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The Educational and Behavioral Impacts of the Ewing Marion Kauffman Charter School

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ABSTRACT

The Kauffman School is a public charter school that serves students from low-income neighborhoods in Kansas City, Missouri. This paper used a matched comparison group design to estimate the impacts of the Kauffman School on student achievement, attendance, and suspensions. We found that the Kauffman School had positive and statistically significant impacts on student achievement in mathematics, reading, and science. This paper also used surveys, interviews, focus groups, and classroom observations to describe the hallmarks and operations of the Kauffman School and explore possible mechanisms for its effects, informing the literature on school effectiveness. We found evidence that the Kauffman School's hallmarks are largely being implemented faithfully, and that key stakeholders believe the Kauffman School's methods are having a positive influence on students' behavior, attitudes, and performance.

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I. INTRODUCTION

Charter schools represent a rapidly growing part of the American public education system. They are intended to serve as laboratories for innovation, and the growth of the sector provides increased opportunities to learn from their experience. Nearly 3 million students are currently served by 6,700 charter schools nationwide, which is an increase from 2,800 charter schools and 0.7 million students in 2003 (National Alliance for Public Charter Schools 2016). With the rapid growth of charter schools, stakeholders' interest has grown in both the academic impact of charter schools and also in charter school policies and practices which may contribute to their impacts on student achievement growth. What follows is a study of the effectiveness, policies, and practices of the Ewing Marion Kauffman School, a charter school in Kansas City, Missouri.

Background about the Kauffman School

The Kauffman School was opened by the Ewing Marion Kauffman Foundation in fall 2011, initially serving 5th grade, and expanding upward one grade each year so that it will ultimately serve grades 5 through 12. 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 Kauffman Foundation established its school design team. The school design team assessed Kansas City's low-income families' educational needs and identified the best practices of successful charter schools from across the country to inform the Kauffman School's policies. The key hallmarks of the Kauffman School include:

1. **High attendance and behavioral expectations.** Kauffman students are expected to maintain at least a 95 percent average daily attendance rate and to fully comply with all school policies and procedures.
2. **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.
3. **Extended school day and year.** As part of the effort to meet the academic growth target, the Kauffman School operates an extended school day and year. The Kauffman School estimates that students receive approximately five weeks of additional instruction per year relative to other public school students in Kansas City.
4. **Increased mathematics and reading instructional time.** Kauffman students have two periods of mathematics instruction each day, one period of reading instruction, and one period of literature/writing instruction. In addition, starting in the Kauffman School's second year of operation, 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 in which they needed help, 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,"[1] quizzes, and tests to measure understanding and academic progress, the Kauffman School's assessment portfolio includes the following:
   - Achievement Network (ANet) assessments in mathematics and reading, revised by Kauffman School teachers to be consistent with Missouri State Standards, administered every six weeks,
   - 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, and
   - 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 classroom observations and feedback; (2) weekly one-on-one meetings with instructional coaches; and (3) group-based professional development sessions every Friday afternoon, focused on various topics related to curriculum, instruction, assessment, student behavior, and school culture.
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.

Taken together, these features of the Kauffman School are similar to those found in "no excuses" charter schools, yet the Kauffman School does not identify itself as a "no excuses" school. When Kauffman School leaders think about how the term "no excuses" applies to their school, they describe a learning environment in which every adult holds high academic and behavioral expectations of all students and the adults do not make excuses for themselves if students are not meeting expectations.

Study summary

This paper uses a quasi-experimental, matched comparison group design to estimate the impacts of the Kauffman School on student achievement, attendance, and suspensions. According to our findings, during its first three years of operation, the Kauffman School had positive, statistically significant, and educationally meaningful impacts on student achievement in mathematics, reading, and science.

[1] 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.

The estimated impact of Kauffman School on student attendance is positive and significant in some grades and not significantly different from zero in others. We find that the Kauffman School suspends students at a higher rate than other schools in Kansas City. However, we also see that the number of days suspended for Kauffman students is on average small relative to the additional instructional time afforded by the Kauffman School's extended school day and year. It appears then that the discipline policy at the Kauffman School can be strictly enforced without resulting in a substantial loss of learning time for suspended students.

Data from surveys (of teachers, students, and parents), interviews, and classroom observations help us explore the mechanisms that might have contributed to the large positive impacts on student achievement and the high suspension rates. By combining information on school policies and operations with data on student impacts, the study aims to enhance our understanding about how schools can ensure that students develop the skills needed for academic success. Our study also contributes to the current policy debate about disparities in suspension rates and student achievement by placing the high suspension rates at the Kauffman School in context with the Kauffman School's large positive impacts on student achievement.

II. PREVIOUS LITERATURE

Large nationwide studies of charter schools have shown mixed impacts on student achievement on standardized tests. Gleason et al. (2010) analyzed a sample of oversubscribed charter middle schools with lottery admission processes and found, on average, no detectable effects on student achievement, although a subsample of these schools serving low-income students showed significantly positive impacts on students' mathematics achievement. Across the 27 states included in the Center for Research on Education Outcomes (CREDO) analysis of charter schools, there was no average impact on students' mathematics achievement and a small positive impact on students' reading achievement (CREDO 2013). A national study of charter school management organizations (CMOs) found that, on average, CMOs had no detectable effects (Furgeson et al. 2012). Berends et al. (2010) conducted a study of the impacts of 62 charter schools in Idaho, Indiana, and Minnesota and found no statistically significant effects. Zimmer et al. (2012) found mixed results in their study of charter schools and traditional public schools in two states—Ohio and Texas—and five large school districts—Chicago, Denver, Milwaukee, Philadelphia, and San Diego. Sass (2006) used data covering all public school students in Florida and found that, on average, charter schools in their first few years of operation had negative impacts on student achievement, but charter schools in operation for five or more years have positive and significant impacts on student achievement.

Many studies of charter schools in urban settings, and especially among schools serving poor and minority students, like the population served by the Kauffman School, have shown significant positive impacts on student achievement. Urban charter schools in 41 regions across the United States were shown to have on average positive and significant impacts on student mathematics and reading achievement (CREDO 2015). Abdulkadiroglu et al. (2009) found large positive impacts on student achievement of attending a charter school in Boston relative to traditional public schools, particularly among oversubscribed charter schools with admission lotteries. The New York City charter schools analyzed in Hoxby et al. (2009) were also shown to have substantial positive effects on student achievement. Dobbie and Fryer (2011) showed large positive impacts on student achievement for two Promise Academy charter schools in the

Harlem Children's Zone in New York City. Angrist et al. (2010) showed large positive impacts on student achievement for KIPP Lynn, which is part of the Knowledge Is Power Program (KIPP) network of charter schools that serve predominately low-income students. In a comprehensive study of KIPP middle schools, Tuttle et al. (2013; 2015) also found substantial positive average impacts on student achievement. Witte et al. (2007) showed that charter schools in Wisconsin performed better than traditional schools mainly at improving the achievement of low-performing students who are initially at the minimal or below basic levels. Grigg and Borman (2014) found no impacts for students attending two oversubscribed charter elementary schools in Colorado, although they found suggestive evidence of positive impacts on achievement for non-white students.

