

REPORT

FINAL REPORT

Ewing Marion Kauffman School Evaluation Impact Report Year 3

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EXECUTIVE SUMMARY

As part of its ongoing efforts to raise the academic achievement of children from low-income families in Kansas City, Missouri, the Ewing Marion Kauffman Foundation founded the Ewing Marion Kauffman School in fall 2011. The Kauffman School’s mission is “to prepare students to excel academically, graduate from college, and apply their unique talents in the world to create economically independent and personally fulfilling lives” (Ewing Marion Kauffman School 2013).

As a public charter school, the Kauffman School is tuition-free and serves students living in Kansas City. The Kauffman School enrolled its first class of 5th-graders (about 100 students) in fall 2011 and added a second class of 5th-graders (about 100 students) in fall 2012. In fall 2013, a third class of 5th graders joined the Kauffman School. With the opening of its new building, the Kauffman School had sufficient capacity to double the size of the cohort entering in 2013. Each year, the Kauffman School will add a new 5th-grade class of about 200 students, ultimately resulting in a fully enrolled middle school and high school (grades 5 through 12).

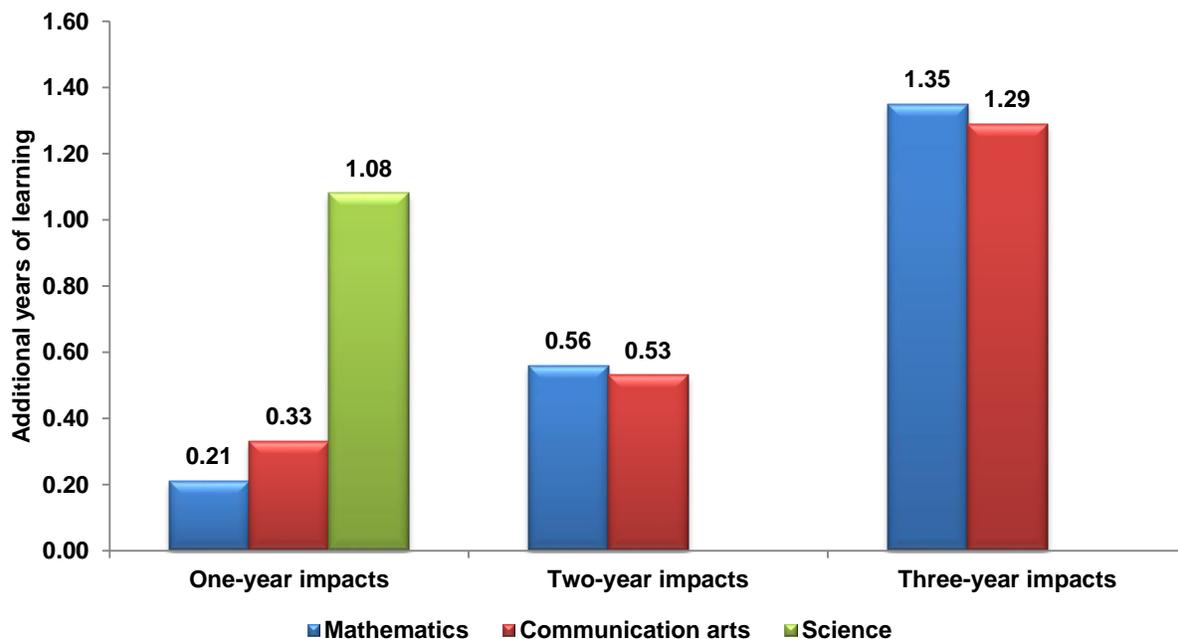
The Kauffman School has ambitious goals for its students. These include accelerated learning, high attendance levels, and exemplary behavior. In this report, we summarize information about the impact of the Kauffman School on student achievement, attendance, and rate of suspensions. Mathematica Policy Research obtained data from the Missouri Department of Elementary and Secondary Education that included student achievement on the Missouri Assessment Program (MAP) exams, attendance, suspensions, and demographic characteristics. Using these data, we identified a group of Kansas City students similar to Kauffman students based on demographic characteristics and prior achievement. We used data on outcomes for these students to determine the Kauffman School’s impact on its students’ achievement, attendance, and rate of suspensions during the 2011–2012 through 2013–2014 school years.

Main findings. Our findings indicate that in the 2011–2012 through 2013–2014 school years, the Kauffman School had positive, statistically significant, and educationally meaningful impacts on student achievement growth in mathematics, communication arts (reading), and science and that these impacts went beyond the growth achieved by students in other Kansas City public schools. In all three subjects, the Kauffman School attained its goal of having students achieve average growth equivalent to at least 1.25 years for every year they attend. Our main results compare the achievement growth of Kauffman students to that of similar students in other public schools (including other charter schools) serving 5th- through 7th-grade students within the boundaries of the Kansas City Public Schools district (KCPS). Only Kauffman

students for whom we could find suitable matched comparison students are included in the main analysis. We report results separately for students one, two, and three years after entering the Kauffman School in 5th grade.

Our estimates of the impact of the Kauffman School on student achievement growth are measured in effect size units (units of standard deviations of student test scores). These impacts estimate the average effect that attending the Kauffman School has on student test score growth beyond what students would have achieved if they had attended other Kansas City public schools. We estimate the impact of the Kauffman School one year after enrollment to be 0.12 standard deviations in mathematics, 0.13 in reading, and 0.43 in science. The estimated impacts of the Kauffman School two years after enrollment are 0.27 standard deviations in mathematics and 0.19 standard deviations in reading. The estimated impacts three years after enrollment are 0.57 standard deviations in mathematics and 0.41 standard deviations in reading. (There are no two- or three-year estimates for science because the state does not have a science test for 6th or 7th graders.) All of these results are statistically significant. Figure ES.1 displays these impact estimates converted to years of additional learning growth for Kauffman students (see Bloom et al. [2008] for conversion tables).

Figure ES.1. Kauffman School estimates of additional years of learning growth on MAP exams



Note: The additional growth for all impact estimates is significantly different from zero.

The size of the estimated impact of the Kauffman School on student achievement is substantial. The magnitude of the effect size estimates imply that students attending the Kauffman School achieve approximately 1.35 additional years of learning growth in mathematics three years after enrollment. Before entering the Kauffman School (that is, in 4th grade), the average Kauffman student is at the 36th percentile in the state distribution of mathematics test scores. The mathematics impact estimate indicates that the average Kauffman

student would move to the 58th percentile three years after enrollment at the Kauffman School. Moreover, the three-year mathematics effect is equal to approximately 57 percent of the math test score achievement gap between black and white students in 7th grade in Kansas City.

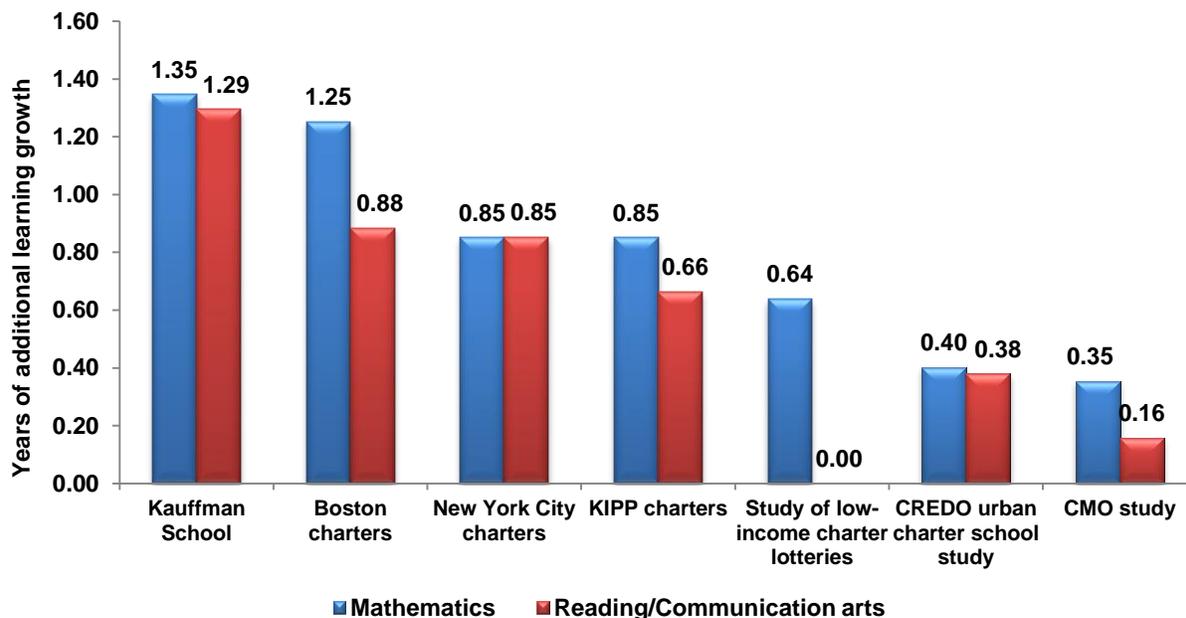
The effect size estimate in reading is substantial as well; the magnitude implies that students attending the Kauffman School achieve approximately 1.29 additional years of learning growth by the end of the third year after enrolling. The average Kauffman student moves from the 39th percentile in the state reading test score distribution before entering the school to the 55th percentile after three years. This effect is approximately equivalent to 45 percent of the local reading test score achievement gap between black and white students in 7th grade.

The estimated impact of the Kauffman School after one year of enrollment is largest in science. In their first year in the school, Kauffman students achieve approximately 1.08 additional years of learning in science compared with students at other Kansas City schools. This is equivalent to approximately 40 percent of the local science test score achievement gap between black and white students in 5th grade. However, the science impact estimate should be interpreted with caution, because there was no prior year science exam that could be used in the analysis; instead, prior reading and mathematics scores were used as baseline controls.

Comparison to other charter schools. The Kauffman School's estimated achievement impacts in mathematics and reading three years after enrollment are larger than the average effects of other highly successful charter school programs (see Figure ES.2). The estimated impacts of the Kauffman School are larger than those of the average Boston charter school analyzed by Abdulkadiroglu et al. (2009), the average Knowledge Is Power Program (KIPP) middle school studied by Tuttle et al. (2013), and the average New York City charter school analyzed by Hoxby, Murarka, and Kang (2009) (although some individual schools in those studies achieved higher impacts than the Kauffman School's). The estimated two-year impacts of the Kauffman School are smaller, but within the range of these highly successful charter school programs. See Section III.C for further details.

Moreover, the Kauffman School is strongly outperforming broader samples of charter schools nationwide. The effects of the Kauffman School are substantially larger than those of (1) the average oversubscribed charter school serving a large fraction of low-income students analyzed by Gleason et al. (2010), (2) the average urban charter school in the 41 regions analyzed by the Center for Research on Education Outcomes (CREDO 2015), and (3) the average school in the charter school management organizations (CMOs) studied by Furgeson et al. (2012). Many of the charter schools included in these studies were open for more than three years. The performance of charter schools often improves after the first year of operation (Gill et al. 2007; Sass 2006), suggesting that the Kauffman School's effects are especially noteworthy because the three-year impacts are based on students who were enrolled during the first year the Kauffman School was open.

Figure ES.2. Charter school three-year impact estimates from various studies represented as years of additional learning growth

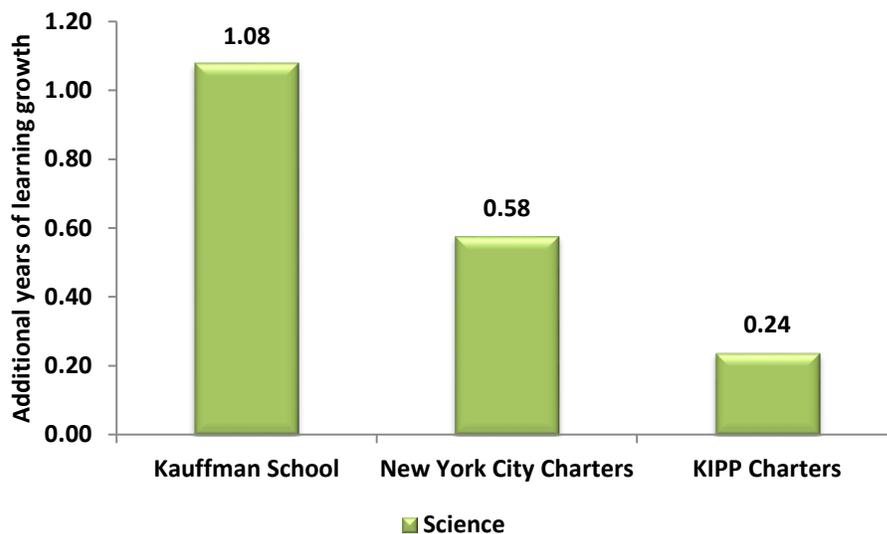


Note: Figure ES.2 contains three-year effect size estimates converted to years of additional learning growth for the average Boston charter school as reported in Abdulkadiroglu et al. (2009), for the average KIPP charter school analyzed by Tuttle et al. (2013), the average New York City charter school in grades 4 through 8 as reported in Hoxby et al. (2009), the average charter school with a lottery admission process serving a large fraction of low-income students analyzed by Gleason et al. (2010), the average urban charter school in the 41 regions analyzed by the Center for Research on Education Outcomes (CREDO 2015), and the average school in the charter school management organizations (CMOs) studied by Furgeson et al. (2012), and. See Section III.C for further details.

CMO = charter school management organization; CREDO = Center for Research on Education Outcomes; KIPP = Knowledge Is Power Program.

The impact of other charter schools on science achievement is less widely reported because science tests are administered in fewer grades in most states. The available evidence suggests that the Kauffman School, with an estimated one-year effect size of 0.43, is substantially outperforming other successful charter schools with respect to its impact on science achievement. New York City charter schools are estimated to have average annual impacts of 0.23 standard deviations on science achievement in grades 5 through 8 (Hoxby et al. 2009). KIPP middle schools are estimated to have a cumulative average impact of 0.33 standard deviations in science for students three to four years after enrollment (Tuttle et al. 2013), implying an average one-year impact of approximately 0.094 standard deviations. Figure ES.3 displays the one-year science impact estimates from these studies represented as years of additional learning growth.

Figure ES.3. Charter school one-year science impact estimates from various studies represented as years of additional learning growth



Note: Figure ES.3 contains one-year effect size estimates converted to years of additional learning growth for the average New York City charter school in grades 4 through 8 as reported in Hoxby et al. (2009) and the average for the average KIPP charter school analyzed by Tuttle et al. (2013). See Section III.C for further details.

KIPP = Knowledge Is Power Program.

Alternate comparison groups in Kansas City. The main findings summarized here are a result of comparing Kauffman School students with a matched comparison group of students from all public schools in Kansas City. We also compared Kauffman School students with two subgroups of children—(1) similar students attending district-operated schools in Kansas City and (2) similar students attending other Kansas City charter schools. The estimated effect sizes are generally higher when the Kauffman School is compared only with district-operated schools and lower when compared only with other charter schools. All the effect size estimates for the latter comparison group remain positive and significantly different from zero, indicating that the Kauffman School is outperforming the average charter school in Kansas City in these subjects.

Changes in effectiveness of the Kauffman School over time. We analyzed whether the impact of the Kauffman School on student achievement changed during the Kauffman School's second and third years of operation by examining changes in the one- and two-year impact estimates. The Kauffman School's estimated impacts were consistently positive each year, and there were no significant changes in estimated impacts over time.

MAP proficiency goal. One of the goals of the Kauffman School is for at least 75 percent of students enrolled at the Kauffman School for three consecutive years to score in the proficient or advanced performance range on all subjects of the MAP test. This is an ambitious goal, as only 20 percent of incoming 5th-grade students in the 2011–2012 school year had achieved at the proficient or advanced levels in both subjects in 4th grade, prior to enrolling in the Kauffman School. Based on discussions with education experts, staff at the Kauffman School currently view the 75 proficiency target to be unrealistically high and are considering amending the

Kauffman School's charter application to change this goal. The Kauffman School did not meet the 75 percent goal during 2013–2014. Among students who were enrolled at the Kauffman School for three consecutive years, 51 percent achieved proficient or advanced on both subjects of the 7th grade MAP test.

Attendance and suspensions. The results for the estimated impact of the Kauffman School on attendance varied across grades. The Kauffman School did not have a significant effect on attendance in 2013–2014 for 5th- or 6th-grade students, but the impact was positive and significant for 7th-grade students. The Kauffman School achieved its goal of having an average daily attendance rate of 95 percent in all three grades.

