial/Ethnic Group

Student Group	Standard Deviation Units	Days of Learning
All Students[1]	0.03	n.s.
Asian/Pacific Islander Students[2]	0.08	n.s.
Black Students[2]	0.04	n.s.
Hispanic Students[2]	0.04	n.s.

Table 7b: Charter School Impact on Learning Gains in Math by Student Racial/Ethnic Group

Student Group	Standard Deviation Units	Days of Learning
All Students[1]	0.07	n.s.
Asian/Pacific Islander Students[2]	0.16	n.s.
Black Students[2]	0.08	n.s.
Hispanic Students[2]	0.12	n.s.

Table Notes:

[1] Benchmarked against all students in traditional public school settings (TPS).

[2] Benchmarked against TPS students in the same racial/ethnic group.

The values with stars indicate statistically significant differences; all others should be interpreted as being no statistically different from zero (n.s.). * Significant at the 0.05 level, **Significant at the 0.01 level

Asian/Pacific Islander Students

Tables 7a and 7b show the comparison of learning gains of students in different racial/ethnic groups across school settings. Asian/Pacific Islander students in charter schools exhibit similar academic progress to the progress of Asian/Pacific Islander students in traditional public school settings in both reading and math.

Black Students

In Washington State, black charter school students experience similar growth to their black TPS counterparts in reading and math, a finding consistent with our 2019 study.

Hispanic Students

Hispanic students in charter schools show similar learning growth to Hispanic students attending traditional public school settings in math and reading. This finding is consistent with the corresponding result in our 2019 study.

Academic Performance of Students Receiving Support Services

According to the latest statistics reported by the National Center for Education Statistics, 34 percent of charter school students attend schools in which more than 75 percent of students qualify for free or reduced-price lunch, a proxy for low income households.[13] In Washington State, 59 percent of charter school students are eligible for subsidized school meals compared with 46 percent of TPS students across the state. Poverty may negatively impact the academic progress of students.

Table 2 shows that a sizable proportion if the charter school population in Washington State receive support services, such as special education services or English language support. In particular, fourteen percent of the charter school population in Washington State receives special education services. In TPS across the state and in feeder schools, the special education populations amount to 15 percent of total enrollment. Compared with national proportions, the proportions in Washington State seem to be on par.[14] It is challenging to compare the outcomes of students receiving special education services, regardless of where they enroll, as these services vary widely. Ideally, 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.

At the same time, eight and 12 percent of the student population in charter schools and TPS across Washington State, respectively, are English language learners. The 2015 National Assessment of Education Progress documents a performance gap between English language learners and their English proficient peers.[15]

This section shows the learning gains of students receiving different support services in traditional public school settings and charter schools. We also show the impact of charter school attendance on the learning gains of students receiving different support services.

Differences in Learning Gains by Student Support Services

Tables 8a and 8b present the learning gains of student subgroups receiving support services across different school settings in reading and math, respectively. The learning gains of all students in charter schools and traditional public school settings are reported as a reference point. Table 8a (8b) shows the difference in learning gains in reading (math) for each student subgroup between charter schools and TPS.

Readers' tip for tables below: If the learning gains were equivalent across all groups, the values in all the cells would be 0.00.

[13] The information was retrieved from "Public Charter School Enrollment," National Center for Education Statistics, https://nces.ed.gov/programs/coe/indicator_cgb.asp, when the report was produced.

[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.

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

Table 8a: Differences in Learning Gains in Reading by Student Support Services

Student Group	Standard Deviation Units		Days of Learning	
	TPS	Charter	TPS	Charter
All Students[1]	0.00	0.03	0	n.s.
Students in Poverty[2]	-0.10**	-0.04	-59**	n.s.
Special Education Students[3]	-0.16**	-0.23*	-94**	-136*
English Language Learners[4]	-0.09**	0.01	-53**	n.s.