In addition to academic performance, the impact of charter schools on disciplinary outcomes, such as attendance and suspension rates, has gained attention by educators and stakeholders. However, this relationship has been less widely studied. Dobbie and Fryer (2011) found that children attending both the Promise Academy middle and elementary school had significantly fewer absences than comparison students. Angrist et al. (2011) estimated that urban charter middle school attendance was associated with a higher number of days suspended compared to urban traditional public schools. However, Gleason et al. (2010) found that students who attended oversubscribed charter schools in their study experienced a similar number of school absences and were equally likely to be suspended during the school year compared to students who also applied, but were not admitted to these schools.

Our paper adds to this growing body of research related to the academic and behavioral impacts of charter school attendance by examining the hallmarks of the Kauffman School and how they are implemented to understand the factors contributing to the observed impacts. Below we discuss the literature on the effectiveness of school policies and programs related to each of the Kauffman School's key hallmarks.

High expectations for behavior and attendance

High expectations for behavior and attendance is one of the fundamental principles of many charter schools, particularly of schools that believe in a "no excuses" approach to education. "No excuses" schools combine intensive classroom and learning policies geared toward the realization of high academic goals (Angrist et al. 2011). Such policies involve the consistent enforcement of discipline and behavior codes that reward students who consistently behave well, and impose predictable and immediate sanctions on those who violate rules (Thernstrom and Thernstrom 2004).

Studies have also shown that charter schools vary substantially in both the types of behavioral policies they implement and the level of consistency with which they enforce them. Studies indicate that schools with more comprehensive and consistently enforced schoolwide behavior systems have larger impacts on student achievement in mathematics and reading (Dobbie and Fryer 2013; Furgeson et al. 2012; Knechtel et al. 2015; Tuttle et al. 2013).

Specific disciplinary tactics, such as the removal of disruptive or misbehaving students from the classroom, may directly affect academic outcomes. It is possible that "zero tolerance" policies positively affect student learning by removing disruptive students from school and deterring misbehavior (Ewing 2000; Noguera 1995). However, schools' use of suspension has

also been linked to short-term and long-term academic delays for students (Arcia 2006; Rausch and Skiba 2005). These academic delays may be a result of suspensions reducing academic learning time or opportunity to learn (Advancement Project/Civil Rights Project 2000). There has also been heightened awareness of suspension rates of minority students, with studies linking the racial achievement gap to the gap in school discipline rates (Losen et al. 2015; Morris and Perry 2016). Nonetheless, because suspension rates are driven by school policy and student behavior, and often are related to prior achievement (Rausch and Skiba 2005), it is difficult to identify precisely how these elements contribute to differences in achievement gains or losses.

School attendance is another behavioral expectation many charter schools emphasize and enforce with formal policies. For example, Hoxby et al. (2009) report that about half of New York City's charter school students attended a school where parents were asked to sign a contract that included established expectations about attendance and on-time arrival at school. There is also empirical evidence documenting a negative relationship between absenteeism and short- and long-term academic outcomes (Buehler et al. 2012; Spradlin et al. 2012; Chang and Romero 2008).

Ambitious academic goals

Charter schools that hold high expectations for student achievement have been shown to produce larger academic gains in core subjects compared to charter schools that lack explicit policies related to high expectations (Dobbie and Fryer 2013) and compared to traditional public schools (Berends et al. 2010; Goldring and Cravens 2007). In an analysis of 76 charter schools in Colorado, Idaho, Indiana, and Minnesota, Goldring and Cravens (2007) found that, compared to traditional public schools, charter schools are more likely to implement in-school organizational conditions that support teachers' efforts to improve instruction and focus on achievement, such as principal leadership, professional learning communities, and teacher decision making authority. Berends et al. (2010) extended this research using a subsample of elementary schools and found that a school's "focus on achievement" level was significantly and positively associated with gains in mathematics achievement. In their study on the inner workings of 35 charter schools in New York City, Dobbie and Fryer (2013) found that prioritization of high academic and behavioral expectations was associated with higher annual mathematics and ELA achievement gains for charter school students.

As noted above, expectations and ambitious academic goals are fundamental principles of "no excuses" schools. "No excuses" schools place a strong emphasis on educational practices including frequent testing, increased instructional time, and a relentless focus on mathematics and reading achievement (Dobbie and Fryer 2013). The "no excuses" teaching and learning philosophy has been associated with large academic gains (Angrist et al. 2011; Dobbie and Fryer 2013). However, in Dobbie and Fryer (2011), the "no excuses" designation became statistically insignificant when controlling statistically for more instructional time, more effective teachers, the use of data and high-dosage tutoring, and high expectations, suggesting these policies are more important predictors of school effectiveness than a school's overarching "no excuses" philosophy.

Extended school day and year

Extended school days and years are intended to provide students with more instructional time to help attain greater academic gains. Schools extend classroom time not only to help students who are performing below grade level to catch up, but also to maintain a momentum of instruction that will help students meet high academic goals. Farbman and Kaplan (2005), for instance, suggest more time in school can advance learning when it affords students opportunities to spend more time on task, delve deeply into subject matter, engage in experimental learning, and receive tutoring and help with homework.

Relative to district schools, charter schools tend to have significantly longer school days and slightly longer school years (Farbman and Kaplan, 2005; Furgeson et al, 2012; Gleason et a1., 2010). For example, oversubscribed charter middle schools studied by Gleason et al. (2010) had significantly longer school days (7.2 versus 6.7 hours) and marginally longer school years (181.2 versus 179.9 days) than comparison schools. In addition, CMO principals studied by Furgeson et al. (2012) reported that their schools provide an additional 134 hours of instruction annually, compared to hours of instruction reported by traditional district school principals. While Zimmer and Buddin (2007) and Knechtel et al. (2015) found time in school had no effect on achievement, others have found a positive association with an increase in instructional days and student gains in mathematics and reading (Furgeson et al. 2012; Hoxby and Murarka 2009).

Increased time for mathematics and reading instruction

A more important predictor of academic outcomes than increased instructional time may be how instructional time is spent. Dobbie and Fryer (2011) found that, after controlling for operational policies, schools that add more instructional time for mathematics have higher annual achievement gains in that subject. Tuttle et al. (2013) found that average impacts on reading and mathematics achievement are larger in KIPP schools that spend relatively more time on core academic activities, a factor not necessarily correlated with length of school day. However, more recent data on KIPP schools show no relationship between time in core subjects and impacts on academic achievement (Knechtel et al. 2015).