The Kauffman School suspends students at a higher rate than other Kansas City schools. During 2013–2014, Kauffman students were 25 percentage points more likely to receive at least one in-school suspension and 17 percentage points more likely to receive at least one out-of-school suspension than students attending other Kansas City Schools. During 2013–2014, the estimated suspension impacts were higher than in other years, which is consistent with teachers' reports that some students continued to struggle with the school discipline system throughout the school year, leading to a retraining of teachers and staff on the discipline system to ensure consistent application of rules (Gentile et al. 2014). Among Kauffman students who received at least one suspension during 2013–2014, the average student was suspended for approximately 3 days. The Kauffman School estimates that students receive the equivalent of approximately 5 weeks of additional instruction per year relative to other public school students in Kansas City. The average number of days suspended is therefore small relative to the increased instructional time at the Kauffman School.

Conclusions. The Kauffman School has ambitious goals for its students: accelerated learning and high levels of attendance. An analysis of data from the Kauffman School's first three years shows that the Kauffman School achieved its goal of having students grow at least 1.25 years on average for every year of attendance. While the Kauffman School did not meet its goal of 75 percent of students scoring proficient or advanced on the MAP exams, Kauffman students made significance progress towards this goal with average student proficiency rates increasing by 31 percentage points over three years. The Kauffman School achieved the goal of an average daily attendance rate of 95 percent in all three grades. Though the Kauffman School suspended students at a significantly higher rate than other schools in Kansas City, the average number of days missed due to suspensions was small relative to the additional instructional time received by Kauffman students.



I. INTRODUCTION

A. Background about the Kauffman School

For many years, the Kauffman Foundation has focused efforts on improving education for children in Kansas City. Before opening the Kauffman School, the Kauffman Foundation operated several programs that addressed the challenges faced in urban education, such as Project Early (an early childhood program), Project Choice (a high school dropout prevention program), and the Kauffman Scholars program (an after-school college preparatory program). The success of these programs led Foundation leaders to consider the impact they might have on students in Kansas City if they established a charter school. In March 2009, the Foundation established its school design team, composed of Foundation education experts and the founding executive director of the Missouri Charter Public School Association. This team engaged in a three-step process of exploration and decision making before establishing the Kauffman School.

Step 1. Analyzing Kansas City’s educational landscape. From a review of Kansas City assessment data, the school design team learned that, during the 2008–2009 school year, charter school enrollment accounted for one-third of all public school enrollment in Kansas City (North 2009), and that, among Kansas City’s charter and non-charter schools, only 16 percent of the middle schools and 7 percent of the high schools had at least 50 percent of students reaching proficient or better on statewide mathematics assessments in 2009 (Richardson 2009).¹

From the Foundation’s perspective, these data suggested that Kansas City families had a desire for alternatives to the city’s regular public schools, and that current charter and non-charter public schools were struggling to help students achieve. In light of students’ low academic performance, the Foundation determined that 5th grade was the optimal grade for students to enter its charter school, in order to have ample time to prepare struggling students for the Kauffman School’s college preparatory program that begins in 9th grade.

Step 2. Selecting a location. The Foundation intended the Kauffman School to serve Kansas City’s low-income families. From a review of demographic data on Kansas City, the school design team learned that most of the city’s low-income population lives in the eastern part of the city, yet the majority of the city’s 23 charter schools are located in the western part. In

¹ Prolonged poor academic performance in the district contributed, in part, to the Kansas City Public Schools district losing its accreditation in 2011-12—the same year the Kauffman School opened. At the time of this writing, the district received provisional accreditation from the state of Missouri after showing improvements in student achievement growth (Missouri Department of Elementary and Secondary 2014b).

response to this discrepancy, the Foundation selected a location in the eastern part of the city, so that the school would be in proximity to its target students. Using data on household income by zip code, the design team identified five sections of the city with high concentrations of low-income families. Students living within the boundaries of these five zip codes are given first preference for enrollment.²

In August 2013, the Kauffman School moved to its permanent location, in the same section of the city. The school campus has three buildings, a middle school building, a high school building, and a gymnasium-cafeteria-commons building. The third building, the high school, opened in August 2014, so all classes were held in the middle school building during year 3. Design elements of the new school buildings reflect the Kauffman School's key values and activities. For example, the new buildings have interior windows to facilitate classroom observations, a central feature of the Kauffman School's professional development model. According to the Kauffman School's website, the interior windows create "an environment that is transparent" and encourages "staff, faculty, parents, and visitors to observe classroom instruction as they walk through the building" (Kauffman School 2013). The Kauffman School also offers teacher workrooms and community spaces for small- and large-group meetings, such as the weekly professional development meetings and community meetings.

Step 3. Identifying best practices. The school design team made extensive efforts to learn about the best practices of successful charter schools, a process the team described as the "year of learning." The team conducted a thorough review of research literature on charter schools and visited successful charter schools in New York and Boston to learn more about the variables that contributed to the success of those schools.

B. Key characteristics of the Kauffman School

The key hallmarks of the Kauffman School include: (1) ambitious academic goals, (2) high attendance and behavioral expectations, (3) extended school day and year, (4) increased time for mathematics and reading instruction, (5) intensive data-driven decision making, (6) extensive teacher professional development, and (7) well-established cultural norms. We discuss each of these next.

1. **Ambitious academic goals.** The Kauffman School expects its students to excel academically and achieve at least 1.25 years of growth in mathematics, science, and reading each year. These goals are regularly discussed by school administrators and staff, teachers, students, and parents. In addition, daily homework, referred to as "life work," is mandatory, and students serve detention if they do not turn in these assignments.
2. **High attendance and behavioral expectations.** The Kauffman School has high goals for student attendance (95 percent average daily attendance) and behavior (full compliance with school policies and procedures). As a guide for student behavior, teachers implement the SLANT method (Sit up, Listen, Ask and answer questions, Nod your head, Track the

² The School also offers bus transportation for students who live more than one mile away, thereby providing access to the School to students of need across the city. During the School's second year of operation, the Foundation identified an additional zip code with a high concentration of low-income students and offered first preference for enrollment to students living in that section of Kansas City as well.

speaker) that was developed by the Knowledge Is Power Program (KIPP). Students receive merits for positive behavior and demerits for noncompliance with School policies and procedures, and may serve detention (in or out of school) depending on the number of demerits they earn. The dean of students oversees the implementation of the Kauffman School's behavioral policies. The Kauffman School holds an all-parent meeting to orient incoming students and their families to the Kauffman School's high behavioral expectations before the start of each school year.

3. **Extended school day and year.** With students coming from Kansas City's low-performing schools, the school design team anticipated that many of the Kauffman School's students would enter school performing below grade level and would need more instructional time to catch up academically and be ready for the Kauffman School's college preparatory program. Thus, the Kauffman School operates an extended school day and year in order to provide students with more instructional time.

During the Kauffman School's first year, students received 37.8 hours of instruction per week (Richardson 2009). In Year 2, the instructional time was shortened to 36.5 hours per week in response to feedback from students, parents, teachers and staff (Gentile et al. 2013). In Year 3, the instructional time was slightly reduced from Year 2 to 36.2 hours per week. According to the Kauffman School calendar there were 7 additional days of instruction during the school year, which when combined with the longer school days equates to approximately 5 additional weeks of school per year for Kauffman students compared to traditional public school students in Kansas City.

4. **Increased mathematics and reading instructional time.** In Year 1, Kauffman students each day attended a double period of mathematics (104 minutes), a nonfiction reading class (50 minutes), a writing class (50 minutes), and an extended period of literature (80 minutes). During Year 2, students continued to have a double period of mathematics and their nonfiction reading and writing classes. Students' literature class was focused on guided reading instruction and shortened to one class period of 50 minutes. During Year 3, students continued to receive a double period of mathematics and 50 minutes of reading instruction. A textual analysis course was added in Year 3. The Kauffman School's writing class was absorbed into the textual analysis class, and students received a double period of textual analysis. In Years 2 and 3, all students attended an instructional support class each day in which they received tutoring and special instruction. Struggling students received additional instruction and practice in any subjects they needed help with, and high-performing students received advanced instruction.
5. **Intensive data-driven decision making.** With its strong emphasis on results, the Kauffman School employs a large assessment portfolio so that teachers and administrators can make data-driven decisions about how to adapt instruction to best meet students' needs. In addition to teacher-developed "exit tickets,"³ quizzes, and tests to measure understanding and academic progress, the Kauffman School's assessment portfolio includes the following:

³ Exit tickets are short questions or tasks that students complete at the end of the class period. These enable teachers to track the progress of their students' understanding of the course material on a regular basis.

- Achievement Network (ANet) assessments in mathematics and reading, revised by Kauffman School teachers to be consistent with Missouri State Standards, administered every six weeks⁴
 - Strategic Teaching and Evaluation of Progress (STEP) assessments to measure students' reading growth, administered six times per year
 - Northwest Evaluation Association (NWEA) assessments in mathematics, reading, and science, administered twice a year
 - Missouri Assessment Program (MAP) standardized tests in mathematics, reading, and science, administered annually by the State of Missouri
6. **Extensive teacher professional development.** The Kauffman School places a significant emphasis on teachers' professional development, with teachers experiencing (1) frequent observations and feedback from administrators (about once per week); (2) weekly individual coaching sessions (provided by the principal in Year 1; by the principal and instructional coaches in Year 2; and by the principal, chief academic officer,⁵ and instructional coaches in Year 3); and (3) weekly group-based professional development sessions every Friday afternoon, focused on various topics related to curriculum, instruction, and assessment (Gentile et al. 2014).
7. **Well-established cultural norms.** The Kauffman School takes an intentional approach to establishing a culture that consists of shared values, expectations, and norms, epitomized by the Kauffman School's motto: "Creating College Graduates." Continuous efforts are made to explicitly communicate the values, expectations, and norms to all school staff, students, and families.

⁴ Kauffman School staff revised all of the ANet assessments in Year 1 and some of the ANet assessments in Years 2 and 3. Kauffman School staff also created a similar set of assessments to measure student learning in science.

⁵ In Year 3, the same person served as principal and chief academic officer.



II. METHODOLOGY AND DATA

A. Methodology

Comparing Kauffman students to students from other Kansas City schools. Because all Kauffman students have chosen to enroll in the Kauffman School, they might differ from other Kansas City students in important ways. Measuring the effect of the Kauffman School on student achievement requires identifying a comparison group of Kansas City students who, as of 4th grade (before the Kauffman School's 5th-grade entry year), are similar to the students who are about to enter the Kauffman School. Otherwise, any difference we find in later student outcomes might not really be due to the effect of the Kauffman School.

To guarantee that the comparison group is similar, the gold standard research design would involve conducting a lottery wherein some of the students who apply to the Kauffman School are randomly selected to attend the Kauffman School and others are randomly denied admittance. The achievement of these two randomly established groups could then be fairly compared (based on the assumption that any naturally occurring differences among students would be randomly distributed between the two groups). However, the Kauffman School was not sufficiently oversubscribed during its first three years of operation to use this approach. Instead, we employed the next best approach: using data from students across Kansas City to identify a matched comparison group of students who were similar to Kauffman School students at the time they were in the 4th grade.

To construct a comparison group of students, we implemented a propensity-score matching procedure. Students attending other schools in Kansas City were matched to Kauffman students based on characteristics such as prior test scores, prior attendance, prior suspensions, and demographic characteristics. This approach is commonly used as an alternative to the random assignment approach when evaluating the impacts of charter schools and has been shown to produce valid impact estimates that replicate the results of experimental research designs (Tuttle et al. 2013; Gill et al. 2015).⁶

⁶ See Appendix A.4 for more details about the implementation of the propensity-score matching procedure. In Appendix B.2, we examine the sensitivity of the results to the use of all students in Kansas City public schools as the comparison group rather than those selected by the propensity-score matching procedure.

Constituting the Kauffman student group. Throughout our analysis, we classify any student who was enrolled for at least part of a year in the Kauffman School as a Kauffman student. Classifying students in this manner defuses the potential criticism that the Kauffman School's effects are overestimated because low-achieving students have left the charter school. However, including these students might lead to understating the impact of the Kauffman School on student achievement because students who left the Kauffman School early in the school year and would have received very little influence from the Kauffman School. Similarly, students from the Kauffman School's first cohort who left after 5th grade are nonetheless kept in the treatment group for the 6th and 7th grade analysis samples.⁷ Again, this is a conservative analytic approach that eliminates the risk of overestimating the impact, but it means that the full impact on students who continue in the Kauffman School for two or three years is likely to be underestimated.⁸

Data for our analysis were available for three cohorts of Kauffman students. Cohort I students are those who entered the Kauffman School as 5th graders in 2011–2012 (the year the Kauffman School opened). Cohort II students are those who entered the Kauffman School as 5th graders in 2012–2013. Cohort III students are those who entered the Kauffman School as 5th graders in 2013–2014.

In the next chapter, we present three-year, two-year, and one-year impact estimates for the Kauffman School. The three-year impacts are based on the outcomes of cohort I students, who were 7th graders in 2013–2014.⁹ The two-year impacts are the average of the Kauffman School's estimated impact on cohort I, the 6th graders in 2012–2013, and its impact on cohort II, the 6th graders in 2013–2014. The one-year impacts are the average of the Kauffman School's estimated impact on all three cohorts in their 5th-grade year.

B. Data and descriptive statistics

In this section, we provide details about the data used in our main analysis of the impact of the Kauffman School on student outcomes. We also present a set of descriptive statistics to show how Kauffman students compare to students in other schools in the city, in terms of prior achievement and demographic characteristics.

1. Data

The data we used in our main analyses were provided by the Missouri Department of Elementary and Secondary Education. The data consisted of MAP test scores in mathematics, communication arts (CA), and science, along with attendance and suspension data for all students in Missouri who were in the 5th, 6th, or 7th grade in the 2011–2012 through 2013–2014 school years. We also obtained for these students data on their prior (3rd and 4th grade) test

⁷ Only students who entered the Kauffman School in 5th grade are included in the treatment group for this analysis. In years 2 and 3, the Kauffman School did not admit new 6th or 7th grade students to the School.

⁸ In Appendix B.1, we discuss the issue of attrition in more detail and present attrition-adjusted impact estimates that approximate the impact of the Kauffman School for students who remain enrolled in the School.

⁹ Cohort I students who repeated 5th grade in 2012–2013 or 6th grade in 2013–2014 are also included in the Kauffman student group for the main three-year impact calculations. See Appendix B.3 for details.

scores, prior attendance, prior suspensions, and demographic characteristics. We limited our potential comparison group to students attending schools in the borders served by the Kansas City Public Schools district (KCPS). (See Appendix A.2 for details about the analysis sample selection process.)

The main results in this report are based on a matched comparison group selected from all students attending schools within the borders of KCPS, including other charter schools. This group of students is likely the most relevant for our evaluation, because using these students to construct the comparison group provides an impact estimate that can be interpreted in terms of how much more or less a Kansas City student would be expected to achieve if that student were to enroll in the Kauffman School rather than a typical Kansas City school. However, given the large number of charter schools serving students in the Kansas City area, comparing the Kauffman School's impacts on student achievement to those of other Kansas City charter schools might also be of interest. Thus, we report the results in three ways—using comparison groups of students (1) from all public schools in Kansas City (the primary impact estimates), (2) from district-operated (non-charter) KCPS schools only, and (3) from other charter schools within Kansas City only.

Data on one or more of the variables used as baseline controls are missing for many students. About 15 percent of the students we could potentially include in our analysis sample in the most recent year of data are missing data on one or more of the baseline control variables. To avoid dropping them from the analysis, we employed a multiple imputation procedure to estimate their missing baseline values.¹⁰ We also analyzed the data without using imputation and found similar results (see Appendix B.4).

2. Descriptive statistics: What types of students attend the Kauffman School?

Full descriptive statistics for the first two cohorts of Kauffman students, compared with students in other Kansas City public schools, are presented in Appendix A, Tables A.2 through A.4. On average, Kauffman students had 4th-grade MAP scores that were below the statewide average in both mathematics and communication arts (CA). Students at the Kauffman School were also predominately from low-income and minority families: across the first two cohorts, at least 80 percent of Kauffman students were eligible for free or reduced-price lunches and at least 83 percent were black or Hispanic.

Although, on average, the Kauffman students performed below the state average on the 4th-grade MAP, they had higher 4th-grade MAP test scores than other students in Kansas City public schools and were less likely to receive any accommodations on the 4th-grade MAP. Compared to students in Kansas City public schools, Kauffman students were also more likely to be black, less likely to be Hispanic, and had slightly higher average 4th-grade attendance rates. In general, differences tended to be larger relative to Kansas City district schools and smaller relative to Kansas City charter schools. Kauffman students were generally similar to other Kansas City public school students with respect to free or reduced-price lunch and disability rates, although there were some significant differences across cohorts.