Table 8b: Differences in Learning Gains in Math by Student Support Services

Student Group	Standard Deviation Units		Days of Learning	
	TPS	Charter	TPS	Charter
All Students[1]	0.00	0.07	0	n.s.
Students in Poverty[2]	-0.09**	0.00	-53**	n.s.
Special Education Students[3]	-0.20**	-0.17*	-118**	-100*
English Language Learners[4]	-0.12**	0.07**	-71**	41**

Table Notes:

[1] Benchmarked against all students in traditional public school settings (TPS).

[2] Benchmarked against non-poverty students in TPS.

[3] Benchmarked against TPS students not in Special Education.

[4] Benchmarked against non-English language learner TPS students.

The values with stars indicate statistically significant differences; all others should be interpreted as being no statistically different from zero (n.s.). * Significant at the 0.05 level, **Significant at the 0.01 level

Students in Poverty

Columns "TPS" and "Charter" of Table 8a (8b) compare the learning gains in reading (math) for students in poverty in TPS and charter schools, respectively, with the learning gains of TPS students who are not eligible for free or reduced price school meals.[16]

TPS students in poverty make less progress than their non-poverty TPS peers with the difference amounting to 59 and 47 days of learning in reading and math, respectively. In our 2019 study, TPS students in poverty in Washington State exhibited 77 fewer days of learning in reading and similar learning progress in math compared with TPS students who are not in poverty. Thus, compared with our 2019 study, TPS students in poverty have widened the gap in growth in math with respect to TPS students who are not in poverty. Charter school students in poverty make similar progress to that of their non-poverty TPS peers in math and reading, a result also found in our 2019 study.

[16] 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.

Students in Special Education

We compare the learning gains of TPS and charter students who receive special education services with the learning gains of TPS students not receiving special education. This comparison is shown in column "TPS" of Tables 8a and 8b for reading and math, respectively. TPS students in Special Education experience a weaker learning growth equivalent to 94 fewer days in reading and 118 fewer days of learning in math when compared with students in TPS not receiving special education services. In our 2019 study, TPS students in Special Education in Washington State exhibited 71 fewer days of learning in reading and 124 fewer days of learning in math compared with TPS students not receiving special education services.

Table 8a (column "Charter") shows that charter students in Special Education exhibit a learning growth that is lagging by 136 days of learning in reading compared with students in TPS not receiving special education services. Tables 8b (column "Charter") shows weaker learning growth of charter students in Special Education in math compared with students in TPS not receiving special education services, equivalent to 100 fewer days of learning. Our 2019 study found that charter students receiving special education services exhibited 136 fewer days of learning in reading and a learning growth in math that was statistically indistinguishable from that of TPS students not receiving special education services. Therefore, the gap in math between the growth of charter students receiving special education services and the growth of TPS students who are not receiving special education services has widened since our 2019 study.

English Language Learners

Columns "TPS" and "Charter" in Tables 8a (8b) compare the learning gains in reading (math) in TPS and charter schools, respectively, of students who are English language learners with the learning gains of TPS students who are English proficient. ELL students in TPS make significantly less annual academic progress than non-ELL students in traditional school settings, equivalent to 53 and 71 fewer days of learning in reading and math, respectively. In reading, ELL students in charter schools have similar academic progress to that of non-ELL students in traditional school settings. ELL charter students have higher academic progress in math than non-ELL students in TPS, equivalent to 41 additional days of learning. Thus, for both reading and math, charter school attendance is associated with a reduction in the learning growth gap between ELL students and non-ELL students. This finding is consistent with our 2019 study.

Charter School Impact on Learning Gains by Student Support Services

Tables 9a and 9b highlight the difference in learning gains between charter schools and TPS for students receiving different support services (free or reduced price lunch, special education services, English language support) in reading and math, respectively. The overall impact of charter attendance on the learning gains across all students is also included as a reference point.

Readers' tip for tables below: If the learning gains were equivalent between TPS and charter school students, the values in the "Standard Deviation Units" column would be 0.00.