Zimmer and Buddin (2007) also found that spending more hours on mathematics was positively associated with higher mathematics and reading scores in both charter and traditional public elementary schools, but increased reading/language arts instruction in elementary schools was not significantly correlated with higher test scores. The amount of time middle and high schools spend on mathematics and reading also was found to have little effect on test scores in charter and traditional public schools.

Intensive data-driven decision making

Teachers and administrators often use assessment data to track student progress and inform decisions about instruction such as adjusting tutoring groups and assigning remediation, modifying instructional material, and developing individualized student goals. Although Knechtel et al. (2015) found that KIPP teachers who receive more frequent support in the use of data to drive instruction have smaller positive impacts on reading, other studies have found that strategic use of data to inform decisions is positively related to achievement in charter schools (Dobbie and Fryer 2011; Furgeson et al. 2012). For example, reviewing student test results has

been linked to modest academic outcomes, whereas frequently revising teaching plans in response to assessment data results is positively and significantly predictive of achievement (Furgeson et al. 2012). Likewise, Dobbie and Fryer (2011) found charter schools that give five or more interim assessments during the school year and that implement four or more differentiation strategies have higher gains in mathematics and ELA achievement than schools that conduct fewer assessments and implement fewer differentiation strategies. These findings suggest that student assessment data may be useful only to the extent that they are associated with decision making and actual changes in instructional practices (Furgeson et al. 2012).

Extensive teacher professional development

Schools may aim to increase teacher effectiveness by offering professional development opportunities such as classroom observation and feedback, peer coaching, meetings with school leaders, and in-service workshops. Both charter schools and traditional public schools offer frequent professional development, yet the types of opportunities emphasized tend to vary across schools. (Zimmer and Buddin 2007; Wei et al. 2014). For example, charter schools in California studied by Zimmer and Buddin (2007) placed a greater emphasis on mentoring and coaching than traditional schools. Evidence suggests that CMOs are more likely to practice more frequent and intense professional development than district schools. Principals of CMO schools studied by Furgeson et al. (2012) reported providing more observations of and feedback to new teachers and required that these teachers submit lesson plans for review more often than did district school principals.

Although there is some evidence that professional development opportunities in both traditional public and charter schools are largely unrelated to reading and mathematics achievement (Zimmer and Buddin 2007), some studies have found that placing an emphasis on coaching new teachers and conducting more one-on-one meetings translates into larger academic gains (Dobbie and Fryer 2011; Furgeson et al. 2012). Dobbie and Fryer (2011), for example, found schools that give formal or informal feedback 10 or more times per semester had significantly higher annual mathematics and ELA gains than other schools. Furgeson et al. (2012) also found that the extent to which teachers are observed is correlated with the frequency with which they modify their lesson plans using student assessments, which is, in turn, associated with positive impacts on student achievement.

Well-established cultural norms

In addition to investing in the professional development of its teachers and staff, schools often establish comprehensive policies that promote a school culture aimed to develop the character of their students while improving student capacity for learning. Using interviews, focus groups, and class observations from eight schools in the northeast, Farbman and Kaplan (2005) concluded a positive school culture is a key feature of what helps a school reach its goals and produce strong student outcomes. Research suggests policies that aim to establish shared norms and values may be more common among CMOs and charter schools than traditional public schools. Goldring and Cravens (2007), for instance found that, compared to traditional public schools, charter schools scored higher on a composite measure of instructional focus, level of expectations, school climate, monitoring of student progress, and school-community relations. Lake et al. (2010; 2012) found in their comprehensive evaluation of 43 CMOs that nearly all CMO leaders required their schools to promote certain shared beliefs and values.

III. METHODOLOGY AND DATA FOR IMPACT ANALYSIS

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 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 when they were in 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 School 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 random assignment to evaluate 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).[2]

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 would have received very little influence from the Kauffman School. Similarly, students from the Kauffman School's first cohort who left after

[2] See Section IV of the appendix for more details about the implementation of the propensity-score matching procedure. In Johnson et al. (2016), 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 and find similar results.

5th grade are kept in the treatment group for the 6th and 7th grade analysis samples.[3] Again, this is a conservative analytic approach that reduces 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.[4]

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 section, 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.[5] 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.

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.

Data characteristics

The data 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, reading, 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.[6] We also obtained for these students data on their prior (3rd and 4th grade) test 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 Section III of the appendix for details about the analysis sample selection process.)

[3] Only students who entered the Kauffman School in 5th grade are included in the treatment group for this analysis. During the second and third year of operation, the Kauffman School did not admit new 6th or 7th grade students to the School.

[4] In Johnson et al. (2016), 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.

[5] 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 three-year impact calculations. See Johnson et al. (2016) for details about how grade repeaters are treated in the analysis.

[6] The official name of the reading MAP assessment is "Communication Arts."

The 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 analysis; using them to construct the comparison group provides an impact estimate that indicates 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. Our main results include students at both traditional public schools and charter schools in Kansas City in the comparison group; see Johnson et al. (2016) for results reported separately for each comparison group of schools.

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.[7] We also analyzed the data without using imputation and found similar results (see Johnson et al. 2016).

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

Full descriptive statistics for the first three cohorts of Kauffman students, compared with students in other Kansas City public schools, are presented in Table A.2 in the appendix. On average, Kauffman students had 4th-grade MAP scores that were below the statewide average in both mathematics and reading. Students at the Kauffman School were also predominately from low-income and minority families: across the first three 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 had performed below the state average on the 4th-grade MAP (before enrolling in the Kauffman School), they had higher 4th-grade MAP test scores than other students in Kansas City public schools and were less likely to receive any special accommodations while taking the 4th-grade MAP test. Compared to other students in Kansas City public schools, Kauffman students also were more likely to be black, were less likely to be Hispanic, and had slightly higher average 4th-grade attendance rates. 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.

As previously mentioned, we used a matching procedure to identify a group of comparison students who were similar to Kauffman students with respect to baseline characteristics. Table A.5 in the appendix 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 Table A.4 in the appendix for details on the number of Kauffman students who

[7] See Section III of the appendix for more details about our imputation procedure.

were excluded for this reason. 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 (Johnson et al. 2016).

IV. THE IMPACT OF THE KAUFFMAN SCHOOL ON STUDENT ACHIEVEMENT

In this section, 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 also 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.

Impacts on MAP test scores

The impact estimates for the Kauffman School on student achievement in each MAP subject are displayed in Table 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.[8] 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).[9] Standard errors are displayed in parentheses below each estimate, and asterisks indicate whether the estimate is significantly different from zero.

[8] The covariates include all the variables summarized in Table A.2. We also include 3rd-grade mathematics and reading 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.