¹⁰ See Appendix A.3 for more details about our imputation procedure.

Given that Kauffman students differed from the average student in Kansas City public schools, if we included all Kansas City students in the analysis comparison group, there would have been significant differences in baseline characteristics between Kauffman and comparison students. These differences could lead to concerns about bias in the impact estimates because students who differ with respect to baseline characteristics may be expected to show different rates of growth. We therefore used a matching procedure to ensure that the comparison students were similar to Kauffman students with respect to baseline characteristics. Appendix A, Table A.7 provides descriptive statistics for the matched comparison groups relative to each cohort of Kauffman students. By design, there are no significant differences in baseline characteristics between the Kauffman and matched comparison groups. Some Kauffman students are not included in the main analyses because we were unable to find matching comparison group students. For instance, when creating a comparison group similar to all Kansas City Public School students in 2013-2014, we were unable to find a match for 11 percent of Kauffman students. See Appendix A, Table A.6 for details on the number of Kauffman students who were excluded for this reason. Caution should therefore be used when interpreting the impact results, because it is possible that they are not representative of the achievement of all Kauffman students. However, as a robustness check we performed an analysis that did not use matching but relied exclusively on a regression model to account for baseline differences between Kauffman and comparison students. This analysis included all Kauffman and comparison students with non-missing data; the results were similar to the main findings. See Appendix B.2 for details.



III. THE IMPACT OF THE KAUFFMAN SCHOOL ON STUDENT ACHIEVEMENT

In this chapter, we present the main impact estimates for the Kauffman School on student achievement as measured by the MAP exams in mathematics, reading, and science. We present three- and two-year impact estimates for mathematics and reading, as well as one-year impact estimates for all three subjects. We describe various ways of interpreting the impact estimates and place the size of the estimates in the context of findings for other evaluations of charter school effectiveness. We also evaluate whether the Kauffman School achieved its goal of 75 percent of students enrolled for three consecutive years achieving proficient or advanced scores on the mathematics and reading MAP exams.

A. Impacts on MAP test scores

The impact estimates for the Kauffman School on student achievement in each MAP subject are displayed in Table III.1. The results are based on linear regression models that include the Kauffman students and matched comparison students and control for small remaining differences in prior achievement and other baseline characteristics.¹¹ As noted previously, any student who is enrolled in the Kauffman School as a 5th grader for at least part of the school year is included in the Kauffman group for all impact estimates. The impact estimates should therefore be interpreted as the average effect of enrolling in the Kauffman School, accounting for the possibility that students may leave. The results are displayed in effect size units, which can be interpreted as how many student test score standard deviations higher or lower Kauffman students are performing relative to students in the comparison groups (after controlling for baseline achievement).¹² Standard errors are displayed in parentheses below each estimate, and asterisks indicate whether the estimate is significantly different from zero.

¹¹ The covariates include all the variables summarized in Table A.2. We also include 3rd-grade mathematics and CA MAP scores, second- and third-order polynomial terms for 4th-grade MAP scores, and indicator variables that equal one if a student has imputed prior test scores or imputed attendance or suspension data.

¹² The statewide standard deviations of 7th-grade MAP scores were 41 in mathematics and 36 in CA. The statewide standard deviations of 6th-grade MAP scores were 40 in mathematics and 33 in CA. The statewide standard deviations of 5th-grade MAP scores were 43 in mathematics, 36 in CA, and 34 in science.

Table III.1. Impact of Kauffman School on MAP test scores (citywide comparison group)

	Mathematics	CA	Science	Sample size
One-year impact estimates	0.12** (0.04)	0.13** (0.04)	0.43** (0.04)	2,242
Two-year impact estimates	0.27** (0.05)	0.19** (0.06)	n.a.	1,181
Three-year impact estimates	0.57** (0.07)	0.41** (0.08)	n.a.	534

Note: This table displays impact estimates in effect size units. The first row presents the average one-year impact estimates for cohort I, cohort II, and cohort III 5th graders. The second row presents the average two-year impact estimates for cohort I and cohort II 6th graders. The third row presents the three-year impact estimates of cohort I 7th graders (the only cohort that has completed three years in the Kauffman School). Standard errors are displayed in parentheses below each impact estimate. The sample size represents the total number of Kauffman and matched comparison students entering each analysis. One asterisk (*) indicates impacts that are significantly different from zero at the 5 percent level. Two asterisks (**) indicate impacts that are significantly different from zero at the 1 percent level.

CA = communication arts.

n.a. = not applicable

The first row of Table III.1 shows the amount of additional growth realized by Kauffman students relative to matched comparison students in all other Kansas City public schools one year after enrollment in the Kauffman School. These numbers represent the average effect size estimate for the first three cohorts of 5th-grade students.¹³ The one-year impact estimates for the Kauffman School are positive and statistically significant in mathematics, reading, and science. The estimated effect size is 0.12 standard deviations for mathematics and 0.13 standard deviations for reading. The magnitude of the science estimate is 0.43 standard deviations, more than three times larger than the one-year impact estimates for the other two subjects. Caution should be used when interpreting the science estimate, however, because no prior year science test score was available to use in the propensity-score matching procedure or as a control variable in the regressions. The statewide science assessment in Missouri is first administered in 5th grade, so the only baseline test score variables available for use in the analysis of 5th-grade science impacts are prior scores in mathematics and reading.

The second row of Table III.1 reports the estimated effect of the Kauffman School on student achievement two years after enrollment. The results show that the Kauffman School had a positive and significant two-year impact on student MAP growth of 0.27 standard deviations in mathematics and 0.19 standard deviations in reading. The third row of Table III.1 reports the effect size estimates three years after enrollment. The estimated three year impact of the Kauffman School on student MAP growth is especially large, amounting to 0.57 standard deviations in mathematics and 0.41 standard deviations in reading. Collectively, these results

¹³ The effect sizes were estimated separately for each cohort of students. To calculate the impact estimates in Table III.1, we averaged these effect sizes together, weighting by the number of Kauffman students in the analysis sample for each cohort.

demonstrate that the impact of the Kauffman School accumulates for students who are enrolled for multiple years.

In Table III.2, we report the results with two alternative comparison groups. The first half of the table reports the effect size estimates for the Kauffman School compared to district-operated (non-charter) public schools in KCPS. The impact estimates in all subjects are larger when this comparison group is used. The second half of Table III.2 presents the results when the Kauffman School is compared to other charter schools in Kansas City. When compared to this group of schools, the effect sizes estimates for the Kauffman School are generally lower, but the estimates remain positive and statistically significant for all durations and subjects. Thus, students at the Kauffman School are showing significantly higher growth than students in other Kansas City charter schools. The differences in the impact estimates based on the district and charter comparison groups suggest that Kansas City's charter schools are generally outperforming district schools.

Table III.2. Alternate estimates of impact of Kauffman School on MAP test scores (district and charter school comparisons)

	Mathematics	CA	Science	Sample size
Compared to Kansas City district schools				
One-year impact estimates	0.12** (0.04)	0.14** (0.04)	0.46** (0.05)	1,665
Two-year impact estimates	0.33** (0.06)	0.21** (0.06)	n.a.	810
Three-year impact estimates	0.68** (0.08)	0.48** (0.09)	n.a.	335
Compared to Kansas City charter schools				
One-year impact estimates	0.12* (0.05)	0.12** (0.04)	0.42** (0.06)	923
Two-year impact estimates	0.23** (0.08)	0.17* (0.07)	n.a.	472
Three-year impact estimates	0.45** (0.11)	0.32** (0.11)	n.a.	215

Note: This table displays impact estimates in effect size units. Standard errors are displayed in parentheses below each impact estimate. The sample size represents the total number of Kauffman and matched comparison students entering each analysis. One asterisk (*) indicates impacts that are significantly different from zero at the 5 percent level. Two asterisks (**) indicate impacts that are significantly different from zero at the 1 percent level.

CA = communication arts.

n.a. = not applicable

B. Interpretation of Kauffman School impact estimates

To assist with the interpretation of the effect size estimates, we converted the effect sizes into three alternative units: (1) years of learning growth, (2) the change in state test score percentile rank for the average Kauffman student, and (3) the effect size as a percentage of local achievement gaps.

Results as years of learning growth. We can translate the effect sizes presented in the previous section into an approximate measure of the years of additional learning growth experienced by Kauffman students. We performed this conversion based on results presented in Bloom et al. (2008).¹⁴

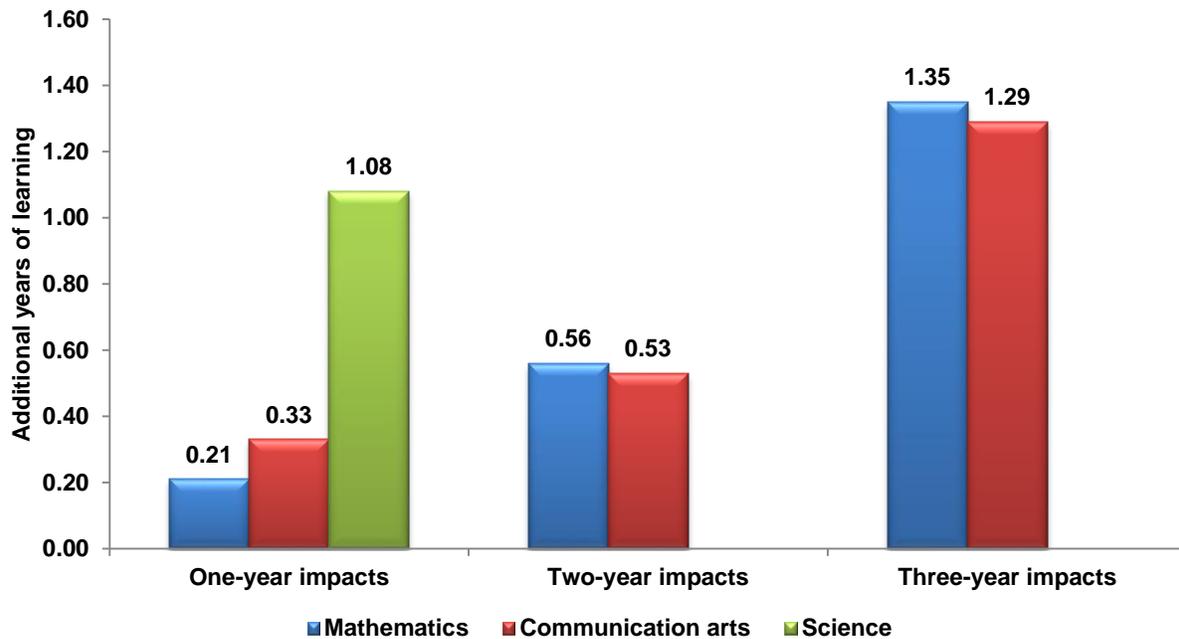
Performing this conversion on the results from the main comparison group yields the results shown in Figure III.1. One year after enrolling, Kauffman students realized an additional 0.21 years of growth in mathematics, 0.33 years in reading, and 1.08 years in science. Applying a similar conversion to our two-year impact estimates indicates that, two years after enrollment, Kauffman students achieved approximately 0.56 years of additional learning growth in mathematics and 0.53 years of additional learning growth in reading. Three years after enrollment, Kauffman students experienced a cumulative additional 1.35 years of learning in mathematics and 1.29 years in reading. Together these results suggest that the Kauffman School is meeting its aim of producing on average at least 1.25 years of learning in each year of instruction.¹⁵ Note that caution is warranted when interpreting the Kauffman School effect size results in terms of years of learning because the accuracy of these conversions depends on how similar achievement growth on the MAP exams is to the vertically scaled assessments analyzed in Bloom et al. (2008).¹⁶

¹⁴ See Gleason et al. (2012), Clark et al. (2013), and Tuttle et al. (2013) for examples of other studies performing conversions between effect size estimates and years of learning growth. Using a set of widely administered vertically scaled assessments, Bloom et al. (2008) estimated that the typical 5th-grade student grows 0.56 standard deviations in math, 0.40 standard deviations in reading, and 0.40 standard deviations in science. They also estimated that the typical 6th-grade student grows 0.41 standard deviations in math and 0.32 standard deviations in reading, whereas a typical 7th-grade student grows 0.30 standard deviations in math and 0.23 standard deviations in reading. To convert the one-year impact estimates of the Kauffman School into units of additional years of learning, we divided the impact estimates by the typical growth of 5th-grade students in each subject. We used a similar method to convert the two- and three-year impact estimates into additional years of learning growth. For the two- and three-year results, we divided the impact estimates by the average of the typical growth across all grades included in each analysis.

¹⁵ Though the one-year mathematics impact estimate is equivalent to 0.21 additional years of learning growth, the two- and three-year mathematics impact estimates suggest that the average additional yearly learning growth is above 0.25 after the first year of enrollment.

¹⁶ If typical achievement growth on the MAP is less than growth on the assessments analyzed in Bloom et al. (2008), then this conversion will underestimate the additional years of learning growth achieved by Kauffman students and vice versa. The scale of the MAP assessments is based, in part, on the Terra Nova exams, giving the MAP some of the characteristics of a vertically scaled exam. Thus, in principle, we could use average growth on the MAP in place of the numbers from Bloom et al. (2008). However, there are known issues with the MAP vertical scale when students show no growth on average between grades 5 and 6 (CTB McGraw-Hill 2012). Therefore, we did not attempt to use the vertical scale of the MAP to convert effect sizes into units of years of learning.

Figure III.1. Kauffman School estimates of additional years of learning growth on MAP exams



Note: The additional growth for all impact estimates is significantly different from zero.

Results as test score percentile ranks. As a second interpretation approach, we report the change in state test score percentile ranks that the average Kauffman student would expect to achieve as a result of attending the Kauffman School rather than an average Kansas City school. In 4th grade, before entering the Kauffman School, the average Kauffman student from the first cohort was at the 36th percentile in the state mathematics test score distribution and at the 39th percentile in the state CA test score distribution.¹⁷ Three years after enrollment at the Kauffman School, the average student moved to the 58th percentile in mathematics and the 55th percentile in CA.¹⁸ On average, students enrolled at the Kauffman School moved from substantially below average in the state distribution to above the state average three years after enrollment at the Kauffman School.

Results as a percentage of local achievement gaps. The Kauffman School effect size estimates can also be reported as a percentage of the local black-white test score gap and of the test score gap for poor students. These percentages provide a sense of how much of that achievement gap is being closed three years after enrollment in the Kauffman School. The three-

¹⁷ These calculations are based on the current analysis sample of cohort I students only, because this is the sample used to calculate the three-year impact estimates. Average 4th-grade achievement of cohort II students was at the 42nd percentile in math and the 38th percentile in CA. For cohort III students, average 4th-grade achievement was at the 37th percentile in math and the 42nd percentile in CA.

¹⁸ The percentile ranks three years after enrollment at the Kauffman School were calculated by taking the average 4th-grade z-scores of Kauffman students and adding the three-year effect size estimates. These calculations assume that the percentile rank of the average student in Kansas City does not change over time.

year impact estimates for the Kauffman School are approximately equivalent to 57 percent of the 7th-grade black-white test score gap in mathematics and 46 percent of the black-white gap in CA for Kansas City students.¹⁹ Because the science MAP exam is not administered in 6th or 7th grades, only the one-year science impact estimate can be examined in relation to this gap. The science impact estimate for the Kauffman School is equivalent to about 50 percent of the black-white test score gap in that subject.²⁰

In terms of the test score achievement gap for students who are eligible for free or reduced-price lunches relative to students who are ineligible, the three-year impact estimates for the Kauffman School are equivalent to about 121 percent of this gap in mathematics and 75 percent of this gap in CA. Thus, the three-year impact estimate for mathematics is large enough to more than close the achievement gap between students who are eligible for free or reduced-price lunches and those who are ineligible. The one-year impact estimate in science is equivalent to about 81 percent of the test score gap for poor students.²¹ These results indicate that the Kauffman School is making significant progress toward reducing achievement gaps for poor and minority students attending the Kauffman School.