Table 9a: Charter School Impact on Learning Gains in Reading by Student Support Services

Student Group	Standard Deviation Units	Days of Learning
All Students[1]	0.03	n.s.
Students in Poverty[2]	0.06	n.s.
Special Education Students[3]	-0.07	n.s.
English Language Learners[4]	0.10*	59*
Hispanic English Language Learners[5]	0.14	n.s.

Table 9b: Charter School Impact on Learning Gains in Math by Student Support Services

Student Group	Standard Deviation Units	Days of Learning
All Students[1]	0.07	n.s.
Students in Poverty[2]	0.09	n.s.
Special Education Students[3]	0.03	n.s.
English Language Learners[4]	0.19**	112**
Hispanic English Language Learners[5]	0.18**	106**

Table Notes:

[1] Benchmarked against all students in traditional public school settings (TPS).

[2] Benchmarked against poverty students in TPS.

[3] Benchmarked against TPS students in Special Education.

[4] Benchmarked against English language learner TPS students.

[5] Benchmarked against Hispanic English language learner TPS students.

The values with stars indicate statistically significant differences; all others should be interpreted as being no statistically different from zero (n.s.). * Significant at the 0.05 level, **Significant at the 0.01 level

Students in Poverty

We compare the learning gains of charter students in poverty to those of TPS students in poverty. This difference is shown in Tables 9a and 9b for reading and math, respectively. The difference between the gains of students in poverty in different educational settings is not significant in a statistical manner. This result is consistent with the findings in our 2019 study.

Students in Special Education

Tables 9a and 9b compare the academic progress of charter students in receiving special education services to the progress of TPS students with a special education designation in reading and math, respectively. Charter students in Special Education and their TPS VCRs fare similarly in reading and math as the differences are not statistically significant. This result is consistent with the corresponding finding in our 2019 study.

English Language Learners

The differences between the ELL TPS learning growth and the ELL charter learning growth are statistically significant. In particular, English language learners in charter schools experience stronger learning growth of the size of 59 additional days of learning in reading and 112 additional days of learning in math, when compared with English language learners in TPS. In our 2019 study, English language learners in charter schools in Washington State exhibited 83 additional days of learning in reading and math compared with English language learners in TPS.

Hispanic English Language Learners

Tables 9a and 9b show that the learning growth of Hispanic ELL students in charter schools is on par with the learning growth in reading but significantly higher than the growth in math of Hispanic ELL students in TPS. Hispanic ELL students in charter schools post growth in math equivalent to 106 additional days of learning compared with Hispanic ELL TPS students. The difference in gains between Hispanic ELL students in TPS and in charter schools in our 2019 study was statistically indistinguishable from zero days of learning in both subjects.

Charter School Impact on Learning Gains of Students in Poverty by Race/Ethnicity

Poverty may be more prevalent among racial/ethnic minorities and may affect differentially their academic progress. In 2015, 36 percent of black students and 31 percent of Hispanic students were living in poverty, respectively.[17] This section shows the learning gains of all students in poverty and the gains of students in different race/ethnicities in poverty in charter schools and traditional public school settings. We also present the impact of charter school attendance on the learning gains of students in poverty overall and by different race/ethnicities.

Tables 10a and 10b highlight the difference in learning gains between charter schools and TPS for each student subgroup in reading and math, respectively. The overall impact of charter attendance on the learning gains across all students is also included as a reference point.

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[17] 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

Readers' tip for tables below: If the learning gains were equivalent between TPS and charter school students, the values in the "Standard Deviation Units" column would be 0.00.

Table 10a: Charter School Impact on Learning Gains in Reading of Students in Poverty and Students in Poverty by Race/Ethnicity

Student Group	Standard Deviation Units	Days of Learning
All Students[1]	0.03	n.s.
Asian/Pacific Islander Students in Poverty[2]	0.17	n.s.
Black Students in Poverty[2]	0.09	n.s.
Hispanic Students in Poverty[2]	0.10	n.s.