[9] 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 1. Impact of Kauffman School on MAP test scores (citywide comparison group)

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

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 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.

n.a. = not applicable.

The first row of Table 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.[10] The one-year impact estimates for the Kauffman School are positive and statistically significant in mathematics, reading, and science. Caution should be used when interpreting the science estimate, 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 two-year impacts are statistically significant and larger than the one-year impact estimates in both subjects. The third row of Table 1 reports the effect size estimates three years after enrollment. The 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 demonstrate that the impact of the Kauffman School accumulates for students who are enrolled for multiple years.

Interpretation of Kauffman School impact estimates

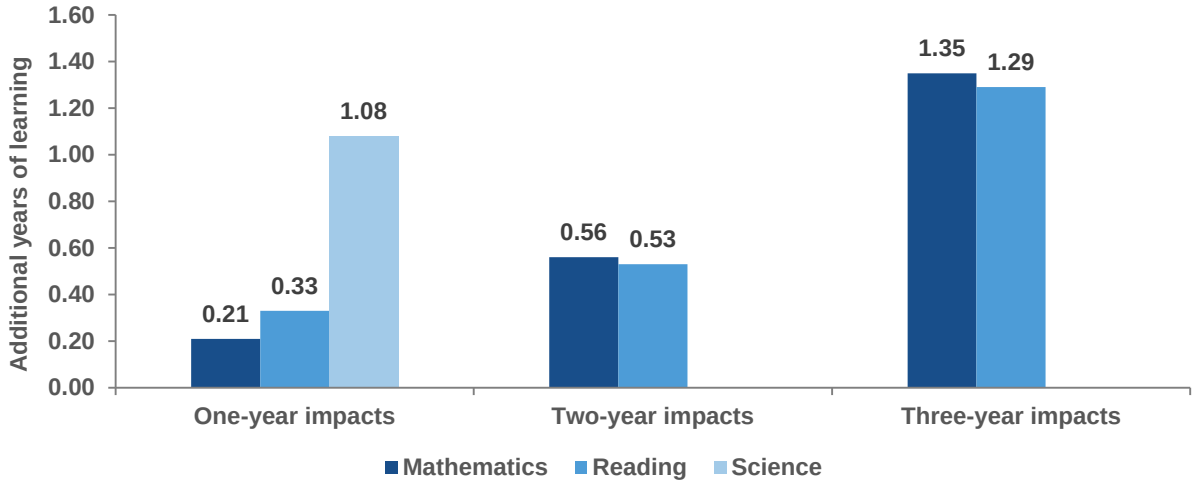
To support the interpretation of the effect size estimates, we converted the effect sizes into two alternative units: (1) years of learning growth and (2) the change in state test score percentile rank for the average Kauffman student.

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

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 using the results in Bloom et al. (2008).[11] Performing this conversion on the results from the main comparison group yields the results shown in Figure 1. Three years after enrollment, Kauffman students experienced a cumulative additional 1.35 years of learning in mathematics and 1.29 years in reading. 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).[12]

Figure 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.

[11] 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 mathematics, 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 mathematics and 0.32 standard deviations in reading, whereas a typical 7th-grade student grows 0.30 standard deviations in mathematics 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.

[12] 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.

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 reading test score distribution.[13] Three years after enrollment at the Kauffman School, the average student moved to the 58th percentile in mathematics and the 55th percentile in reading.[14] 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.

Comparison of Kauffman School estimated impacts to charter schools nationwide

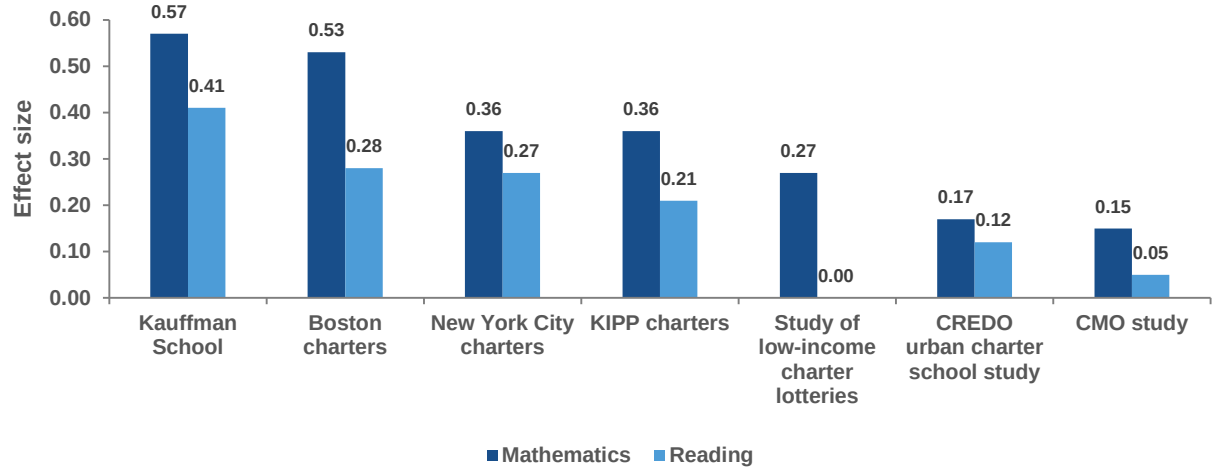
In this section, we compare the three-year impact estimates of the Kauffman School to the average impacts from some of the other samples of charter schools described in Section II. The comparisons are summarized in Figure 2. The achievement growth experienced by students at the Kauffman School is substantially higher than the average growth experienced by charter school students nationwide. The Kauffman School also has larger impacts than the average Boston, New York City, and KIPP charter school.[15] It is important to note that Figure 2 displays the *average* impacts of 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 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 (see Johnson et al. 2016).

[13] 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.

[14] 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.

[15] 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.

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



Note: Figure 2 contains three-year effect size estimates for the average Boston charter middle 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 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 CMOs studied by Furgeson et al. (2012).

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

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.[16] 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). These results suggest that the Kauffman School's estimated effects are especially noteworthy because the three-year impacts are based on students who enrolled during the first year the Kauffman School was open.

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

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

In this section, 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 Section IV. 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 (see Section VI of the appendix for impact estimates from previous school years). We 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 using indicators for ever receiving an in-school or out-of-school suspension as outcome variables. (See Section I of the appendix 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.[17] To assist with interpretation of the magnitude of the differences in suspension rates, we also present the average number of days suspended among Kauffman students and matched comparison students. We then discuss the relationship between the suspension rates at the Kauffman School and the large positive impacts the Kauffman School has on student achievement.

Before presenting the impact estimates of the Kauffman School, we show some descriptive statistics about attendance and suspensions at the Kauffman School and other schools in Kansas City during the 2013–2014 school year. That descriptive information is displayed in Table 2. 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

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

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. In-school suspensions appear to drive the higher percentage of 7th graders receiving suspensions at the Kauffman School, as the percentage of students receiving an out-of-school suspension did not differ between Kauffman and district 7th graders.