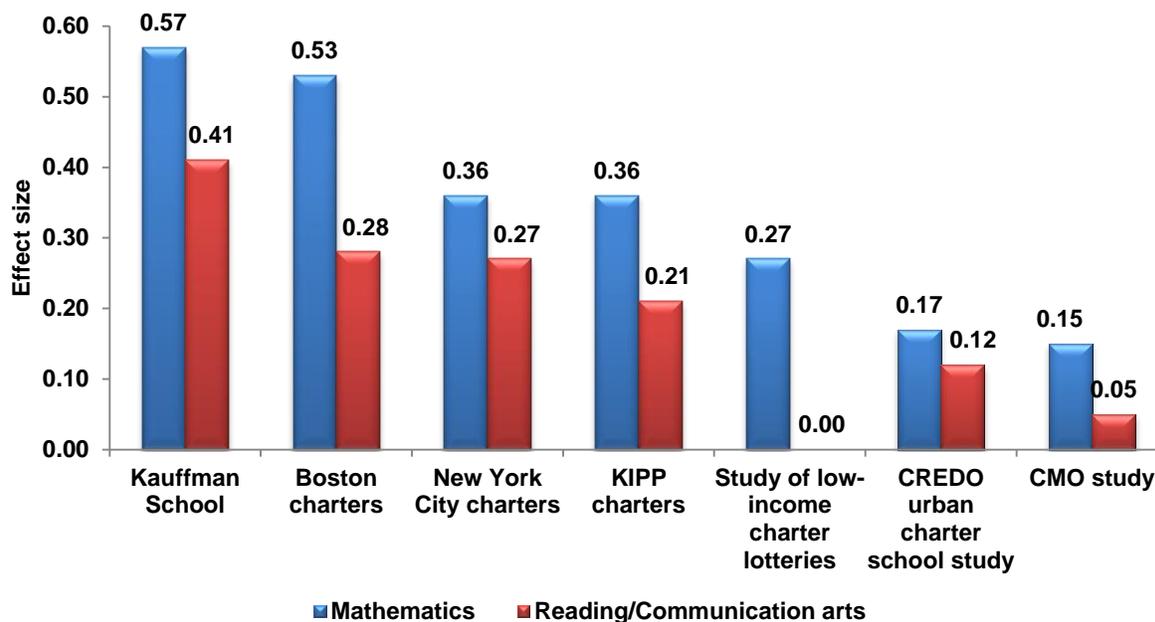
C. Comparison of Kauffman School estimated impacts to charter schools nationwide

The main three-year effect size results (based on the citywide comparison group) are larger than the average impacts estimated for high-performing charter schools in other studies and substantially greater than average impact estimates of charter schools nationwide. Here we discuss studies of three groups of charter schools widely acknowledged as producing substantial achievement growth for students: Boston, KIPP, and New York City charter schools. We also report the results of three nationwide studies of charter schools that focused on (1) charter schools with admission lotteries, (2) the average urban charter school in the 41 regions analyzed by the Center for Research on Education Outcomes (CREDO 2015), and (3) charter school management organizations (CMOs). The comparisons are summarized in Figure III.2. The three-year impact estimates for the Kauffman School are based only on one cohort of students. We therefore also present a comparison of the Kauffman School two-year impact estimates with those from other studies, as these impacts estimates are based on approximately twice as many students and are therefore estimated with greater precision.

¹⁹ The average 7th-grade math z -score for non-Kauffman black students in Kansas City in math is -0.861, and the average z -score for white students is 0.146. The corresponding z -scores in reading are -0.792 for black students and 0.103 for white students. These z -scores are based on test score data from the spring of 2014 to provide an estimate of the current black-white test score gap.

²⁰ The average 5th-grade science z -score for non-Kauffman black students in Kansas City is -0.968; the corresponding average z -score for white students is -0.115. These z -scores are based on data from the spring of 2014.

²¹ The z -scores used in the calculations for the poverty achievement gaps are as follows: the 7th-grade math gaps are -0.717 for non-Kauffman students eligible for free or reduced-price lunches and -0.247 for students who are not eligible; the 7th-grade reading gaps are -0.690 for non-Kauffman students eligible for free or reduced-price lunches and -0.140 for students who are not eligible; 5th-grade science gaps are -0.795 for non-Kauffman students eligible for free or reduced-price lunches and -0.264 for students who are not eligible.

Figure III.2. Charter school three-year impact estimates from various studies

Note: Figure III.2 contains three-year effect size estimates for the average Boston charter school reported in Abdulkadiroglu et al. (2009), the average KIPP charter school analyzed by Tuttle et al. (2013), the average New York City charter school in grades 4 through 8 reported in Hoxby, Murarka, and Kang (2009), the average charter school with a lottery admission process serving a large fraction of low-income students analyzed by Gleason et al. (2010), the average urban charter school in the 41 regions analyzed by the Center for Research on Education Outcomes (CREDO 2015), and the average school in the CMOs studied by Furgeson et al. (2012).

CMO = charter school management organization; CREDO = Center for Research on Education Outcomes; KIPP = Knowledge Is Power Program.

The performance of the Kauffman School in mathematics and reading is higher than the average estimated impacts of other successful charter school programs. A study of Boston charter schools (Abdulkadiroglu et al. 2009) showed an estimated average three-year effect size for these schools of 0.53 in mathematics and 0.28 in reading.²² The results presented by Hoxby et al. (2009) imply average three-year effect sizes of 0.36 in mathematics and 0.27 in reading for New York City charter schools in grades 4 through 8.²³ A study of KIPP charter middle schools—widely recognized as high-performing—reported average three-year impact estimates of 0.36 in mathematics and 0.27 in reading (Tuttle et al. 2013). The Kauffman School is estimated, on average, to have larger impacts on student achievement than these high-performing charter school programs. It is important to note that Figure III.2 displays the *average* impacts of

²² The three-year impact estimates reported in this section are generally obtained by tripling the average annual impact estimates reported by the authors. The exceptions to this are the KIPP study, the charter lottery study, and the CMO study. In the KIPP and CMO studies, the authors reported three-year impact estimates separately from one-year impact estimates. The three-year impact estimates for the charter lottery study were obtained by increasing the two-year impact estimates by 50 percent.

²³ The estimated impacts of New York City charter schools on lower elementary school grades are smaller than in grades 4 through 8. When lower elementary school grades are included in the calculations, the average three-year impact estimates for New York City charter schools are 0.27 in math and 0.18 in reading.

the charter schools in these groups. Some individual schools or subsets of these groups have larger estimated impacts than the Kauffman School. For example, the three-year impact estimates for over-subscribed Boston charter middle schools analyzed in Abdulkadiroglu et al. (2009) are equivalent to 0.51 standard deviations in reading and 1.6 standard deviations in mathematics.—

The achievement growth experienced by students at the Kauffman School is substantially higher than the average growth experienced by students at broader samples of charter schools nationwide. Gleason et al. (2010) analyzed a sample of oversubscribed charter middle schools with lottery admission processes. The results indicate an average three-year impact estimate of 0.27 in mathematics and zero in reading for charter schools serving a large fraction of low-income students.²⁴ Across urban charter schools in the 41 regions included in the Center for Research on Education Outcomes (CREDO) analysis, the average impact was 0.17 in mathematics and 0.12 in reading (CREDO 2015). The average charter school in the CMOs analyzed by Furgeson et al. (2012) was estimated to produce three-year effect sizes of 0.15 in mathematics and 0.05 in reading.

The three-year impact estimates for the Kauffman School are approximately double the size of the two-year impact estimates. When the Kauffman School two-year impact estimates are compared to those reported in other studies of charter schools, the estimates fall within the range of other highly successful charter programs but are still substantially larger than the impact estimates from national charter school studies (Figure III.3).

Relatively few studies of charter school effectiveness report impact estimates in science because there are fewer available data on science achievement than there are for mathematics and reading. New York City charter schools are estimated to have average annual impacts of 0.23 standard deviations on science achievement in grades 5 through 8 (Hoxby et al. 2009). KIPP charter schools are estimated to have an average impact of 0.33 standard deviations in science three to four years after enrollment, implying an average one-year impact of approximately 0.094 standard deviations.²⁵ The Kauffman School's estimated science impact is substantially larger than both of these.

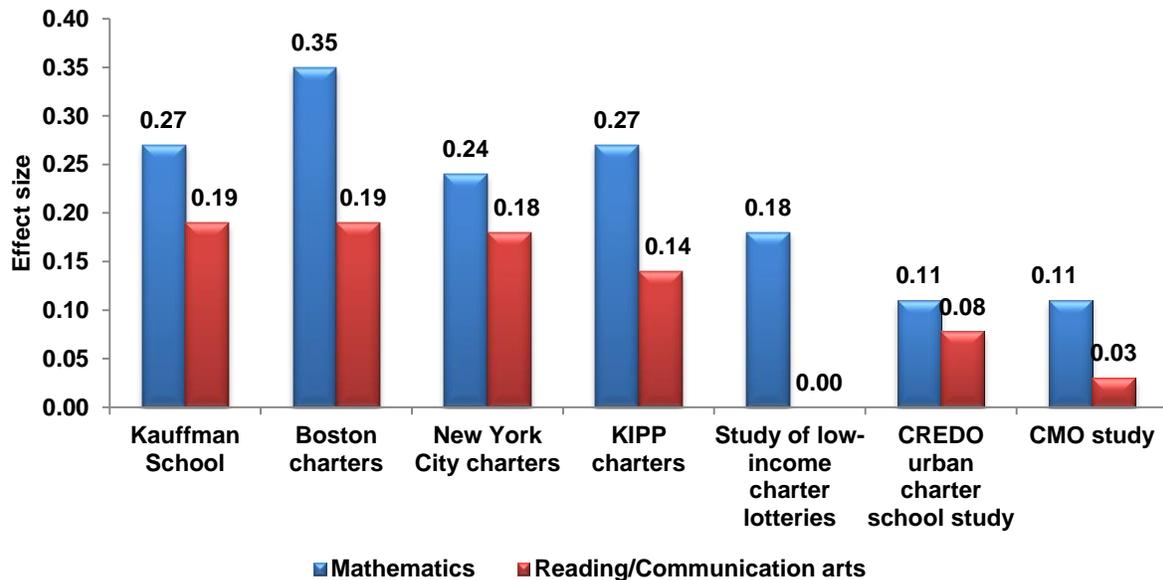
Few of the charter schools included in the studies cited here were in their first two or three years of operation. Studies have shown that the performance of charter schools often improves after the first year of operation (Gill et al. 2007; Sass 2006). For example, Sass (2006) found that charter schools in Florida significantly underperformed traditional public schools during their first year of operation. Sass (2006) also found that the impact estimates of first-year charter schools were on average 0.05 to 0.07 standard deviations lower than those of charter schools in

²⁴ Gleason et al. (2010) report negative but statistically insignificant impact estimates based on the full set of charter schools in their sample.

²⁵ The KIPP one-year science impact estimate was obtained by dividing the three- to four-year impact estimate by 3.5.

their fifth and higher years of operation.²⁶ These results suggest that the Kauffman School's estimated effects are especially noteworthy because the three-year impacts are based on students who were enrolled during the first year the Kauffman School was open.

Figure III.3. Charter school two-year impact estimates from various studies



Note: Figure III.3 contains two-year effect size estimates for the average Boston charter school reported in Abdulkadiroglu et al. (2009), the average KIPP charter school analyzed by Tuttle et al. (2013), the average New York City charter school in grades 4 through 8 reported in Hoxby, Murarka, and Kang (2009), the average charter school with a lottery admission process serving a large fraction of low-income students analyzed by Gleason et al. (2010), the average urban charter school in the 41 regions analyzed by the Center for Research on Education Outcomes (CREDO 2015), and the average school in the CMOs studied by Furgeson et al. (2012).

CMO = charter school management organization; CREDO = Center for Research on Education Outcomes; KIPP = Knowledge Is Power Program.

D. Goal that 75 percent of students score proficient or advanced on all MAP subjects

One goal of the Kauffman School is that at least 75 percent of students enrolled at the Kauffman School for three consecutive years will score in the proficient or advanced performance range on all subjects of the MAP test.²⁷ The proficiency rates of Kauffman School students enrolled for three consecutive years are summarized in Table III.3. The first column displays the percentage of these students who scored proficient or advanced on the MAP exams taken in the spring before they entered the Kauffman School. This column provides an indication

²⁶ The results in Sass (2006) differ by subject and whether the sample was based on all charter schools or a sample that excluded conversion charter schools. Conversion charter schools began as traditional public schools but later changed to charter schools.

²⁷ Based on discussions with education experts, staff at the Kauffman School currently view the 75 proficiency target to be unrealistically high and are considering amending the School's charter application to change this goal.

of how ambitious the 75 percent goal is, as only 20 percent of incoming 5th-grade students in the 2011–2012 school year had achieved proficient or advanced in both subjects of their prior-year MAP exams.

The Kauffman School did not meet the goal of 75 percent of students achieving at the proficient or advanced levels during 2013–2014. Among students who were enrolled at the Kauffman School for three consecutive years, 51 percent achieved proficient or advanced on both subjects of the spring 2014 MAP exams. To provide additional detail about the progress Kauffman students made toward this goal, we report the percentage of students scoring proficient or advance separately by subject. In mathematics, 69 percent of students scored proficient or advanced after three years of enrollment, while in CA 55 percent of students scored proficient or advanced.

Table III.3. Percentage of continuously enrolled Kauffman students scoring proficient or advanced on MAP exams

	Proficient/advanced at time of entry	Proficient/advanced after three years of enrollment
Mathematics and communication arts MAP	20%	51%
Mathematics MAP	32%	69%
Communication arts MAP	30%	55%
Sample size	74	74

Note: The sample includes 74 students who were enrolled at the Kauffman School for three consecutive years. The scores at time of entry are based on 4th-grade MAP scores taken in the spring of 2011 for 69 students and 3rd-grade MAP scores taken in the spring of 2011 for 5 students who skipped a grade when entering the Kauffman School. The scores after three years of enrollment are based on 7th-grade MAP exams taken in the spring of 2014 for 71 students and 6th-grade MAP exams taken during the spring of 2014 for 3 students who repeated a grade during their time at the Kauffman School.



IV. CHANGE IN EFFECTIVENESS OF THE KAUFFMAN SCHOOL OVER TIME

The Kauffman School has completed three full years of operation: the 2011–2012, 2012–2013, and 2013–2014 school years. We can use data on 5th- and 6th-grade students to test whether the estimated impacts of the Kauffman School have changed over time. We might expect to see an increase in the estimated impact of the Kauffman School over time because other studies have found that charter schools often show increases in their performance after the first year (Gill et al. 2007; Sass 2006).

Table IV.1 compares the estimated one-year Kauffman School impacts for cohorts I, II, and III. Each cohort performed better than their comparison groups in all subjects. The estimates are larger for cohort II than for cohort I, although none of the differences in estimated impacts between the two cohorts are statistically significant.²⁸ Conversely, the estimates are smaller for cohort III than for cohort II, though again the differences are not statistically significant. Thus, there is no evidence of a change in the one-year impact estimates for the Kauffman School over time.

Table IV.2 compares the estimated two-year Kauffman School impacts for 6th-graders in cohorts I and II. In mathematics, the impact estimate is smaller for cohort II than for cohort I, although in reading the effect size is slightly larger. Neither difference is statistically significant. As with the one-year impact estimates, there is no evidence that the Kauffman School's cumulative two-year impacts changed between the first and second cohorts.

²⁸ Independent two-sample t-tests were used to test for significant differences between the one-year impact estimates in each subject.

Table IV.1. Comparison of one-year MAP test score impacts: Cohort I, II, and III 5th graders

	Cohort I 5th graders	Cohort II 5th graders	Cohort III 5th graders
5th-grade mathematics effect size	0.13 (0.06)	0.15 (0.07)	0.12 (0.04)
5th-grade CA effect size	0.06 (0.07)	0.18 (0.06)	0.13 (0.04)
5th-grade science effect size	0.40 (0.08)	0.54 (0.07)	0.43 (0.04)
Sample size	677	617	948

Note: This table displays impact estimates in effect size units. Standard errors are displayed in parentheses below each impact estimate. The sample size represents the total number of Kauffman students and matched comparison students entering each analysis. One asterisk (*) indicates significantly different from the prior cohort at the 5 percent level. Two asterisks (**) indicate results are significantly different from the prior cohort at the 1 percent level.

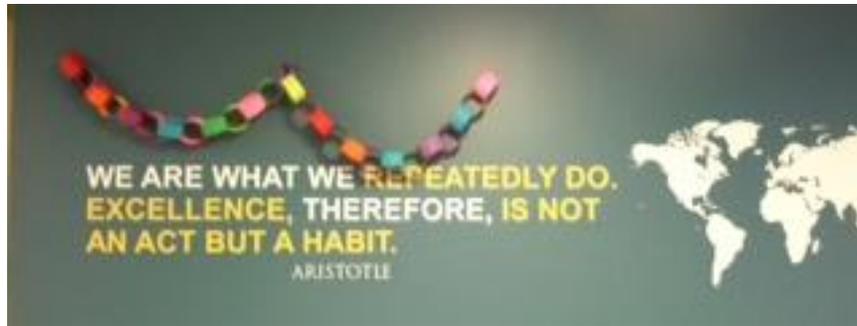
CA = communication arts.