Table 10b: Charter School Impact on Learning Gains in Math of Students in Poverty and Students in Poverty by Race/Ethnicity

Student Group	Standard Deviation Units	Days of Learning
All Students[1]	0.07	n.s.
Asian/Pacific Islander Students in Poverty[2]	0.13	n.s.
Black Students in Poverty[2]	0.11	n.s.
Hispanic Students in Poverty[2]	0.16	n.s.

Table Notes:

[1] Benchmarked against all students in traditional public school settings (TPS).

[2] Benchmarked against poverty TPS students in the same racial/ethnic group.

The values with stars indicate statistically significant differences; all others should be interpreted as being no statistically different from zero (n.s.). * Significant at the 0.05 level, **Significant at the 0.01 level

Asian/Pacific Islander Students in Poverty

Tables 10a and 10b show the difference in learning gains between charter students in poverty in various racial/ethnic groups and TPS students in poverty in the same racial/ethnic group. Asian/Pacific Islander students living in poverty attending charter schools exhibit an academic progress statistically equivalent to the progress of Asian/Pacific Islander students in poverty in traditional public school settings in reading and math.

Black Students in Poverty

Tables 10a and 10b also show the difference in learning gains between black charter students in poverty and black TPS students in poverty. Black charter students living in poverty experience similar growth gains in both subjects to those of black TPS students living in poverty, a finding consistent with our 2019 study.

Hispanic Students in Poverty

Hispanic charter students in poverty experience learning growth in reading and math similar to that of Hispanic TPS students in poverty. This result is consistent with our 2019 study.

To summarize, charter school enrollment produces learning gains for black, Hispanic, and Asian/Pacific Islander students in poverty that are statistically indistinguishable from those of TPS black and Hispanic students in poverty, respectively, for both math and reading. These findings are consistent with the corresponding results in our 2019 study.

The main take-away of our discussion on the effect of charter school attendance on student subgroups is that the only statistically significant findings concern ELL students overall and Hispanic ELL students, who post particularly strong learning gains in math, associated with their charter school attendance.

Summary and Discussion

This study offers an updated examination of the learning gains associated with charter school attendance in Washington State over a four-year period. Our data window ranges from the 2014-15 school year to the 2017-18 school year, amounting to three one-year growth periods.

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

Table 11: Summary of Analysis Findings for Washington Charter School Students Benchmarked Against Comparable TPS Students

	Reading	Math
Washington Charter Students (compared with TPS)	Similar	Similar
Charters in 2015-16 (compared with TPS in 2015-16)	Similar	Similar
Charters in 2016-17 (compared with TPS in 2016-17)	Similar	Similar
Charters in 2017-18 (compared with TPS in 2016-17)	Similar	Similar
First Year Enrolled in Charter School (compared with TPS)	Similar	Similar
Second Year Enrolled in Charter School (compared with TPS)	Similar	Similar
Third Year Enrolled in Charter School (compared with TPS)	Similar	Similar
Black Charter School Students (compared with Black TPS students)	Similar	Similar
Hispanic Charter School Students (compared with Hispanic TPS students)	Similar	Similar
Special Education Charter School Students (compared with TPS students in Special Education)	Similar	Similar
English Language Learner Charter School Students (compared with ELL TPS students)	Positive	Positive
Charter Students in Poverty Students (compared with TPS Students in Poverty)	Similar	Similar
Black Charter Students in Poverty (compared with Black TPS Students in Poverty)	Similar	Similar

Hispanic Charter Students in Poverty (compared with Hispanic TPS students in poverty)	Similar	Similar
Hispanic English Language Learner Charter School Students (compared with Hispanic ELL TPS Students)	Similar	Positive

During the study period, the average charter school student in Washington State demonstrated no statistically different academic growth in reading and math when compared with their counterparts in nearby similar district schools (TPS). This result is consistent with our finding in our 2019 evaluation of charter school performance in Washington State. The downward trend in reading and math across the two growth periods, documented in our 2019 study, seems to have been overcome in the third growth period. In consistence with our 2019 study, the finding of no significant difference in learning gains has held across most of student groups within the charter population. The only subgroups that were found to experience significantly stronger learning gains associated with their charter school attendance were English language learners (in both subjects) and Hispanic English language learners (in math). English language learners were found to experience significantly positive charter school impacts in our 2019 study as well. Similar to our 2019 study, other student subgroups in charter schools such as students in poverty, black students, and Hispanic students continue to experience gains that are higher on average but statistically indistinguishable from the gains of their respective TPS counterparts.