Table 2. 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 2 are based on the full sample of Kauffman and Kansas City students in 5th, 6th, and 7th grades during 2013–2014. In Table 3, we present the estimated impacts of the Kauffman School on attendance and suspensions during 2013–2014, based on the sample of matched comparison students. The impact estimates for other school years are displayed in Appendix Tables A.5 and A.6.

Table 3. 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 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. In Section VI, we discuss the behavior policies of the Kauffman School in detail, and show that the high suspension rates may be a result of the Kauffman School's strict and consistently enforced discipline policy.

Relationship between suspensions and student achievement

In this section, we describe possible mechanisms through which the Kauffman School can have large positive impacts on achievement while suspending students at significantly higher rates than other schools. 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 4. 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.

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 higher 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 per year of additional schooling relative to other public school students in Kansas City (see Section VI for details). 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. It also may be the case that enforcement of the Kauffman School's discipline policy through suspensions improves the future behavior of suspended students and minimizes classroom disruptions.

Table 4. 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.

VI. SCHOOL HALLMARKS DESCRIPTION AND PERCEPTIONS OF IMPLEMENTATION

In this section, we discuss the Kauffman School's hallmarks to help address the question of what factors are contributing to the high level of student achievement growth at the Kauffman School. We describe the Kauffman School's hallmarks and its key stakeholders' (school administrators, teachers, students, and parents) perceptions of how the Kauffman School's hallmarks are being implemented.

The descriptive information on the Kauffman School's hallmarks and their implementation is derived from various sources of data collected while conducting annual site visits three times per school year. The types of data collected include: (1) School and Foundation documents and interviews with school administrators; (2) focus group discussions with teachers, students, and instructional coaches; (3) classroom observations; (4) surveys of teachers, parents, and students; and (5) interviews with parents. More detail about these data collection efforts can be found in Section II of the appendix.

High attendance and behavioral expectations

Recognizing that students must be in school in order to meet its academic growth targets, the Kauffman School set 95 percent as the daily attendance goal. Upon enrollment in the Kauffman School, students and families are informed that students should have fewer than 10 absences each year and those with 10 or more absences, excused and unexcused, may be retained in their current grade. The Kauffman School advises students and parents that colleges review students' attendance records as part of the application process, which is another reason to minimize absences.

In addition, the Kauffman School implemented a system of behavioral expectations and school rules designed to minimize distractions and maximize instructional time. According to the Kauffman School's Handbook (Ewing Marion Kauffman School 2014), the Kauffman School's discipline system utilizes *merits* to reward student behavior (for example, displaying leadership or good citizenship) and *demerits* for non-compliance with School policies and procedures (for example, not following directions, or violating the uniform code). Students may be required to serve detention during school hours as a result of earning three demerits in one day (Ewing Marion Kauffman School 2013). Students are expected to demonstrate active behavioral and cognitive engagement following the SLANT method (Sit up, Listen, Ask and answer questions, Nod your head, and Track the speaker) During class, students are expected to speak in a voice that is confident and loud enough for everyone to hear—what the Kauffman School refers to as their "college voice."

During the study's classroom observations, teachers were observed actively tracking and documenting students' behavior, providing students with behavioral cues related to SLANT (for example, "Let's all track Johnnie."), and offering silent reminders about appropriate behavior (for example, standing next to a student who is off-task). From the perspective of parents, the Kauffman School's behavior expectations and rules are beneficial to students. When asked about SLANT, one parent remarked that SLANT works because it helps her child engage and "…absorb it all."

The Kauffman School also makes considerable efforts toward heightening awareness of the school rules. The Kauffman School has a week-long orientation for new students at the beginning of the school year and one of the primary goals of that orientation is to introduce the behavioral expectations and rules the Kauffman School has for students. Key stakeholders at the Kauffman School report that students have a high awareness of the school rules. The vast majority of students agreed that they know the school rules (87 percent) and that students know what the punishment will be if they break a school rule (84 percent). Similarly, the vast majority of teachers report that students know the rules (93 percent) and know what the consequences will be if they break a rule (85 percent). However, student and teacher survey responses indicate students' adherence to the rules is not as strong. For example, less than half of students (47 percent) agreed that most students follow the rules at school and about one-third of teachers (37 percent) agreed that student discipline is a problem in their classroom. These reports on student misbehavior may also be related to the Kauffman School's high suspension rates that were previously discussed. When administrators and teachers sense persistent school-level behavioral issues, the school staff work together to ensure that routines and procedures are consistently enforced.

As with other aspects of the Kauffman School, the discipline system, including the suspension policy, was informed by other successful charter schools' policies. The Kauffman School sought to establish clear guidelines for suspensions in which everyone knows the consequences for specific behaviors. School administrators meet with parents and families when students engage in behaviors that have been established as warranting suspension to discuss the terms of the suspension, but students cannot avoid being suspended. From the Kauffman School's perspective, consistent application of its suspension policy helps to strengthen its culture.

Ambitious academic goals

According to the Kauffman School's charter application, the Kauffman Foundation expected that incoming students would be one to three years behind grade level. The Foundation estimated that students, on average, would need to achieve 1.25 years of academic growth during each year of enrollment to be at grade level by the end of 8th grade and prepared for high school. The Foundation therefore set 1.25 years of academic growth as an explicit charter goal for the Kauffman School to achieve.

In focus groups, teachers frequently cited the Kauffman School's high academic goals as influencing their decision to work at the Kauffman School. Teachers feel that students have internalized the high academic expectations. The majority of Kauffman students (67 percent) agreed that their classes are challenging and nearly all parents (98 percent) agreed that their child was challenged at school. The academic goals were also perceived by teachers and parents as being realistic and appropriate for Kauffman School students. Nearly all teachers (93 percent) agreed that most of their students can learn everything they want them to learn during the year. Nearly all parents (94 percent) agreed that the standards set by the school are realistic.

Extended school day and year

The Kauffman School's design team anticipated that ensuring 1.25 years of growth each school year would require additional instructional time. During the Kauffman School's first year, students received 37.8 hours of instruction per week (Richardson 2009). In the Kauffman School's second year, the instructional time was shortened to 36.5 hours per week in response to feedback from students, parents, teachers, and staff that the longer school day was too difficult for everyone to manage. In the third year of operation, the instructional time was slightly reduced from the second year to 36.2 hours per week. According to the Kauffman School calendar, there were also seven additional days of instruction during the school year, which when combined with the longer school days equates to approximately five additional weeks of school per year compared to traditional public schools in Kansas City.