Table IV.2. Comparison of two-year MAP test score impacts: Cohort I and cohort II 6th graders

	Cohort I 6th graders	Cohort II 6th graders
6th-grade mathematics effect size	0.33 (0.08)	0.20 (0.07)
6th-grade CA effect size	0.18 (0.07)	0.20 (0.07)
Sample size	596	585

Note: This table displays impact estimates in effect size units. Standard errors are displayed in parentheses below each impact estimate. The sample size represents the total number of Kauffman students and matched comparison students entering each analysis. One asterisk (*) indicates significantly different from the prior cohort at the 5 percent level. Two asterisks (**) indicate results are significantly different from the prior cohort at the 1 percent level.

CA = communication arts.



V. THE IMPACT OF THE KAUFFMAN SCHOOL ON STUDENT ATTENDANCE AND SUSPENSIONS

In this chapter, we present the impacts of the Kauffman School on student attendance and suspensions during the 2013–2014 school year. It is important to keep in mind that the analysis of suspensions cannot distinguish effects driven by differences in student behavior from effects driven by differences in the enforcement of school policies or reporting practices. If Kauffman students are more likely than students in other schools to be suspended, this could be due to poor behavior or because the Kauffman School issues suspensions for different kinds of behavior than other Kansas City schools.

The set of comparison students used to analyze attendance and suspension outcomes is the same as the set used to analyze MAP achievement in Chapter III. We also used the same set of baseline control variables, including 4th-grade attendance and suspension information. We analyzed the attendance and suspension outcomes separately by cohort and by grade to highlight differences that arise over time and across grades. We used the attendance rate as the outcome in the attendance models and present three sets of results for suspension outcomes. The state of Missouri collects suspension data separately for in-school suspensions and out-of-school suspensions. For the initial suspension analysis, we combined these data into one variable, indicating whether a student received either type of suspension. Our aim in combining these data was to create a variable that would be as comparable as possible across schools, because some schools have different standards for the kinds of disciplinary infractions that warrant in-school and out-of-school suspensions. To provide additional information on the source of the Kauffman School suspension impacts, we also present separate results where indicators for ever receiving an in-school or out-of-school suspension are used as outcome variables. (See Appendix A.1 for further details about the construction of the attendance and suspension variables.)

The distribution of suspensions is skewed, with the majority of students receiving no suspensions. To simplify the analysis for the main suspension impact results, our outcome of interest is whether a student ever received a suspension during the year.²⁹

Before presenting the impact estimates of the Kauffman School, we present some descriptive statistics about attendance and suspensions at the Kauffman School and other schools

²⁹ Because the suspension outcome is a binary variable rather than a continuous one, we use a logit model in place of the linear regression to implement the analysis.

in the Kansas City school district during the 2013–2014 school year. That descriptive information is displayed in Table V.1. It shows that the Kauffman School achieved its goal of 95 percent average daily attendance in both 5th, 6th, and 7th grades during the 2013–2014 school year. The attendance rate of Kauffman students was significantly higher than that of other Kansas City students in all grades.

The Kauffman School also suspended students at a significantly higher rate during 2013–2014, compared with other schools in Kansas City. Almost half (48 percent) of Kauffman 5th-grade students received at least one suspension during the year, compared with 18 percent of 5th-graders districtwide. Kauffman in-school and out-of-school suspension rates were 28 and 22 percentage points higher than districtwide rates, respectively. Similarly, 48 percent of Kauffman 6th-grade students received at least one suspension during the year, compared with 23 percent of 6th graders districtwide. Both in-school and out-of-school suspension were higher for Kauffman 6th graders. Approximately half (51 percent) of 7th-grade Kauffman students were suspended during 2013–2014, compared with 33 percent of 7th graders districtwide. The higher percentage of 7th graders receiving suspensions at the Kauffman School appears to be driven by in-school suspensions, as the percentage of students receiving an out-of-school suspension did not differ between Kauffman and district 7th graders.

Table V.1. Attendance and suspension rates for Kauffman and all Kansas City students during 2013–2014

	Kauffman students	Kansas City students	Difference
5th-grade students			
Attendance rate (%)	95.8 (4.4)	94.8 (4.5)	1.0**
Ever suspended (%)	48.4 (50.1)	17.5 (38.0)	30.9**
Ever suspended (in-school) (%)	35.7 (48.0)	7.3 (26.0)	28.4**
Ever suspended (out-of-school) (%)	35.2 (47.9)	13.1 (33.8)	22.0**
Sample size	182	1,675	
6th-grade students			
Attendance rate (%)	96.0 (3.3)	94.6 (4.8)	1.4**
Ever suspended (%)	47.6 (50.2)	22.9 (42.1)	24.7**
Ever suspended (in-school) (%)	31.0 (46.5)	12.0 (32.5)	19.0**
Ever suspended (out-of-school) (%)	34.5 (47.8)	15.9 (36.6)	18.6**
Sample size	84	1,539	
7th-grade students			
Attendance rate (%)	95.1 (5.1)	93.0 (6.1)	2.1**
Ever suspended (%)	50.5 (50.3)	32.7 (46.9)	17.8**
Ever suspended (in-school) (%)	40.0 (49.2)	18.3 (38.7)	21.7**
Ever suspended (out-of-school) (%)	29.5 (45.8)	24.3 (42.9)	5.2
Sample size	95	1,505	

Note: Standard deviations are presented next to means in parentheses. Two asterisks (**) indicate results are significantly different at the 1 percent level.

The descriptive statistics presented in Table V.1 are based on the full sample of Kauffman and Kansas City students in 5th, 6th, and 7th grades during 2013–2014. In Table V.2, we present the estimated impacts of the Kauffman School on attendance and suspensions, based on the sample of matched comparison students.

Table V.2. Impact of Kauffman School on attendance and suspensions during 2013–2014

	5th-grade students	6th-grade students	7th-grade students	2013–2014 average
Attendance rate (%)	0.57 (0.39)	0.51 (0.46)	1.16* (0.57)	0.72** (0.27)
Probability of being suspended (%)	27.9** (3.6)	24.9** (5.2)	18.7** (5.5)	24.7** (2.6)
Probability of in-school suspension (%)	29.1** (3.4)	20.0** (5.1)	21.1** (5.8)	24.8** (2.6)
Probability of out-of-school suspension (%)	19.4** (4.0)	20.9** (5.6)	8.2 (5.1)	16.6** (2.8)
Sample size	948	585	534	2,067

Note: The suspension results are marginal effects from logit models in which the outcome variable is an indicator for receiving a suspension during the year. Standard errors are displayed in parentheses beside each impact estimate. The sample size represents the total number of Kauffman students and matched comparison students entering each analysis. The fourth column represents a weighted average (by the number of Kauffman students) of the impacts across grade levels. One asterisk (*) indicates results are significantly different from zero at the 5 percent level. Two asterisks (**) indicate results are significantly different from zero at the 1 percent level.

Impact on attendance. The results show that during the 2013–2014 school year, the Kauffman School overall had a positive and significant impact on the attendance rate of its students. The magnitude of the coefficient indicates that, on average, Kauffman students had an attendance rate that was 0.72 percentage points higher than that of other similar students in Kansas City. The estimated impact is positive in all grades, but is only significant for 7th-grade students where the magnitude of the impact is almost twice as large as it is in 5th or 6th grade.

Impact on suspensions. The estimated suspension impacts for the Kauffman School are also positive, indicating that Kauffman students are significantly more likely to be suspended than similar students in Kansas City. Overall, Kauffman students were 25 percentage points more likely to receive at least one in-school suspension and 17 percentage points more likely to receive at least one out-of-school suspension than were comparison students. The lower average effect for out-of-school suspensions is driven by the fact that the impact estimate for 7th-grade students was relatively small (8 percentage points) and not significantly different from zero.

Caution is warranted when interpreting the suspension impact estimates for the Kauffman School. The positive and significant impacts could be due to (1) stricter discipline policies at the Kauffman School, which might result in the issuing of suspensions for less-severe infractions than at other schools; (2) the longer school day and school year at the Kauffman School, which provides more opportunities for students to misbehave and for suspensions to be issued; or (3) a larger number of behavior problems from Kauffman students than comparison students. We report the attendance and overall suspension impact estimates when the two alternative comparison groups are used in Appendix B, Table B.10.

For the Kauffman School, a clearly defined and consistently implemented discipline system is vital for meeting the Kauffman School’s mission, because student misbehavior has the potential to inhibit teaching and learning (Richardson 2009). As a result, the Kauffman School might be more likely to remove disruptive students from the classroom via in-school or out-of-school suspension than other schools to minimize the loss of instructional time. To help put the high suspension rates at the Kauffman School into perspective, we present the average number of days suspended *among students who receive at least one suspension* in Table V.3. The average number of days suspended *among students ever suspended* is not significantly different between Kauffman and matched comparison students in any of the three grades examined. The average number of days suspended among students receiving at least one suspension is between two and three for most grades for both Kauffman and comparison students. The results are similar when median days suspended is examined in place of average days suspended; the median days suspended ranges from one to two across grades for both groups. Overall, although more students receive suspensions at the Kauffman School, the average number of days missed due to suspensions *among suspended students* is not significantly higher among Kauffman students.

Table V.3. Average number of days suspended for students receiving suspensions during 2013–2014

	Kauffman students	Kansas City students	Difference
5th-grade students			
Mean suspensions	3.33 (3.20)	2.38 (2.21)	0.95
Mean suspensions (in-school)	2.26 (1.74)	2.52 (2.17)	0.70
Mean suspensions (out-of-school)	2.26 (1.86)	1.80 (1.26)	0.25
Sample size	76	137	
6th-grade students			
Mean suspensions	2.64 (1.82)	2.20 (1.94)	0.44
Mean suspensions (in-school)	1.92 (1.29)	2.02 (1.59)	-0.10
Mean suspensions (out-of-school)	1.84 (1.15)	1.66 (1.16)	0.17
Sample size	36	119	
7th-grade students			
Mean suspensions	2.82 (3.18)	2.92 (2.60)	-0.10
Mean suspensions (in-school)	1.93 (1.42)	2.56 (2.13)	-0.62
Mean suspensions (out-of-school)	2.18 (2.20)	2.01 (1.53)	0.17
Sample size	47	141	

Note: Standard deviations are presented next to means in parentheses. The sample size represents the total number of Kauffman students and matched comparison students with at least one suspension (in-school or out-of-school). No differences are statistically significant at the 5 percent level.

The fact that the average number of days missed among Kauffman students who receive suspensions is approximately three helps to shed light on how the Kauffman School may be having large positive impacts on student achievement while suspending students at high rates. The additional instructional time at the Kauffman School that results from the extended school day and year is much larger than three days. The Kauffman School estimates that students receive the equivalent of approximately five weeks of additional schooling per year relative to other public school students in Kansas City. Since the average number of days missed due to

suspensions is small relative to the additional instructional time at the Kauffman School, it is possible that the high suspension rates are not substantially detracting from learning.

Changes in attendance and suspension impacts across years.

Table V.4 displays a comparison of the attendance and suspension impacts between for the first three cohorts of 5th-grade students. Estimated impacts on both in-school and out-of-school suspensions were significantly higher for cohort III 5th-graders relative to cohort II 5th graders. Table V.5 displays a similar comparison for the first two cohorts of 6th-grade students. In-school suspension rates were significantly higher for cohort II 6th graders relative to cohort I 6th graders.

Overall, the suspension impact estimates were greatest for cohort I 7th graders, cohort II 6th graders, and cohort III 5th graders, indicating that suspensions were higher in 2013–2014 than in previous years. This is consistent with reports from Kauffman School teachers and staff that students struggled with the discipline system throughout the 2013–2014 school year, leading to efforts such as increased professional development sessions on the discipline system, to ensure that the Kauffman School’s disciplinary system was consistently implemented across all teachers and staff.

Table V.4. Comparison of impacts of the Kauffman School on attendance and suspensions from 2011–2012 to 2012–2013 and from 2012–2013 to 2013–2014

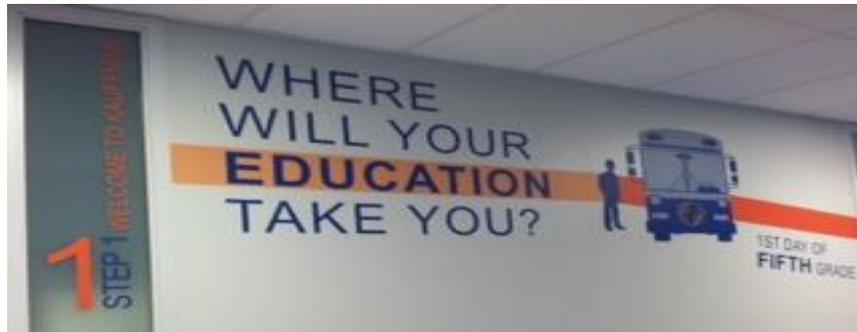
	2011–2012 cohort I 5th- grade students	2012–2013 cohort II 5th- grade students	2013–2014 cohort III 5th- grade students
Attendance rate (%)	-0.83 (0.48)	0.84* (0.45)	0.57 (0.39)
Probability of being suspended (%)	13.4 (5.2)	1.5 (4.5)	27.9** (3.6)
Probability of in-school suspension (%)	0.3 (3.9)	-1.4 (1.6)	29.1** (3.4)
Probability of out-of-school suspension (%)	14.2 (4.7)	3.1 (4.4)	19.2* (0.40)
Sample size	677	617	948

Note: The suspension results are marginal effects from logit models in which the outcome variable is an indicator for receiving a suspension during the year. Standard errors are displayed in parentheses beside each impact estimate. The sample size represents the total number of Kauffman students and matched comparison students entering each analysis. One asterisk (*) indicates results are significantly different from the prior 5th-grade cohort's outcomes at the 5 percent level. Two asterisks (**) indicate results are significantly different from the prior 5th-grade cohort's outcomes at the 1 percent level.

Table V.5. Comparison of impacts of the Kauffman School on attendance and suspensions from 2012–2013 to 2013–2014

	2012–2013 cohort I 6th-grade students	2013–2014 cohort II 6th-grade students
Attendance rate (%)	0.89 (0.44)	0.51 (0.46)
Probability of being suspended (%)	12.1 (5.1)	24.9 (5.2)
Probability of in-school suspension (%)	-1.1 (3.8)	20.0** (5.1)
Probability of out-of-school suspension (%)	14.0 (5.1)	20.9 (5.6)
Sample size	596	585

Note: The suspension results are marginal effects from logit models in which the outcome variable is an indicator for receiving a suspension during the year. Standard errors are displayed in parentheses beside each impact estimate. The sample size represents the total number of Kauffman students and matched comparison students entering each analysis. One asterisk (*) indicates results are significantly different from the prior 6th-grade cohort's outcomes at the 5 percent level. Two asterisks (**) indicate results are significantly different from the prior 6th-grade cohort's outcomes at the 1 percent level.



VI. CONCLUSIONS

A. Key findings

The Kauffman School has ambitious goals for its students: accelerated learning and high levels of attendance. The results from our analysis of MAP assessments and attendance data show that the Kauffman School is achieving these goals. But the Kauffman School is also suspending its students at rates that are much higher than suspension rates for similar students in other schools in Kansas City.

Achieving academic goals. An analysis of data from the Kauffman School's first three years shows that the Kauffman School achieved its goal of having students grow on average at least 1.25 years for every year of attendance, in all three subjects tested by the MAP (mathematics, communication arts, and science). The average Kauffman School student started out substantially below the state average in terms of mathematics and reading scores upon entering the school but performed above the state average in both subjects three years after enrollment.

Comparisons to other charter schools. The Kauffman School's three-year impacts on test scores are larger than the average effects of groups of other charter schools known for their strong positive impacts on student achievement, such as Boston, KIPP, and New York City charter schools. These results are especially notable considering that the Kauffman results are from its first three years, and many of the results in these studies are based on charter schools that have been operating for a longer period of time.

Achieving attendance goals. The Kauffman School achieved its goal of an average daily attendance rate of 95 percent each year during Years 1, 2, and 3 (see Gentile et al. 2014). During the 2013–2014 school year, the Kauffman School had a statistically significant positive impact on its 7th-grade students' rate of attendance, boosting the rate by about one percentage point.