Our school-level analysis reveals important differences in the learning gains among charter schools in Washington State. We observe charter schools with significantly positive impacts, as much as 166 and 149 more days of learning in reading and math, respectively, compared with the learning they would have realized in TPS. Conversely, some charters significantly underperformed their local school options by as much as 105 and 50 fewer days of learning in reading and math, respectively. The number of schools with statistically significant positive results continues to be larger than the number of schools with significant negative performance, and is an important finding in these early years of charter school operations.

Additionally, consistent with our 2019 study, the percentage of schools significantly outperforming the local schooling option in Washington State continues to be slightly above the percentage of schools significantly outperforming the local option nationally. At the same time, the percentage of schools posting significantly weaker progress than the local option in Washington State in math is lower than the percentage of schools posting weaker progress than the local option nationally, a finding persisting since our 2019 study.

This study also highlights the dynamics of the charter school environment in Washington State. Even though the charter school sector continues to expand every year, three schools closed in the 2018-19 school year. We were able to evaluate the academic performance of two schools that closed. These two schools had some of the weakest average gains across the 2016-17 and 2017-18 growth periods among Washington State charter schools. Thus, their closure both reduced the spread of school performance in the charter sector and raised the average growth we could expect a typical student to experience in a charter school from 2018-19 onwards.

The limited number of schools and students in the charter sector in Washington State continues to play a large role in the lack of statistical significance found throughout this report. The finding of increasingly positive results in the most recent growth period, 2017-18, compared with the prior two growth periods, points in hopeful

directions. This study underlines the existence of promising examples of stronger performance as well as of examples warrantying concern. Future research will be able to examine with greater statistical confidence the patterns examined in this study as the charter sector expands.

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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 State Charter Students Tested & Matched	2,374	2,286
Students in Charters in 2015-2016	425	388
Students in Charters in 2016-2017	881	761
Students in Charters in 2017-2018	1,068	1,137
Students First Year Enrolled in Charter School	1,476	1,409
Students in Second Year Enrolled in Charter School	553	512
Students in Third Year Enrolled in Charter School	174	155
Black Charter School Students	561	551
Hispanic Charter School Students	473	442
White Charter School Students	920	898
Charter School Students in Poverty	1,544	1,474
Black Charter School Students in Poverty	451	439
Hispanic Charter School Students in Poverty	388	360
Special Education Charter School Students	239	220
English Language Learner Charter School Students	211	193
Hispanic English Language Learner Charte School Students	93	87

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.

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 1. 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].