With the longer school day, the Kauffman School provides students with opportunities for additional learning and relationship-building with their teachers and peers. For example, students receive additional instructional support during the Kauffman School's "Focus" class period. During Focus, struggling students receive additional instruction and practice in any subjects in which they need help, and high-performing students can receive advanced instruction. The Focus class is approximately 35 minutes long and is offered during the last period of every school day.

During focus groups, some students expressed appreciation for the longer school day stating, "[My] favorite thing about the Kauffman School is [that] we have more time to learn." According to survey data, students and teachers generally perceived the longer school day and year as being beneficial. Over half of students (55 percent) agreed that they learn more because they have a longer school day and over two-thirds of teachers (68 percent) agreed that they believed the longer school day and year benefits their students.

Increased mathematics and reading instructional time

The school design team determined that its students would need more instructional time specifically in mathematics and reading to catch up academically. Each day in Year 1, Kauffman students 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 study (80 minutes). During Years 2 and 3, students continued to have a double period of mathematics (100 minutes) and three periods (150 minutes) of instruction related to ELA and reading.

Intensive data-driven decision making

The Kauffman School has a strong emphasis on data and results, and employs a large assessment portfolio that it uses to make data-driven decisions. Teachers receive training to understand and use the various data sources to monitor students' learning and to adjust curriculum and instruction as necessary. Teachers reported regularly reviewing students' assessment data to determine "…what skills need to be re-taught and how to re-teach them." One mathematics teacher described re-teaching a unit on fractions because students' ANet scores indicated that they "…were missing crucial conceptual knowledge about fractions." When asked about their professional growth at the Kauffman School, teachers frequently mention data-driven decision-making, "I feel I have grown a lot in looking at, analyzing, and making very aligned decisions about instruction based on what our kids need." On the teacher surveys, more than half of teachers (56 percent) rated themselves as advanced proficient in their ability to use assessment

data to purposefully plan their instruction. The remaining teachers (44 percent) rated themselves as beginning proficient in their ability to use assessment data, with no teachers rating themselves as a novice. From the perspective of teachers, data-driven decisions contribute to their students' success in the classroom.

In addition to assessment data, the Kauffman School also tracks and monitors students' behavioral data (for example, merits, demerits, detentions). Teachers described keeping a "…frequent pulse on [behavior]," which helps them readily address behavior problems as they emerge. As part of this effort, professional development sessions often focus on classroom management and student behavior.

Extensive teacher professional development

The Kauffman School places a significant emphasis on teachers' professional development. Kauffman School teachers are frequently observed by and receive feedback from administrators, have weekly meetings with instructional coaches, and participate in weekly small- and large-group professional development sessions. All School staff, including teachers, attend a two-week professional development session every summer. The Kauffman School also promotes classroom observations through the physical configuration of the building: the classrooms were designed to have large interior windows that allow any adult in the hallway to see what is happening in any classroom.

According to teacher survey data, all teachers reported receiving professional development in the previous month, and nearly all experienced different types of professional development from multiple sources. Nearly all teachers (96 percent) reported being mentored or coached by an administrator and over three-quarters (81 percent) reported being mentored or coached by another teacher. Teachers also reported having someone observe their classroom teaching five times in the previous month (median=three times by a peer or colleague; median=two times by a mentor or supervisor). Teachers reported meeting formally or informally nine times in the past month with peers or colleagues and six times with mentors or supervisors. Teachers stated they received written feedback on their performance two times in the previous month from peers or colleagues and two times from mentors or supervisors. The rate at which teachers are observed and receive feedback is high even when compared to many other charter schools. Only 17 percent of the charter school principals surveyed in Furgeson et al.'s (2012) study of CMOs reported that administrators observe their teachers eight or more times in a year, while 61 percent of teachers were observed between four and eight times and 22 percent were observed between two and four times.

Incoming and returning teachers frequently cite the Kauffman School's professional development program as one of the main things that attracted them to the school. One teacher shared, "for me it was the opportunity to grow as a teacher…getting the feedback to become better, that's what really attracted me to come here." In general, teachers are satisfied with the professional development they receive and frequently comment on their professional growth. In the words of one teacher, "last year I improved more as a teacher than I could have imagined I would."

Well-established cultural norms

The Kauffman School takes an intentional approach to establishing a culture that consists of shared values, expectations, and norms. School leaders continuously communicate the values, expectations, and norms to all school staff, students, and families. The school design team laid out its expectations for the Kauffman School's culture and the importance of a strong school culture in their early planning documents: "Research, school visits, and advice from charter school practitioners and experts all emphasize the vital importance of a strong culture as essential to school success." The team highlighted some of their expectations for the Kauffman School's culture, including, but not limited to: (1) a clearly defined and consistently implemented discipline system; (2) visible and frequently communicated "school vocabulary"; (3) school uniforms or other special clothing; (4) required family meeting for all incoming students before attending the Kauffman School; and (5) disciplinary merit/demerit systems. The hallmarks discussed to this point reflect the Kauffman School's implementation of these expectations.

For School leaders, consistent implementation of these elements is key to the Kauffman School's ability to maintain a strong and readily visible culture. For example, students' uniforms are inspected daily to ensure strict adherence. The Kauffman School also established common classroom procedures (for example, every teacher writes the daily learning target on the board) that are implemented across classrooms to ensure that students are having a consistent classroom experience. In addition, the Kauffman School engages in "cultural resets" with staff and students that aim to refocus everyone on the Kauffman School culture. For example, if it seems that teachers are not implementing the merits and demerits consistently or students are not adhering to school policies and norms, school leaders hold cultural reset meetings with staff and students. The teacher survey data indicate that there is a strong sense of a collective unity among teachers, with all teachers agreeing that there is a highly cooperative effort among the members of the Kauffman School staff and that the staff share the same beliefs and values about the central mission of the school. For parents, the Kauffman School's consistency is evident and parents note that "the rules stay the same."

VII. CONCLUSION

The Kauffman School has positive, statistically significant, and educationally meaningful impacts on student achievement growth in mathematics, reading, and science. The estimated impacts for students three years after enrollment are 0.57 standard deviations in mathematics and 0.41 standard deviations in reading, equivalent to approximately 1.35 additional years of learning growth in mathematics and 1.29 additional years of learning growth in reading. In science, the one-year impact estimates are similarly high, equal to approximately 1.08 additional years of learning growth. Students who enroll in the Kauffman School were substantially below the state average in terms of mathematics and reading achievement prior to enrolling but achieve above average on state assessments three years later.