Suspension of students. The Kauffman School suspended students at a significantly higher rate than other schools in Kansas City. During 2013–2014, Kauffman students were 25 percentage points more likely to receive an in-school suspension and 17 percentage points more likely to receive an out-of-school suspension compared with other similar students in Kansas City. Overall, approximately half of Kauffman students received at least one suspension (in-school or out-of-school) during the year. Though the Kauffman School suspended students at a significantly higher rate than other schools in Kansas City, the average number of days missed

due to suspensions was small relative to the additional instructional time received by Kauffman students.

However, the Kauffman School's higher rate of suspension is worrisome in light of recent data from the U.S. Department of Education showcasing racial and ethnic disparities in suspension rates (U.S. Department of Education Office for Civil Rights 2014). According to this report, black students' rate of out-of-school school suspension is three times greater than the rate for white students. The U.S. Department of Education has investigated allegations of Title VI violations related to racial disparities in discipline practices in some school districts (for example, in Mississippi, Minnesota, and Washington) (U.S. Department of Education Office for Civil Rights 2012). Moreover if Kauffman students continue to receive high numbers of suspensions while in high school, the suspensions on students' academic records may decrease their chances of getting accepted to some colleges (Weissman and NaPier 2015).

B. Next steps for the Kauffman School

Growing and moving. Year 4 is a year of change and expansion for the Kauffman School. In Year 3 all students occupied the same building, but in Year 4 the middle and high school buildings will be operational. Students in the 5th and 6th grades will occupy the middle school building and students in the 7th and 8th grades will occupy the high school building. Both buildings will have their own principals, teachers, and deans of students. The student body will grow with the addition of 200 new 5th graders.

Implementing the Common Core State Standards. During Year 3, teachers and school leaders participated in developmental activities to ensure that the Kauffman School's English language arts (ELA) and mathematics curriculum and instruction aligned with the Common Core State Standards (CCSS). In the summer before Year 3, teachers participated in workshops given by Expeditionary Learning in how to implement its CCSS-aligned ELA curriculum. To implement the mathematics CCSS, Kauffman teachers adopted and received training on a CCSS-aligned mathematics curriculum developed by UP Academy, a high-performing charter school. Mathematics teachers reviewed this curriculum and used it to plan lessons for the year. Because the science CCSS were not yet available, Kauffman teachers followed their current curriculum, adding an emphasis on reading in keeping with the CCSS for literacy in the content areas.

Maintaining School culture. As the Kauffman School grows, administrators and teachers are attending to the issue of how to maintain and expand the Kauffman School's culture. On the new campus, students and staff occupy different buildings based on grade level. This grouping has logistical benefits but poses challenges for instilling a common culture across buildings and grade levels. Administrators and teachers are working on ways to maintain the Kauffman School's hallmarks: ambitious academic achievement, high attendance rates, and exemplary behavior.

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APPENDIX A

DATA, SAMPLE SELECTION, AND ANALYSIS METHODOLOGY

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1. Data preparation details

The Missouri Department of Elementary and Secondary Education provided data on state assessment results and student characteristics for all students enrolled in Missouri public schools during our analysis period. Mathematica Policy Research requested student data for all 3rd graders in 2010–2013, all 4th graders in 2011–2013, all 5th graders in 2012–2013, all 6th graders in 2013–2014, and all 7th graders in 2014. The state assessment data contained Missouri Assessment Program (MAP) scaled scores, proficiency levels, and test accommodation information for each student test by year, grade level, and content area. The student characteristics data contained demographic, free or reduced-price lunch status, limited English proficiency, disability, attendance, and disciplinary information for each student by year and school of enrollment, as well as school-level characteristics such as charter school classification and school location.

To link the state assessment and student characteristics data, we reduced both to the unique student level. In the state assessment data, we removed records in which students had more than one unique subject-specific MAP scaled score reported in a given year. In the characteristics data, we first removed all records with zero or missing reported attendance and then summed attendance and disciplinary variables across each student's school-specific records to calculate student-year totals. We then reduced the data to the student level such that all year-specific attendance/disciplinary information was preserved in separate variables, and demographic, free or reduced-price lunch status, limited English proficiency, and disability information was taken from the student's 4th-grade record if available, 3rd-grade record if the 4th-grade record was unavailable, and 5th-grade record if both 4th- and 3rd-grade records were not available. Any students not found in both the characteristics and state assessment data were dropped from the analysis.

We created several new variables to facilitate the analyses. We transformed student MAP scaled scores into z -scores based on statewide year-, grade-, and subject-specific means and standard deviations. We also used enrollment and absence information to create an attendance rate measure that we bottom-coded at the year-specific first percentile to remove extreme outliers. We used disciplinary information to create yearly indicators of whether students received a suspension that year.¹ We then collapsed subject-specific 3rd- and 4th-grade MAP z -scores into grade-specific variables by taking each student's most recent score (by year) within grade level for those students repeating grades. We created a single binary test accommodation indicator to represent having test accommodations on any 3rd- or 4th-grade MAP test.

2. Sample Selection

The Kauffman School group is composed of students enrolled in the Kauffman School in 5th grade in 2011–2012, 2012–2013, or 2013–2014 for at least part of the school year. The Kansas City District Schools comparison group is composed of students enrolled in the Kansas City 33 School District in 5th grade in our analysis years during at least part of the school year who were not included in the Kauffman School group. The Kansas City Charter Schools

¹ All analyses use 4th-grade attendance and suspensions as control variables. If 4th-grade information on these variables was missing, then 3rd-grade values were used instead.

comparison group includes only those students who were enrolled in 5th grade for all or part of the school year in a Kansas City charter school. The all Kansas City public schools comparison group contained all students in either of the other two comparison groups. We developed a list of charter schools using information on school location and background research on charter schools identified as being located in Kansas City (Missouri Department of Elementary and Secondary Education 2014a) and enrolling 5th-grade students in our analysis years.

In addition to these restrictions, we excluded any Kauffman students missing all outcome (5th, 6th, or 7th grade) grade MAP test scores or all 3rd- and 4th-grade MAP test scores.² We also dropped any comparison students missing all 3rd- and 4th-grade MAP test scores or any outcome scores from the final analysis sample. For analyses based on data from 2013–2014, 7 Kauffman students (7 percent) were dropped from the cohort I analysis sample, 18 Kauffman students (18 percent) were dropped from the cohort II analysis sample, and 16 Kauffman students (9 percent) were dropped from the cohort III analysis sample as a result of these restrictions. With respect to the full comparison group, 21 percent of otherwise eligible students were dropped from the cohort I analysis sample, 16 percent of otherwise eligible students were dropped from the cohort II analysis sample, and 11 percent of otherwise eligible students were dropped from the cohort III analysis sample. See Johnson et al. (2014) for details about the percentage of students dropped from the analyses based on data from 2012–2013. Finally, we excluded any students who were enrolled for part of any school year at the Kauffman School from the comparison group (and included them in the Kauffman School group). The numbers of students included in the Kauffman School and comparison groups for each grade and cohort in our analysis are provided in Table A.1.³

Table A.1. Number of students in each comparison group in 2013–2014

Final study group	Cohort I 7th graders	Cohort II 6th graders	Cohort III 5th graders
Kauffman students	95	84	182
All Kansas City public schools comparison group	1,505	1,539	1,675
Kansas City district schools comparison group	857	865	1,026
Kansas City charter schools comparison group	653	687	667

We display the baseline average characteristics of all students included in the Kauffman School and comparison groups for cohort I students in Table A.2, cohort II students in Table A.3, and cohort III students in Table A.4. These tables show that Kauffman students tend to differ significantly from students enrolled in Kansas City public schools on several key baseline measures. Kauffman students had significantly higher average 4th-grade MAP test scores than students in other Kansas City schools, though all groups had test scores that were below the

² Students who transfer to different school districts in Missouri will generally remain in our sample, but students who leave the state will be excluded due to missing outcome test scores.

³ See Johnson et al. (2014) for the corresponding numbers based on data from 2012–2013. The sample sizes for cohort I and cohort II students in Table A.1 are smaller due to missing outcome data for some students in 2013–2014.

statewide average.⁴ Kauffman students are also more likely to be black and less likely to be Hispanic, are less likely to receive baseline test accommodations, and had higher 4th-grade attendance rates relative to students enrolled in Kansas City district schools.⁵ The same directional trends exist for Kauffman students relative to other Kansas City charter school students, but the differences are less pronounced and less likely to be statistically significant. Kauffman students were generally similar to other Kansas City students with respect to free or reduced-price lunch status and disability status, though there were some significant differences across cohorts.

Table A.2. Baseline 4th-grade average characteristics of Kauffman School students and other Kansas City Public School students: Cohort I 7th graders

	Kauffman School	All Kansas City public schools	Kansas City district schools	Kansas City charter schools
4th-grade MAP mathematics scaled score	636	628*	627*	630
4th-grade MAP CA scaled score	651	638**	634**	644
Free or reduced-price lunch	0.86	0.89	0.92	0.85
Black	0.79	0.63**	0.59**	0.69*
Hispanic	0.14	0.25**	0.30**	0.19
Male	0.49	0.49	0.51	0.46
Disabled	0.07	0.09	0.09	0.09
Any baseline test accommodation	0.08	0.21**	0.28**	0.12
4th-grade attendance rate	0.95	0.94**	0.93**	0.95
4th grade ever suspended	0.20	0.18	0.17	0.18
Sample size	95	1,505	857	653

Note: One asterisk (*) indicates significantly different from Kauffman students at the 5 percent level. Two asterisks (**) indicate significantly different from Kauffman students at the 1 percent level.

CA = communication arts.

⁴ The statewide average (pooled across the years 2011–2012 through 2013–2014) 4th-grade MAP scaled score was 648 in math and 661 in communication arts (CA). The statewide standard deviation of 4th-grade MAP scores was 34 in mathematics and 38 in CA. These numbers are calculated by averaging the year-specific means and standard deviations from 2011–2012 through 2013–2014.

⁵ Examples of test accommodations include extended test time, individual testing, and oral reading of test questions.

Table A.3. Baseline 4th-grade average characteristics of Kauffman School students and other Kansas City Public School students: Cohort II 6th graders

	Kauffman School	All Kansas City public schools	Kansas City district schools	Kansas City charter schools
4th-grade mathematics scaled score	643	633**	630**	637
4th-grade CA scaled score	651	640**	635**	646
Free or reduced-price lunch	0.80	0.89*	0.93**	0.84
Black	0.77	0.61**	0.56**	0.69
Hispanic	0.08	0.24**	0.31**	0.15*
Male	0.51	0.48	0.49	0.46
Disabled	0.12	0.08	0.08	0.08
Any baseline test accommodation	0.14	0.24*	0.32**	0.14
4th-grade attendance rate	0.96	0.95**	0.95**	0.95**
4th grade ever suspended	0.12	0.19*	0.19	0.20*
Sample size	84	1,539	865	687

Note: One asterisk (*) indicates significantly different from Kauffman students at the 5 percent level. Two asterisks (**) indicate significantly different from Kauffman students at the 1 percent level.

CA = communication arts.

Table A.4. Baseline 4th-grade average characteristics of Kauffman School students and other Kansas City Public School students: Cohort III 5th-graders

	Kauffman School	All Kansas City public schools	Kansas City district schools	Kansas City charter schools
4th-grade mathematics scaled score	636	632	628**	638
4th-grade CA scaled score	653	639**	633**	649
Free or reduced-price lunch	0.89	0.90	0.94	0.85
Black	0.80	0.58**	0.54**	0.64**
Hispanic	0.12	0.27**	0.32**	0.21**
Male	0.44	0.51	0.54*	0.47
Disabled	0.05	0.10*	0.10*	0.09
Any baseline test accommodation	0.12	0.29**	0.38**	0.17*
4th-grade attendance rate	0.96	0.95**	0.94**	0.95
4th grade ever suspended	0.14	0.15	0.16	0.12
Sample size	182	1,675	1,026	667

Note: One asterisk (*) indicates significantly different from Kauffman students at the 5 percent level. Two asterisks (**) indicate significantly different from Kauffman students at the 1 percent level.

CA = communication arts.

3. Multiple imputation methodology

We calculated impact estimates using a multiple imputation procedure with $M = 10$ imputed data sets. We imputed missing baseline outcome variable values separately by treatment or comparison status using a chained linear equations model that included all outcome variables and all student characteristic variables included in the final impact regressions.⁶

Students were excluded from the imputation model if they had missing data for all 3rd- or 4th-grade MAP test scores or missing data for all outcome (5th-, 6th-, or 7th-grade) MAP test scores. Missing values were imputed before propensity-score matching and regression analyses in each multiple imputation data set.

After collecting coefficient and standard error estimates from each of the 10 imputed data sets, we computed multiple imputation coefficients and standard errors using Rubin's combination method (Rubin 1987). The multiple imputation beta (β_M) coefficient is the average of the beta coefficient values in each imputed data set (β_m); the multiple imputation standard

⁶ In previous years, to maximize sample size we included all students in the state in the imputation of missing data for comparison group students. This year, to account for possible differences in the relationship among variables for Kansas City students relative to other districts in the state, we restricted the imputation sample for comparison students to include only other students in Kansas City who were part of the comparison group. The results were very similar with and without this restriction imposed, so we did not re-estimate the results from previous years.

error is the square root of the within-imputation coefficient variance (Var_W) plus the between-imputation coefficient variance (Var_B) inflated by a finite imputation correction multiplier:

$$(1) SE_M = \sqrt{Var_W + \left(1 + \frac{1}{M}\right) Var_B} = \sqrt{\left(\frac{\sum_{m=1}^M Var_m}{M}\right) + \left(1 + \frac{1}{M}\right) \left(\frac{\sum_{m=1}^M (\beta_m - \beta_M)^2}{M-1}\right)}$$

4. Propensity-score matching methodology

We estimated a propensity score for each eligible treatment and comparison student in each multiple imputation data set using a stepwise logistic regression model. We used an entry criterion of ($p < .20$) to determine whether each variable would enter the final logistic regression model. (See Table A.5 for a list of the variables.)

Table A.5. List of potential covariates used for propensity-score matching

4th-grade mathematics and communication arts MAP z-scores
Second- and third-order polynomials of 4th-grade mathematics and communication arts MAP z-scores
3rd-grade mathematics and communication arts MAP z-scores
4th-grade attendance rate and ever-suspended variables
Gender, race, individualized education plan, English language learner, free or reduced-price lunch, any baseline test accommodation
Interactions of 4th-grade mathematics and communication arts MAP z-scores with gender, race, individualized education plan, English language learner, free or reduced-price lunch, any baseline test accommodation
Interactions of race with gender and free or reduced-price lunch
Indicators for imputed 3rd- and 4th-grade mathematics and communication arts MAP z-score variables
Indicator for imputed 4th-grade attendance rate or ever-suspended variables

After generating propensity scores for each Kauffman student and eligible comparison student, we selected a matched comparison group by finding comparison students with propensity score values within a given threshold, or radius, from each Kauffman student's p-score. Comparison students were sampled with replacement, meaning that each comparison student could be matched to multiple Kauffman students. To limit the number of possible comparison students, we specified a minimum matching radius and maximum number of potential matched neighbors. The matching radius was larger for the district comparison group to prevent the sample sizes of Kauffman and matched comparison students from being too small due to the fact that district students differed more from Kauffman students on baseline characteristics relative to the other two groups. The matching radius was also larger for cohort II and cohort III Kauffman students relative to cohort I students, because these students differed more relative to comparison students on baseline characteristics compared with cohort I students

(see Tables A.2–A.4). If there were no comparison students within the matching radius for a given treatment student, he or she was excluded from the matched comparison impact analyses. Because each comparison student could be matched to multiple treatment students, we used a weighting scheme in which each treatment student had a weight of one and each comparison student had a weight representing the number of treatment students matched to him or her. Table A.6 gives summary matching information for each comparison group.⁷

Table A.6. Matching information summary

	All Kansas City public schools	Kansas City district schools	Kansas City charter schools
Cohort I 7th graders			
Minimum matching radius	0.0003	0.0008	0.0003
Maximum number of matches	20	20	20
Number of Kauffman students	95	95	95
Mean number of Kauffman students matched	91	75	73
Mean number of comparison students	444	260	142
Mean matches per Kauffman student	6.2	4.3	2.3
Cohort II 6th graders			
Minimum matching radius	0.0005	0.0014	0.0005
Maximum number of matches	20	20	20
Number of Kauffman students	84	84	84
Mean number of Kauffman students matched	73	66	68
Mean number of comparison students	511	352	171
Mean matches per Kauffman student	8.7	7.2	3.0
Cohort III 5th graders			
Minimum matching radius	0.0005	0.0014	0.0005
Maximum number of matches	20	20	20
Number of Kauffman students	182	182	182
Mean number of Kauffman students matched	159	155	132
Mean number of comparison students	789	641	252
Mean matches per Kauffman student	6.9	6.8	2.5

In Table A.7, we present summary statistics to show how well Kauffman students were matched to comparison students on baseline characteristics. On average, comparison students from each matched group were not significantly different from Kauffman students on any baseline characteristics used in the analysis. Note that the sample sizes in Table A.7 are smaller for both Kauffman and comparison students relative to those in Tables A.2–A.4. This is because some Kauffman students differed enough from all comparison students such that no good match

⁷ See Johnson et al. (2014) for the matching information for other grade/cohort combinations.