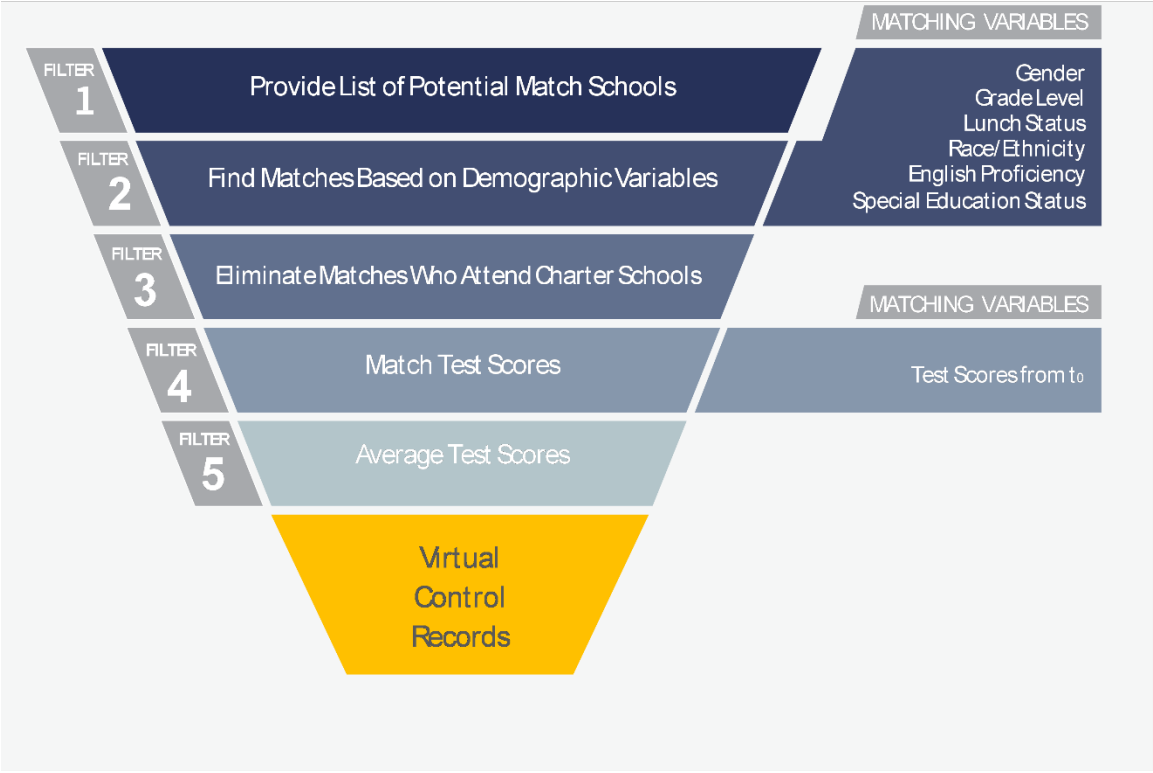
The VCR matching method then eliminates any of the TPS students from the match pool whose demographic characteristics do not match exactly to the individual charter student. As part of the match process, we also drop from the TPS match pool any students who ever enrolled in a charter.

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 1, 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

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

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.

Appendix Figure 1: 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 similar[19] prior test scores.

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

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

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.

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 with other published figures about the charter school population in Washington State. Appendix Tables 2-4 present the student profiles of all and matched Washington State charter students tested in math in each matching period.

Appendix Table 2: 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	2,053		1,795	
% Matched	87%			
Black Students	551	27%	464	26%
Hispanic Students	348	17%	305	17%
White Students	772	38%	719	40%
Students in Poverty	1,307	64%	1,147	64%
Special Education Students	252	12%	168	9%
English Language Learners	182	9%	148	8%
Grade Repeating Students	22	1%	0	0%

Appendix Table 3: 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	712		626	
% Matched	88%			
Black Students	163	23%	142	23%
Hispanic Students	164	23%	141	23%
White Students	254	36%	241	38%
Students in Poverty	466	65%	411	66%
Special Education Students	101	14%	69	11%
English Language Learners	72	10%	51	8%
Grade Repeating Students	9	1%	0	0%

Appendix Table 4: Demographic Composition of Charter Students in the Study: Period 3

Student Group	All Charter Students Tested		Matched Charter Students	
	Number	Percent	Number	Percent
Washington State Charter Students	189		165	
% Matched	87%			
Black Students	35	19%	32	19%
Hispanic Students	39	31%	51	31%
White Students	51	27%	49	30%
Students in Poverty	129	68%	113	68%
Special Education Students	18	10%	11	7%
English Language Learners	18	10%	16	10%
Grade Repeating Students	0	0%	0	0%

Note: Appendix Tables 2 through 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 2,286 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. The larger the portion of a school year a student attends a specific school, the more likely it is for his/her learning growth to be influenced by his/her attendance of that particular school. We impose the 91-day restriction to improve our confidence that the estimated learning gains can be

[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.