Average attendance rates at the Kauffman School are above 95 percent in all grades. Suspension rates are consistently higher for Kauffman students relative to comparison students. Although the likelihood of receiving at least one suspension was approximately 25 percentage points higher among Kauffman students, the average number of days suspended among those receiving suspensions was similar between Kauffman and comparison students. The high

suspension rates at the Kauffman School are likely driven by high behavioral expectations and strict enforcement of the discipline policies associated with them. Although high suspension rates are often associated with lower achievement growth, the cost of missed instruction time due to suspensions may be outweighed by the benefit of maintaining strong discipline and removing disruptive students from the classroom. Moreover, the average duration of suspensions was small compared to the increased instruction time experienced by Kauffman students due to the Kauffman School's extended school day and year.

We explored seven hallmarks of the Kauffman School's practices to shed light on the mechanisms that might be contributing to these impacts. Although we cannot definitively determine which practices are providing the largest contribution to the Kauffman School's positive impacts on student achievement, placing the Kauffman School's policies in context with practices shown to be successful in the research literature can serve as a guide. The Kauffman School provides frequent intensive professional development for teachers, which prior research has found to be related to high achievement growth for students. Part of the teacher professional development at the Kauffman School involves training in the use of student assessment data to improve instruction, which has also been shown to be associated with high achievement growth for students. The positive impacts of the Kauffman School may also be related to the fact that the Kauffman School has an extended school day and year, which allows for additional instructional time in mathematics and reading. Increased instructional time combined with ambitious academic goals serve to encourage strong academic achievement growth at the Kauffman School.

The final hallmark of the Kauffman School explored is that the Kauffman School has well-established cultural norms. School leaders feel that maintaining a strong culture creates an environment in which teaching and learning can flourish because there is a shared understanding of the Kauffman School's values, expectations, and norms among all stakeholders. The Kauffman School is deliberate in its implementation and oversight of its culture to ensure that all aspects of the culture are consistently implemented, distractions are minimized, and time for instruction and learning is maximized.

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APPENDIX

DATA, SAMPLE SELECTION, AND ANALYSIS METHODOLOGY

I. DATA PREPARATION DETAILS FOR IMPACT ANALYSIS

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.[18] 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.

II. DATA FOR ANALYSIS OF SCHOOL HALLMARKS

Throughout the Kauffman School's first three years of operation, Mathematica collected a variety of data which are used to describe the Kauffman School's hallmarks and perceptions of their implementation. Data reported in this study are from those collected during three-day site visits to the Kauffman School. During the site visits, we conducted in-depth interviews with

[18] 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.

School administrators and Foundation staff; conducted focus groups with teachers, instructional coaches, and students; conducted one-on-one interviews with parents; and administered surveys to teachers, students, and parents. The Kauffman Foundation also shared documentation related to the Kauffman School's start-up activities, such as its charter application, memos to the Foundation's Board of Trustees related to School planning and design, and teacher recruitment materials.

Procedures

At the time of application to the Kauffman School, parents agreed to permit student records to be used for research purposes. A second parental consent form, specific to the other data collection activities, was distributed during the first week of school. This consent form described the evaluation and data collection activities in greater detail. Ninety-eight percent of parents consented to participate and we also obtained each student's assent before he or she completed the student surveys. Teachers, School administrators, and Foundation staff were also asked to sign a consent form agreeing to participate in the study. The teachers' consent form included the provision that their responses to survey questions and during focus group discussions would remain anonymous.

Interviews with School administrative staff

In-depth interviews, ranging from 15 to 45 minutes with various administrative staff at the Kauffman School covered topics related to: (1) general observations and impressions of the Kauffman School and its relationship to the Foundation, (2) recruitment and retention of staff and work-life balance, (3) School culture and leadership structure, (4) curriculum, instruction, and assessment, (5) student discipline, and (6) plans for the future.

Surveys and focus groups with teachers

We conducted two types of data collection with Kauffman School teachers: surveys and focus groups. Self-administered teacher surveys were completed in the spring by 27 out of 31 teachers (87 percent) at the Kauffman School. Teachers were asked questions about their students, curriculum and instruction, their experiences teaching at the Kauffman School, parent involvement, and overall satisfaction with the Kauffman School. These surveys were emailed to teachers before each site visit and teachers were asked to return the surveys by the end of the site visit. In addition to the survey, teachers were randomly selected to participate in focus group discussions during the site visit. These discussions addressed a variety of topics including: staff recruitment and retention, curriculum, instruction and assessment, School culture and structures, teacher-student relationships, student and teacher growth and development, overall reflections and observations of the Kauffman School, and plans for coming school year. The focus groups were scheduled at a time that was convenient for teachers. At the conclusion of each focus group, teachers received a $50 gift card for their participation.

Surveys of parents

Parent surveys were administered by Kauffman Foundation staff on report card night, which occurred in the weeks before the site visit to the Kauffman School. The 15-minute survey included questions related to school choice, their child's study habits and behaviors, their plans for their child's future, and their overall satisfaction with the Kauffman School. The survey was

available in both English and Spanish. Parents who did not complete the survey at report card night were sent a letter asking them to complete the survey and send it back to Mathematica in a pre-paid envelope. A small incentive was offered to help increase the parent response rates. Only 135 parents out of 368 responded to the survey (38 percent).

Surveys and focus groups with students

We conducted two types of data collection activities with Kauffman School students: surveys and focus groups. The surveys asked students questions about their learning, motivation levels, activities and homework, goals for the future, behavior outside of school, school climate, and satisfaction with the Kauffman School. Surveys were administered by School staff during the school day at the time of the site visit. The response rate for the student survey was 60 percent (221 out of 368 students). In addition to the student surveys, we held focus groups with students during the site visit. One focus group was conducted separately for each grade level, and two male and two female students were randomly selected from each grade to participate in the focus group discussions. Focus groups were conducted during the students' lunch time and lasted between 15 and 20 minutes. The discussions addressed students' general reflection on their time at Kauffman, specifically their likes and dislikes about the Kauffman School, their satisfaction with the Kauffman School, comparisons to prior schools, and their plans for staying at the Kauffman School in the coming years.

Classroom observations

During the spring site visit, Mathematica staff observed a random selection of 14 teachers. Trained Mathematica observers identified and coded activities and behaviors in the classroom, paying particular attention to student engagement, evidence of School values, peer respect, teacher and student respect, discipline, classroom instruction, and teacher feedback.

III. SAMPLE SELECTION FOR IMPACT ANALYSIS

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 comparison group is composed of students enrolled during at least part of the school year in a district or charter school in Kansas City who were not included in the Kauffman School group. 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 2014) and enrolling 5th-grade students in our analysis years.

In addition to these restrictions, we excluded any Kauffman students who were missing all outcome (5th, 6th, or 7th grade) grade MAP test scores or all 3rd- and 4th-grade MAP test scores.[19] 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

[19] 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.

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.[20]

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

We display the baseline average characteristics of all students included in the Kauffman School and comparison group, separately by cohort, in Table A.2. This table shows 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 both groups had test scores that were below the statewide average.[21] 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 schools.[22] 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.