Table A.7 (continued)

for these students could be found.⁷ The matched comparison analysis excludes these Kauffman students. (See Appendix B.2 for a sensitivity analysis where these students are included.)

Table A.7. Baseline 4th-grade average characteristics of matched comparison samples

	Kauffman School	All Kansas City public schools	Kansas City district schools	Kansas City charter schools
Cohort I 7th graders				
4th-grade mathematics scaled score	635 (32)	636 (33)	633 (34)	635 (30)
4th-grade CA scaled score	650 (34)	651 (33)	645 (32)	650 (34)
Free or reduced-price lunch	0.86 (0.34)	0.85 (0.36)	0.90 (0.30)	0.86 (0.35)
Black	0.78 (0.41)	0.77 (0.42)	0.75 (0.43)	0.79 (0.41)
Hispanic	0.14 (0.35)	0.14 (0.34)	0.14 (0.35)	0.12 (0.32)
Male	0.49 (0.50)	0.44 (0.50)	0.47 (0.50)	0.42 (0.49)
Disabled	0.07 (0.26)	0.07 (0.26)	0.08 (0.27)	0.06 (0.23)
Any prior test accommodation	0.09 (0.28)	0.09 (0.29)	0.12 (0.32)	0.08 (0.26)
4th-grade attendance rate	0.95 (0.04)	0.95 (0.04)	0.95 (0.04)	0.95 (0.04)
4th grade ever suspended	0.20 (0.40)	0.16 (0.37)	0.18 (0.38)	0.16 (0.36)
Sample size	91	444	260	142
Cohort II 6th graders				
4th-grade mathematics scaled score	642 (28)	643 (28)	643 (28)	644 (27)
4th-grade CA scaled score	652 (31)	650 (32)	649 (31)	652 (30)
Free or reduced-price lunch	0.87 (0.34)	0.87 (0.33)	0.89 (0.31)	0.80 (0.40)
Black	0.77 (0.42)	0.75 (0.43)	0.74 (0.44)	0.74 (0.44)
Hispanic	0.10 (0.30)	0.09 (0.29)	0.11 (0.32)	0.09 (0.29)
Male	0.53 (0.50)	0.45 (0.50)	0.50 (0.50)	0.44 (0.50)
Disabled	0.11 (0.31)	0.09 (0.28)	0.10 (0.30)	0.05 (0.22)
Any prior test accommodation	0.12 (0.33)	0.15 (0.36)	0.18 (0.38)	0.09 (0.29)
4th-grade attendance rate	0.96 (0.03)	0.96 (0.04)	0.96 (0.04)	0.96 (0.04)
4th grade ever suspended	0.14 (0.35)	0.13 (0.33)	0.16 (0.36)	0.15 (0.36)
Sample size	73	511	352	171
Cohort III 5th graders				
4th-grade mathematics scaled score	634 (31)	635 (31)	634 (31)	636 (29)
4th-grade CA scaled score	647 (32)	649 (33)	647 (34)	646 (31)
Free or reduced-price lunch	0.89 (0.31)	0.90 (0.30)	0.91 (0.29)	0.92 (0.26)

⁷ The composition of Kaufman students included in each matched comparison group analysis differs slightly among the separate analyses based on each comparison group. In Table A.7, we report averages for Kauffman students included in the main analysis in which the comparison group includes all Kansas City Public Schools.

Table A.7 (continued)

	Kauffman School	All Kansas City public schools	Kansas City district schools	Kansas City charter schools
Black	0.77 (0.42)	0.77 (0.42)	0.75 (0.43)	0.78 (0.41)
Hispanic	0.13 (0.34)	0.15 (0.35)	0.15 (0.36)	0.15 (0.36)
Male	0.44 (0.50)	0.47(0.50)	0.46 (0.50)	0.45 (0.50)
Disabled	0.06 (0.24)	0.05 (0.21)	0.05 (0.22)	0.07 (0.25)
Any prior test accommodation	0.13 (0.34)	0.14 (0,35)	0.14 (0.35)	0.10 (0.31)
4th-grade attendance rate	0.95 (0.04)	0.95 (0.04)	0.95 (0.04)	0.95 (0.04)
4th grade ever suspended	0.15 (0.36)	0.14 (0.34)	0.14 (0.34)	0.12 (0.33)
Sample size	159	789	641	252

Note: Standard deviations are displayed in parentheses next to the averages in this table. No differences between averages for Kauffman School students and comparison group students are significantly different from 0.

CA = communication arts.

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APPENDIX B
SENSITIVITY ANALYSES

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1. Attrition-adjusted results

Approximately 9 percent of cohort I, cohort II, and cohort III 5th-grade Kauffman students who were enrolled in the Kauffman School at the beginning of the school year left the Kauffman School before taking the 5th-grade Missouri Assessment Program (MAP) exams. Most of the students who left the Kauffman School enrolled in other schools in Missouri and took the relevant MAP exams at the end of the year, so we are able to track their achievement and include them in the analyses. Including these students means that the estimated effect sizes are interpretable as the additional achievement growth a student enrolling in the Kauffman School is expected to attain, accounting for the chance that this student might drop out of the Kauffman School during the school year. Although this is an informative number to calculate that is comparable to estimates reported in other charter school evaluations, it could also be of interest to estimate the effect of the Kauffman School on students who remain enrolled in the Kauffman School.

An estimate of the impact of the Kauffman School on the achievement of students who remained enrolled in the Kauffman School can be calculated by applying an adjustment for attrition known as a Bloom adjustment (Bloom 1984). The adjustment is made by dividing the impact estimates by the fraction of students who remained enrolled in the Kauffman School for the entire school year. This adjustment is made under the assumption that the end-of-year outcomes for students who withdrew from the Kauffman School are unaffected by their enrollment in the Kauffman School. This assumption is unlikely to be true for students who withdrew later in the year, which means the attrition-adjusted effect sizes are likely to be biased upward. The attrition-adjusted one-year effect size estimates are displayed in Table B.1. We do not present attrition-adjusted results for the two- or three-year impact estimates, because many of the students in that analysis spent their entire 5th-grade year enrolled in the Kauffman School before dropping out in 6th or 7th grades. For these students, the assumption of zero impact of the Kauffman School made when calculating the attrition-adjusted results would clearly not hold.

Table B.1. Attrition-adjusted impact of Kauffman School on MAP test scores (citywide comparison group)

	Attrition-adjusted results	Benchmark results
One-year impacts		
5th-grade mathematics effect size	0.13** (0.04)	0.12** (0.04)
5th-grade CA effect size	0.14** (0.04)	0.13** (0.04)
5th-grade science effect size	0.48** (0.05)	0.43** (0.04)
Sample size	2,242	2,242

Note: This table presents the attrition-adjusted average one-year impact estimates in effect size units. Standard errors are displayed in parentheses below each impact estimate. The sample size represents the total number of Kauffman students and matched comparison students entering each analysis. One asterisk (*) indicates significantly different from zero at the 5 percent level. Two asterisks (**) indicate significantly different from zero at the 1 percent level.

CA = communication arts.

As shown in Table B.1, the one-year impact estimates are larger but overall very similar in all three subjects when adjusted for attrition: 0.13 in mathematics, 0.14 in reading, and 0.48 in science. The significance level for all effect size estimates from the attrition-adjusted results remains unchanged from the main results.³⁷ The attrition-adjusted attendance and suspension impact estimates are displayed in Table B.2. They are also slightly larger in absolute value, but broadly similar to the main results.

Table B.2. Attrition-adjusted impact of Kauffman School on attendance and suspensions (citywide comparison group)

	Attrition-adjusted results	Benchmark results
Cohort III 5th graders		
Impact on attendance rate (%)	0.64 (0.43)	0.57 (0.39)
Impact on probability of being suspended (%)	31.3** (4.0)	27.9** (3.6)
Sample size	948	948
Cohort II 5th graders		
Impact on attendance rate (%)	0.91 (0.49)	0.84 (0.45)
Impact on probability of being suspended (%)	1.6 (4.9)	1.5 (4.5)
Sample size	617	617
Cohort I 5th graders		
Impact on attendance rate (%)	-0.93 (0.53)	-0.83 (0.48)
Impact on probability of being suspended (%)	14.9* (5.8)	13.4* (5.2)
Sample size	677	677

Note: This table reports the attrition-adjusted estimated impact of the Kauffman School on attendance and suspensions. The suspension results are marginal effects from logit models in which the outcome variable is an indicator for receiving a suspension during the year. Standard errors are displayed in parentheses below each impact estimate. The sample size represents the total number of Kauffman students and matched comparison students entering each analysis. One asterisk (*) indicates significantly different from zero at the 5 percent level. Two asterisks (**) indicate significantly different from zero at the 1 percent level.

2. Sensitivity of results to comparison group students

To examine the sensitivity of the results to the choice of comparison group, we re-estimated the models that included all students, even those whose baseline characteristics differed from the Kauffman students' characteristics. Rather than matching students based on baseline characteristics, this method relies exclusively on statistical controls for baseline characteristics.

³⁷ The statistical significance of the results will not change after the attrition adjustment, because the standard errors are adjusted along with the impact estimates.

The results are displayed in Table B.3. The results using all Kauffman and comparison students are close to the results based on the matched comparison group. This indicates that including the baseline control variables in a regression framework performed well in reducing bias that might result from the inclusion of comparison students who differed from Kauffman students in terms of baseline characteristics. In other charter school evaluations, regression results based on all comparison students have been shown to closely approximate results based on matched comparison groups (Tuttle et al. 2013).

Table B.3. Impact of Kauffman School on MAP test scores using full Kansas City comparison group

	Full Kansas City comparison results	Benchmark matched comparison results
One-year impacts		
5th-grade mathematics effect size	0.11** (0.04)	0.12** (0.04)
5th-grade CA effect size	0.12** (0.04)	0.13** (0.04)
5th-grade science effect size	0.43** (0.04)	0.43** (0.04)
Sample size	5,439	2,242
Two-year impacts		
6th-grade mathematics effect size	0.30** (0.05)	0.27** (0.06)
6th-grade CA effect size	0.20** (0.04)	0.19** (0.05)
Sample size	3,329	1,181
Three-year impacts		
7th-grade mathematics effect size	0.56** (0.06)	0.57** (0.07)
7th-grade CA effect size	0.39** (0.07)	0.41** (0.08)
Sample size	1,600	534

Note: This table displays impact estimates in effect size units for the full Kansas City comparison sample alongside the benchmark estimates from the matched comparison sample. The first section of this table presents the average one-year impact estimates for cohort I, cohort II, and cohort III 5th graders. The second section of this table presents the average two-year impact estimates for cohort I and cohort II 6th graders. The third section of the table presents three-year impact estimates for cohort I 7th graders. Standard errors are displayed in parentheses below each impact estimate. The sample size represents the total number of Kauffman students and comparison students entering each analysis. One asterisk (*) indicates significantly different from zero at the 5 percent level. Two asterisks (**) indicate significantly different from zero at the 1 percent level.

CA = communication arts

The attendance and suspension impact estimates based on all Kansas City students are displayed in Table B.4. These results are also similar to the main results in terms of the effect

size estimates. The estimates are more likely to be statistically significant due to the larger number of students included in the sample.

Table B.4. Impact of Kauffman School on attendance and suspensions using full Kansas City comparison group

	Full Kansas City comparison results	Benchmark matched comparison results
Cohort I 5th graders		
Impact on attendance rate (%)	-0.80 (0.44)	-0.83 (0.48)
Impact on probability of being suspended (%)	11.3** (3.4)	13.4* (5.2)
Sample size	1,832	676
Cohort I 6th graders		
Impact on attendance rate (%)	0.87* (0.39)	0.89* (0.44)
Impact on probability of being suspended (%)	10.5* (3.8)	12.1* (5.1)
Sample size	1,706	596
Cohort I 7th graders		
Impact on attendance rate (%)	1.40** (0.46)	1.16* (0.57)
Impact on probability of being suspended (%)	15.6** (4.3)	18.7** (5.6)
Sample size	1,600	534
Cohort II 5th graders		
Impact on attendance rate (%)	1.06** (0.37)	0.84* (0.45)
Impact on probability of being suspended (%)	1.0 (4.0)	1.5 (4.5)
Sample size	1,750	617
Cohort II 6th graders		
Impact on attendance rate (%)	0.74* (0.34)	0.51 (0.46)
Impact on probability of being suspended (%)	21.1** (3.6)	24.9** (5.2)
Sample size	1,539	585
Cohort III 5th graders		
Impact on attendance rate (%)	0.58 (0.30)	0.57 (0.39)
Impact on probability of being suspended (%)	22.3** (2.1)	27.9** (3.6)
Sample size	1,857	948

Note: This table reports the estimated impact of the Kauffman School on attendance and suspensions using the full Kansas City comparison sample alongside the benchmark matched comparison results. The suspension results are marginal effects from logit models in which the outcome variable is an indicator for receiving a suspension during the year. Standard errors are displayed in parentheses beside each impact estimate. The sample size represents the total number of Kauffman students and comparison students entering each analysis. One asterisk (*) indicates significantly different from zero at the 5 percent level. Two asterisks (**) indicate significantly different from zero at the 1 percent level.

3. Sensitivity of results to exclusion of grade repeaters

A small percentage of Kauffman’s cohort I and cohort II students (3.9 percent) repeated 5th grade in 2012–2013 or 2013–2014. This is slightly higher than the percentage of 5th-grade repeaters in Kansas City, which is 1.2 percent. No cohort I students repeated 6th grade in 2013–2014, though 1.4 percent of other Kansas City students repeated 6th grade. When a student repeats a grade, it creates a missing data problem for the analysis because that student no longer takes the same outcome assessment as the rest of the students in his or her original cohort. If repeaters were excluded from the analyses, this might introduce bias in the two- or three-year impact estimates for the Kauffman School, because repeater students are likely to struggle in terms of achievement growth. We therefore included repeaters in our main analyses. We follow the method used in Tuttle et al. (2013) for dealing with missing outcome scores for repeaters, which involves assuming that the relative rank in the district test score distribution does not change after the first time the repeater completed his or her previous grade. For example, students who repeat 5th grade are included along with other students from their same cohort in the two- and three-year impact estimates, with the z -scores of the repeater students fixed at their end-of-5th-grade values. Because we have shown that the Kauffman School has positive impacts on student achievement, the assumption about the test scores of repeaters will likely bias the two- and three-year impact estimates downward, because we are assuming that the Kauffman School has no effect on repeaters during their subsequent years enrolled in the Kauffman School.

In Table B.5, we present the results from our two- and three-year impact estimates when grade repeaters are excluded from the analysis. These effect sizes will likely provide an upper bound on the estimated effect size for the Kauffman School, given that the Kauffman School retains students at a higher rate in 5th grade compared with other Kansas City schools. The mathematics two-year effect size estimate is similar to the main result, whereas the other two- and three-year effect size estimates are 0.03 to 0.04 standard deviations higher when repeaters are excluded.

Table B.5. Impact of Kauffman School on MAP test scores (citywide comparison group), excluding grade repeaters

	Results excluding repeaters	Benchmark results including repeaters
Two-year impact estimates		
Mathematics effect size	0.27** (0.06)	0.27** (0.05)
CA effect size	0.22** (0.05)	0.19** (0.056)
Sample size	1,101	1,181
Three-year impact estimates		
Mathematics effect size	0.60** (0.08)	0.57** (0.07)
CA effect size	0.44** (0.08)	0.41** (0.08)
Sample size	473	534

Note: This table displays impact estimates in effect size units. The first column presents the two-year impact estimate for 6th graders and the three-year impact estimate for 7th graders when students who repeat 5th (or 6th) grade are excluded from the analysis. Standard errors are displayed in parentheses below each impact estimate. The sample size represents the total number of Kauffman students and matched comparison students entering each analysis. One asterisk (*) indicates significantly different from zero at the 5 percent level. Two asterisks (**) indicate significantly different from zero at the 1 percent level.