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 87 and 88 percent of the tested charter school students in reading and math, respectively.[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 2-4.

Comparison of Starting Scores of Matched Students and VCRs

The VCR method used in this study of Washington State provided matches for 87 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 2 and 3 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.

[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 2: 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	2,286	-.1543812	.0188631	.9018846	-.1913718	-.1173906
Charter	2,286	-.1540944	.018908	.9040312	-.1911731	-.1170158
combined	4,572	-.1542378	.0133526	.9028598	-.1804154	-.1280602
diff		-.0002867	.0267082		-.0526477	.0520742

diff = mean(TPS) - mean(Charter) t = -0.0107
Ho: diff = 0 Welch's degrees of freedom = 4571.97

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.4957 Pr(|T| > |t|) = 0.9914 Pr(T > t) = 0.5043

Appendix Figure 3: 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	2,374	-.1790506	.0189797	.924762	-.2162692	-.1418321
Charter	2,374	-.1786951	.0190139	.9264294	-.2159808	-.1414095
combined	4,748	-.1788729	.0134314	.9254986	-.2052046	-.1525412
diff		-.0003555	.0268656		-.0530245	.0523135

diff = mean(TPS) - mean(Charter) t = -0.0132
Ho: diff = 0 Welch's degrees of freedom = 4747.98

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.4947 Pr(|T| > |t|) = 0.9894 Pr(T > t) = 0.5053

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 found that the best estimation techniques must also include controls for baseline test scores.[24] 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 on 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 with 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., Paul E. Peterson, and Ludger Woessmann. "Achievement Growth: International and US State Trends in Student Performance. PEPG Report No.: 12-03." Program on Education Policy and Governance, Harvard University (2012).

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	-0.21**	0.01	-0.21**	0.02
Charter Student (1=yes)	0.03	0.06	0.07	0.08
Black	-0.07*	0.03	-0.02	0.05
Hispanic	-0.05	0.05	0.01	0.06
Asian/Pacific Islander	0.08	0.04	0.12	0.07
Native American	-0.13	0.09	-0.11**	0.03
Multi-racial	-0.06	0.03	0.00	0.04
Is in Poverty	-0.06**	0.02	-0.06**	0.02
Is English Learner	-0.05	0.04	-0.05	0.03
Is Special Ed	-0.22**	0.05	-0.22**	0.03
Female	0.06	0.01	-0.01	0.02
Year 2016	-0.09	0.07	-0.23**	0.05
Year 2017	-0.17**	0.05	-0.22**	0.05
Second Growth Period	0.07	0.04	0.05	0.02
Third Growth Period	0.13*	0.05	0.08*	0.03
Grade 06	-0.02	0.06	-0.07	0.09
Grade 07	-0.10	0.05	-0.13	0.08
Grade 08	-0.07	0.04	-0.16	0.09
Grade 10	0.69**	0.08	-0.21	0.11
Grade 11	-0.78**	0.16	0.14	0.12
Constant	0.19*	0.07	0.31**	0.09
Observations	4,748		4,572	
R-Squared	0.24		0.18	

Measuring Learning Gains of Each Race/Ethnicity without a Benchmark Race/Ethnicity

This study develops a new approach of presenting the learning gains of each race/ethnicity in traditional public school settings and charter schools without using any specific race/ethnicity as a benchmark against which to measure other race/ethnicities. The data used in this analysis include charter student records and their matches in traditional public schools, obtained by our Virtual Control Record (VCR) methodology. Our data set contains students in each racial/ethnic group that are comparable across traditional public school settings and charter schools. Thus, we are in a unique position to measure the impact of charter school attendance on the learning

gaps between racial/ethnic groups. At the same time, it is important to note that the TPS student records making up the matches of the charter school students may not be representative of the average TPS student in the State. Additionally, the schools which matched records come from (feeder schools) may not be representative of the average traditional public school in Washington State.