[20] 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.

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

[22] Examples of test accommodations include extended test time, individual testing, and oral reading of test questions.

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

	Kauffman School	Other public schools in Kansas City
Cohort I 7th graders		
4th-grade mathematics scaled score	636	628*
4th-grade reading scaled score	651	638**
Free or reduced-price lunch	0.86	0.89
Black	0.79	0.63**
Hispanic	0.14	0.25**
Male	0.49	0.49
Disabled	0.07	0.09
Any prior test accommodation	0.08	0.21**
4th-grade attendance rate	0.95	0.94**
4th grade ever suspended	0.20	0.18
Sample size	95	1,505
Cohort II 6th graders		
4th-grade mathematics scaled score	643	633**
4th-grade reading scaled score	651	640**
Free or reduced-price lunch	0.80	0.89*
Black	0.77	0.61**
Hispanic	0.08	0.24**
Male	0.51	0.48
Disabled	0.12	0.08
Any prior test accommodation	0.14	0.24*
4th-grade attendance rate	0.96	0.95**
4th grade ever suspended	0.12	0.19*
Sample size	84	1,539
Cohort III 5th graders		
4th-grade mathematics scaled score	636	632
4th-grade reading scaled score	653	639**
Free or reduced-price lunch	0.89	0.90
Black	0.80	0.58**
Hispanic	0.12	0.27**
Male	0.44	0.51
Disabled	0.05	0.10*
Any prior test accommodation	0.12	0.29**
4th-grade attendance rate	0.96	0.95**
4th grade ever suspended	0.14	0.15
Sample size	182	1,675

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.

IV. 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.[23]

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 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:

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

V. 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.3 for a list of the variables.)

Table A.3. List of potential covariates used for propensity-score matching

4th-grade mathematics and reading MAP *z*-scores
Second- and third-order polynomials of 4th-grade mathematics and reading MAP *z*-scores
3rd-grade mathematics and reading 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 reading 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 reading MAP *z*-score variables

[23] 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.

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 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 Table A.2). 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.4 gives summary matching information for each comparison group.[24]

Table A.4. Matching information summary

	Match statistics
Cohort I 7th graders	
Minimum matching radius	0.0003
Maximum number of matches	20
Number of Kauffman students	95
Mean number of Kauffman students matched	91
Mean number of comparison students	444
Mean matches per Kauffman student	6.2
Cohort II 6th graders	
Minimum matching radius	0.0005
Maximum number of matches	20
Number of Kauffman students	84
Mean number of Kauffman students matched	73
Mean number of comparison students	511
Mean matches per Kauffman student	8.7
Cohort III 5th graders	
Minimum matching radius	0.0005
Maximum number of matches	20
Number of Kauffman students	182
Mean number of Kauffman students matched	159
Mean number of comparison students	789
Mean matches per Kauffman student	6.9

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

In Table A.5, 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.5 are smaller for both Kauffman and comparison students relative to those in Table A.2. This is because some Kauffman students differed enough from all comparison students such that no good match for these students could be found. The matched comparison analysis excludes these Kauffman students. (See Johnson et al. [2016] for a sensitivity analysis that includes these students.)

Table A.5. Baseline 4th-grade average characteristics of matched comparison samples

	Kauffman School	Other public schools in Kansas City
Cohort I 7th graders		
4th-grade mathematics scaled score	635 (32)	636 (33)
4th-grade reading scaled score	650 (34)	651 (33)
Free or reduced-price lunch	0.86 (0.34)	0.85 (0.36)
Black	0.78 (0.41)	0.77 (0.42)
Hispanic	0.14 (0.35)	0.14 (0.34)
Male	0.49 (0.50)	0.44 (0.50)
Disabled	0.07 (0.26)	0.07 (0.26)
Any prior test accommodation	0.09 (0.28)	0.09 (0.29)
4th-grade attendance rate	0.95 (0.04)	0.95 (0.04)
4th grade ever suspended	0.20 (0.40)	0.16 (0.37)
Sample size	91	444
Cohort II 6th graders		
4th-grade mathematics scaled score	642 (28)	643 (28)
4th-grade reading scaled score	652 (31)	650 (32)
Free or reduced-price lunch	0.87 (0.34)	0.87 (0.33)
Black	0.77 0.42)	0.75 (0.43)
Hispanic	0.10 (0.30)	0.09 (0.29)
Male	0.53 (0.50)	0.45 (0.50)
Disabled	0.11 (0.31)	0.09 (0.28)
Any prior test accommodation	0.12 (0.33)	0.15 (0.36)
4th-grade attendance rate	0.96 (0.03)	0.96 (0.04)
4th grade ever suspended	0.14 (0.35)	0.13 (0.33)
Sample size	73	511

	Kauffman School	Other public schools in Kansas City
Cohort III 5th graders		
4th-grade mathematics scaled score	634 (31)	635 (31)
4th-grade reading scaled score	647 (32)	649 (33)
Free or reduced-price lunch	0.89 (0.31)	0.90 (0.30)
Black	0.77 (0.42)	0.77 (0.42)
Hispanic	0.13 (0.34)	0.15 (0.35)
Male	0.44 0.50)	0.47(0.50)
Disabled	0.06 (0.24)	0.05 (0.21)
Any prior test accommodation	0.13 (0.34)	0.14 (0,35)
4th-grade attendance rate	0.95 (0.04)	0.95 (0.04)
4th grade ever suspended	0.15 (0.36)	0.14 (0.34)
Sample size	159	789

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 zero.

IV. ADDITIONAL ATTENDANCE AND SUSPENSION IMPACT ESTIMATES

Table A.6 displays the attendance and suspension impacts for the first three cohorts of 5th-grade students. Estimated impacts on attendance were not significantly different from zero for any of the three cohorts. Fifth-grade Kauffman students were suspended at a significantly higher rate than comparison students in 2011–2012 and 2013–2014 but not during 2012–2013. Table A.7 displays a similar comparison of the first two cohorts of 6th-grade students. There was a positive and significant impact on the attendance rate of 6th-grade students in 2012–2013. Though the attendance impact was positive in 2013–2014, it was lower and not significantly different from zero. Suspension impact estimates were positive and significantly different from zero for both cohorts of 6th-grade students, though the magnitude was approximately twice as high for cohort II 6th-graders compared 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 A.6. Impacts of the Kauffman School on attendance and suspensions for 5th-grade students between 2011–2012 and 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)	28.0** (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)	19.4** (4.0)
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 zero at the 5 percent level. Two asterisks (**) indicate results are significantly different from zero at the 1 percent level.

Table A.7. Impacts of the Kauffman School on attendance and suspensions for 6th-grade students between 2012–2013 and 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 zero at the 5 percent level. Two asterisks (**) indicate results are significantly different from zero at the 1 percent level.

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