CA = communication arts.

4. Sensitivity of results to imputation procedure

The use of 10 imputed data sets in our multiple imputation procedure should be sufficient to prevent randomness in the imputed values from influencing the results. However, to test the sensitivity of the results to the use of imputed data, we re-estimated the regression models excluding observations that had any imputed baseline values. We also excluded grade repeaters from this sensitivity analysis, so that all impact estimates are based only on observed data. In this section, we report detailed matching information, baseline equivalence results, and MAP impact estimates when no imputed data are used.

The matching information for each cohort and comparison group is displayed in Table B.6. We used the same matching radius and maximum number of matches per Kauffman student as in the main results (see Table A.6). The primary difference in the match statistics in Table B.6 compared with Table A.6 is that there are fewer Kauffman students and fewer comparison students because students with imputed data are excluded from the sample.

Table B.6. Matching information summary for results using no imputed data

	No imputed values	Including imputed values
Cohort I 7th graders		
Minimum matching radius	0.0003	0.0003
Maximum number of matches	20	20
Number of Kauffman students	84	95
Number of Kauffman students matched	74	91
Number of comparison students	346	446
Mean matches per Kauffman student	5.2	6.2
Cohort II 6th graders		
Minimum matching radius	0.0005	0.0005
Maximum number of matches	20	20
Number of Kauffman students	80	84
Number of Kauffman students matched	72	73
Number of comparison students	431	511
Mean matches per Kauffman student	7.8	8.7
Cohort III 5th graders		
Minimum matching radius	0.0005	0.0005
Maximum number of matches	20	20
Number of Kauffman students	170	182
Number of Kauffman students matched	145	144
Number of comparison students	706	789
Mean matches per Kauffman student	6.5	6.9

The average baseline characteristics of Kauffman and comparison students when no imputed data are included are displayed in Table B.7. As with the baseline statistics displayed for the main analysis results (Table A.7), there are no statistically significant differences between the averages for Kauffman and comparison students on any of the baseline characteristics we examined. See Appendix B of Johnson et al. (2014) for the matching information and a comparison of the baseline characteristics for other cohort and grade combinations.

Table B.7. Baseline 4th-grade average characteristics of matched comparison sample: Results using no imputed data

	Kauffman School	All Kansas City Public Schools
Cohort I 7th graders		
4th-grade mathematics scaled score	636 (31)	634 (39)
4th-grade CA scaled score	651 (33)	649 (35)
Free or reduced-price lunch	0.84 (0.37)	0.88 (0.33)
Black	0.77 (0.42)	0.79 (0.41)
Hispanic	0.15 (0.36)	0.12 (0.32)
Male	0.45 (0.50)	0.52 (0.50)
Disabled	0.04 (0.20)	0.05 (0.22)
Any prior test accommodation	0.08 (0.27)	0.06 (0.24)
4th-grade attendance rate	0.95 (0.04)	0.95 (0.04)
4th grade ever suspended	0.18 (0.38)	0.20 (0.40)
Sample size	74	346
Cohort II 6th graders		
4th-grade mathematics scaled score	641 (27)	644 (27)
4th-grade CA scaled score	651 (32)	652 (33)
Free or reduced-price lunch	0.88 (0.33)	0.87 (0.34)
Black	0.78 (0.42)	0.75 (0.43)
Hispanic	0.10 (0.30)	0.09 (0.29)
Male	0.51 (0.50)	0.49 (0.50)
Disabled	0.13 (0.33)	0.09 (0.28)
Any prior test accommodation	0.14 (0.35)	0.12 (0.33)
4th-grade attendance rate	0.96 (0.03)	0.96 (0.04)
4th grade ever suspended	0.14 (0.35)	0.10 (0.31)
Sample size	72	431

Table B.7 (continued)

	Kauffman School	All Kansas City Public Schools
Cohort III 5th graders		
4th-grade mathematics scaled score	632 (31)	634 (30)
4th-grade CA scaled score	645 (32)	650 (32)
Free or reduced-price lunch	0.88 (0.33)	0.91 (0.29)
Black	0.77 (0.43)	0.76 (0.43)
Hispanic	0.13 (0.34)	0.14 (0.35)
Male	0.43 (0.50)	0.45 (0.50)
Disabled	0.06 (0.24)	0.05 (0.22)
Any prior test accommodation	0.13 (0.34)	0.13 (0.34)
4th-grade attendance rate	0.95 (0.04)	0.95 (0.04)
4th grade ever suspended	0.14 (0.35)	0.12 (0.33)
Sample size	145	706

Note: Standard deviations are displayed in parentheses next to the averages in this table. No differences between averages for Kauffman School students and comparison group students are significantly different from 0.

CA = communication arts.

The test score impact estimates based on students with non-missing data are displayed in Table B.8. The results are broadly similar to the main results displayed in Table III.1. The impact estimates are similar in magnitude and the statistical significance is the same as for the main results.

Table B.8. Impact of Kauffman School on MAP test scores (citywide comparison group) using no imputed data

	Results using no imputed data	Benchmark results using imputed data
One-year impact estimates		
5th-grade mathematics effect size	0.10** (0.03)	0.12** (0.04)
5th-grade CA effect size	0.14** (0.03)	0.13** (0.04)
5th-grade science effect size	0.44** (0.04)	0.43** (0.04)
Sample size	1,931	2,242
Two-year impact estimates		
6th-grade mathematics effect size	0.26** (0.06)	0.27** (0.05)
6th-grade CA effect size	0.23** (0.04)	0.19** (0.06)
Sample size	973	1,181
Three-year impact estimates		
7th-grade mathematics effect size	0.56** (0.07)	0.57** (0.07)
7th-grade CA effect size	0.36** (0.09)	0.41** (0.05)
Sample size	420	534

Note: This table displays impact estimates in effect size units. The first section of this table presents the average one-year impact estimates for cohort I, cohort II, and cohort III 5th graders. The second section of this table presents the average two-year impact estimates for cohort I and cohort II 6th graders. The third section presents the three-year impact estimates for cohort I 7th graders. The first data column includes only students with non-missing data in the analysis sample. Standard errors are displayed in parentheses below each impact estimate. The sample size represents the total number of Kauffman and matched comparison students entering each analysis. One asterisk (*) indicates significantly different from zero at the 5 percent level. Two asterisks (**) indicate significantly different from zero at the 1 percent level.

CA = communication arts.

The attendance and suspension impact estimates based on students with non-missing data are displayed in Table B.9. The results are broadly similar to the main results displayed in Table V.1.

Table B.9. Impact of Kauffman School on attendance and suspensions (citywide comparison group) using no imputed data

	Results using no imputed data	Benchmark results using imputed data
Cohort I 5th graders		
Impact on attendance rate (%)	-0.68 (0.47)	-0.83 (0.48)
Impact on probability of being suspended (%)	9.6 (5.1)	13.4* (5.2)
Sample size	528	676
Cohort I 6th graders		
Impact on attendance rate (%)	0.73 (0.45)	0.89* (0.44)
Impact on probability of being suspended (%)	12.8** (4.7)	12.1* (5.1)
Sample size	470	596
Cohort I 7th graders		
Impact on attendance rate (%)	0.93 (0.60)	1.16* (0.57)
Impact on probability of being suspended (%)	27.5** (5.1)	18.7** (5.6)
Sample size	420	534
Cohort II 5th graders		
Impact on attendance rate (%)	0.83 (0.46)	0.84* (0.45)
Impact on probability of being suspended (%)	1.7 (5.0)	1.5 (4.5)
Sample size	552	617
Cohort II 6th graders		
Impact on attendance rate (%)	0.74 (0.41)	0.51 (0.46)
Impact on probability of being suspended (%)	25.3** (4.7)	24.9** (5.2)
Sample size	503	585
Cohort III 5th graders		
Impact on attendance rate (%)	0.49 (0.36)	0.57 (0.39)
Impact on probability of being suspended (%)	27.5** (3.3)	27.9** (3.6)
Sample size	851	948

Note: This table reports the estimated impact of the Kauffman School on attendance and suspensions. The first column presents results using only students with non-missing data in the analysis sample. The attendance rate is used as the outcome variable in the attendance regressions. The suspension results are marginal effects from logit models in which the outcome variable is an indicator for receiving a suspension during the year. Standard errors are displayed in parentheses below each impact estimate. The sample size represents the total number of Kauffman students and matched comparison students entering each analysis. One asterisk (*) indicates significantly different from zero at the 5 percent level. Two asterisks (**) indicate significantly different from zero at the 1 percent level.

5. Alternative comparison groups for attendance and suspension impact estimates

We report the attendance and suspension results when the two alternative comparison groups are used in Table B.10. When the district or charter school reference groups are used, the magnitude of the estimated impacts is similar, though the statistical significance of the estimates varies somewhat relative to the results in Table V.1.

Table B.10. Alternate estimates of impact of Kauffman School on attendance and suspensions (district/charter comparisons)

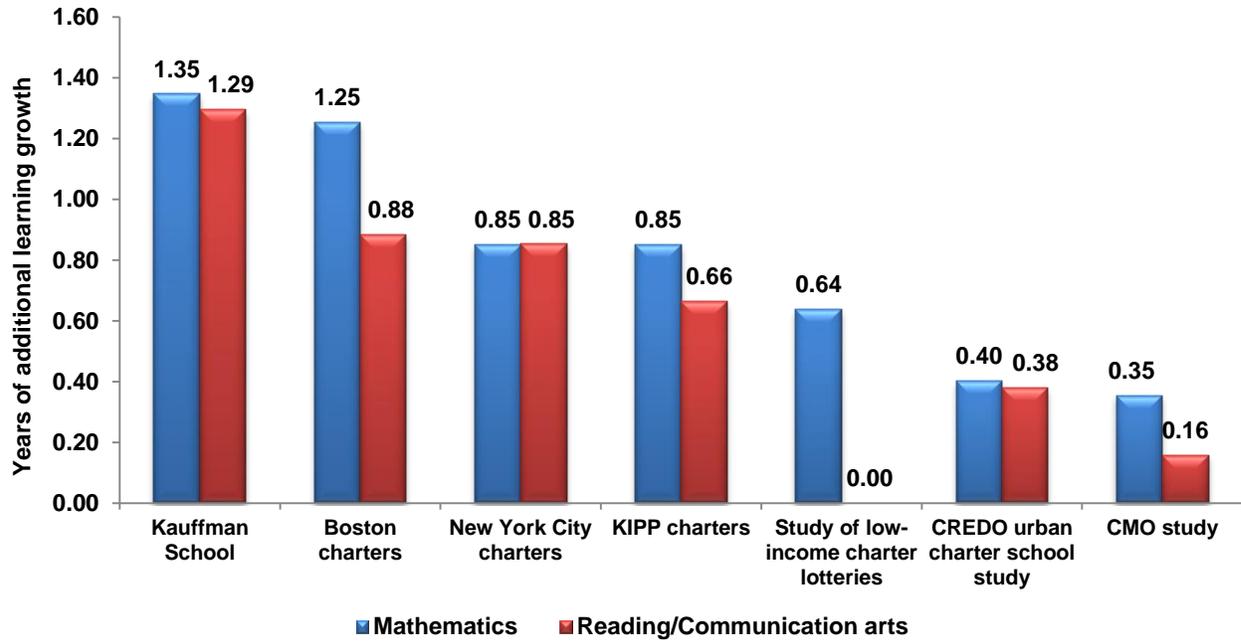
	Impact on attendance rate (%)	Impact on probability of being suspended (%)	Sample size
Kansas City district schools			
Cohort I 5th graders	-1.25* (0.63)	16.1** (5.5)	465
Cohort I 6th graders	0.66 (0.65)	14.0* (6.2)	393
Cohort I 7th graders	1.55 (0.81)	22.3** (6.5)	335
Cohort II 5th graders	0.96 (0.59)	-1.46 (5.73)	421
Cohort II 6th graders	0.47 (0.51)	27.7** (4.7)	417
Cohort III 7th graders	0.57 (0.41)	28.8 (4.2)	796
Kansas City charter schools			
Cohort I 5th graders	-0.41 (0.56)	12.6* (6.1)	280
Cohort I 6th graders	1.15 (0.60)	13.4 (7.2)	233
Cohort I 7th graders	0.92 (0.82)	22.9** (7.8)	213
Cohort II 5th graders	0.99 (0.59)	4.5 (5.8)	260
Cohort II 6th graders	0.73 (0.60)	23.6** (7.5)	236
Cohort III 7th graders	0.42 (0.51)	26.5** (5.1)	383

Note: This table reports the estimated impact of the Kauffman School on attendance and suspensions. The suspension results are marginal effects from logit models in which the outcome variable is an indicator for receiving a suspension during the year. Standard errors are displayed in parentheses below each impact estimate. The sample size represents the total number of Kauffman students and matched comparison students entering each analysis. One asterisk (*) indicates significantly different from zero at the 5 percent level. Two asterisks (**) indicate significantly different from zero at the 1 percent level.

6. Charter school impact estimates as years of additional learning growth

In this section, we use an alternative set of units to display the information contained in Figure III.2 and Figure III.3. We perform the same conversion based on results in Bloom et al. (2008) to translate from the effect size units presented in Figure III.2 and Figure III.3 into the units of years of additional learning growth in Figure B.1 and Figure B.2.

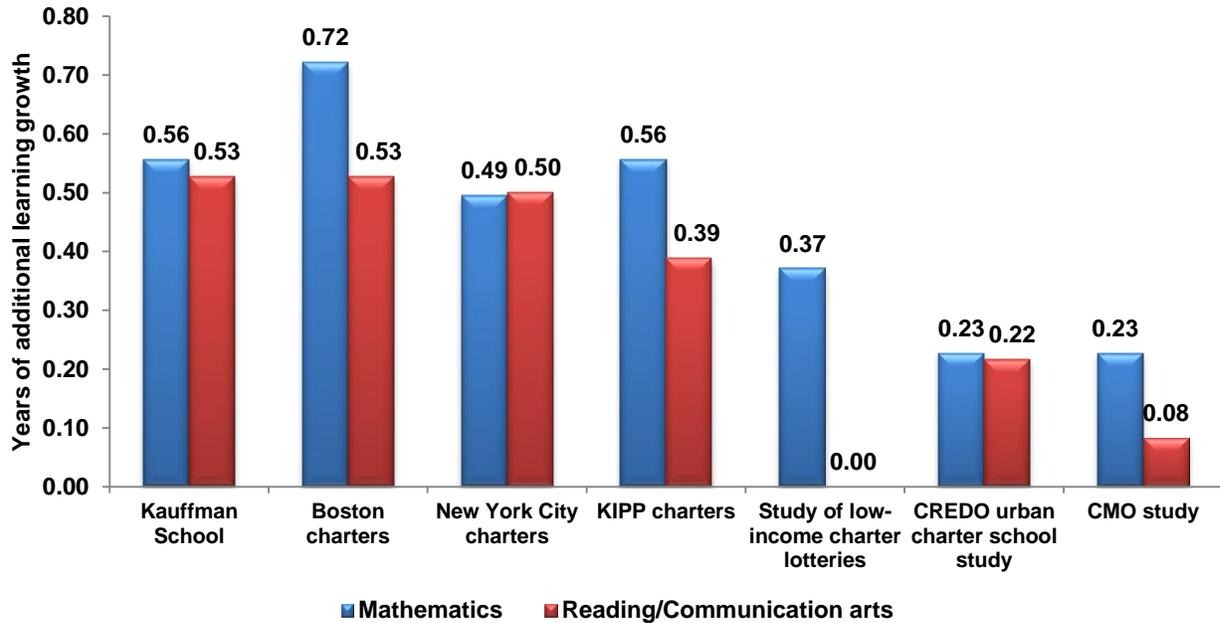
Figure B.1. Charter school three-year impact estimates from various studies represented as years of additional learning growth



Note: Figure B.1 presents the same information as Figure III.2 using years of additional learning growth rather than effect size units. See the note below Figure III.2 for a description of the studies summarized in this figure.

CMO = charter school management organization; CREDO = Center for Research on Education Outcomes; KIPP = Knowledge Is Power Program.

Figure B.2. Charter school two-year impact estimates from various studies represented as years of additional learning growth



Note: Figure B.2 presents the same information as Figure III.3 using years of additional learning growth rather than effect size units. See the note below Figure III.3 for a description of the studies summarized in this figure.

CMO = charter school management organization; CREDO = Center for Research on Education Outcomes; KIPP = Knowledge Is Power Program.

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