We estimate the average growth of students in different race/ethnicities, adjusting for timing influences (associated with the year, the number of years in a school setting, and their grade), past endowments (starting score), and support services received (free or reduced-priced lunch, ELL, or Special Education). To do this, we estimate an augmented version of our baseline model (1) where the charter school indicator is interacted with indicator variables for race/ethnicities (white, black, Hispanic, Asian/Pacific Islander, Native American, and Multi-racial). We also control indicator variables for minority race/ethnicities in traditional public school settings (black, Hispanic, Asian/Pacific Islander, Native American, and Multi-racial). We include controls for starting score, year, growth period, grade, poverty status, ELL status, and Special Education status as well.

The estimated coefficient of the intercept corresponds to the average learning gains of white students in traditional public school settings, adjusted for prior knowledge (starting score), timing (year, growth period, grade), and services (poverty, ELL, Special Education). We estimate the learning gain associated with each race/ethnicity in traditional public school settings and charter schools by adding the estimated coefficient of the relevant subgroup to the estimated coefficient of the intercept. We perform a Wald test for each race/ethnicity in traditional public school settings and charter schools to determine whether the associated learning gains are statistically different from zero. Learning gains of zero correspond to the growth of the average student in Washington State over a school year or 180 days of learning.

We also perform a battery of Wald tests to determine whether the learning gains of students in different race/ethnicities in different school sectors are different with statistical confidence. Appendix Tables 6 and 7 report the results of our statistical tests in reading for TPS and charter schools, respectively. Appendix Tables 8 and 9 report the results of our statistical tests in math for TPS and charter schools, respectively. We have also tested the statistical equivalence of learning gains of students in the same racial/ethnic group across TPS and charter schools. No racial/ethnic group was found to have statistically different learning gains in charter schools compared with the gains of students in the same racial/ethnic group in TPS.

Appendix Table 6: Significance of Learning Differences between Race/Ethnicities in TPS in Reading

	White	Black	Hispanic	Asian/PI	Native American	Multi-Racial
White		**	*		*	
Black	**			**		
Hispanic	*			**		
Asian/PI		**	**		**	*
Native American	*			**		
Multi-Racial				*		

Note: The race/ethnicity is each column is compared with the race/ethnicity in each row. Positive differences appear in green; negative differences appear in red. * Significant at p<0.05; ** Significant at p<0.01.

Appendix Table 7: Significance of Learning Differences between Race/Ethnicities in Charter in Reading

	White	Black	Hispanic	Asian/PI	Native American	Multi-Racial
White						
Black				**		
Hispanic				**		
Asian/PI		**	**			**
Native American						
Multi-Racial				**		

Note: The race/ethnicity is each column is compared with the race/ethnicity in each row. Positive differences appear in green; negative differences appear in red. * Significant at p<0.05; ** Significant at p<0.01.

Appendix Table 8: Significance of Learning Differences between Race/Ethnicities in TPS in Math

	White	Black	Hispanic	Asian/PI	Native American	Multi-Racial
White		*	*		*	*
Black	*					
Hispanic	*			*		
Asian/PI			*		*	*
Native American	*			*		
Multi-Racial	*			*		

Note: The race/ethnicity is each column is compared with the race/ethnicity in each row. Positive differences appear in green; negative differences appear in red. * Significant at p<0.05; ** Significant at p<0.01.

Appendix Table 9: Significance of Learning Differences between Race/Ethnicities in Charter in Math

	White	Black	Hispanic	Asian/PI	Native American	Multi-Racial
White				*		
Black				**		
Hispanic				**		
Asian/PI	*	**	**		*	*
Native American				*		
Multi-Racial				*		

Note: The race/ethnicity is each column is compared with the race/ethnicity in each row. Positive differences appear in green; negative differences appear in red. * Significant at p<0.05; ** Significant at p<0.01.