

**The Quality of Virtual K-12 Education: Operator Status and School Year Associations**

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### **Abstract**

The focus of this study was an examination of the presence or absence of associations between operator status, graduation rate, student-teacher ratio, and school performance among online K-12 schools across a five-year period. This study is timely and significant due to the proliferation of virtual school settings leading up to the COVID-19 pandemic and concerns about virtual school quality and performance. Secondary data from the National Education Policy Center was used to perform Chi-Square Tests for Association among various factors impacting K-12 school quality and performance. We tested for associations between and among school types, operator status, and time, with student-teacher ratio, the percentage of schools with acceptable performance ratings, and graduation rates as our measures of frequency. Statistical analysis of these variables showed no significant association between the type of school and school year with student-teacher ratio and graduation rates as the measures of frequency. There was also no significant association between the operator status and school year when compared against graduation rate. Statistically significant associations were found between operator status and school year when compared against student-teacher ratio and acceptable school performance ratings. These results add to the body of empirical knowledge about K-12 virtual schools leading up to the COVID-19 pandemic.

*Keywords:* operator status, virtual K-12, school quality

### **The Quality of Virtual K-12 Education: Operator Status and School Year Associations**

The following study provides an examination of the quality of K-12 virtual schools that receive public funding in the United States. Secondary data was extracted from the National Center for Education Statistics for the 2014-2015, 2016-2017, and 2019-2020 school years, which represented the most recent school years with available data. This study was a collaborative effort that worked through the various stages of social research to arrive at new conclusions and implications for future research in the area of virtual school quality.

#### **Research Problem, Purpose, and Questions**

##### **Research Problem**

There has been an upward trend in student enrollment in fully virtual schools over the past decade (National Center for Education Statistics, 2021). As virtual enrollment has proliferated in the K-12 setting, concerns have been raised about student outcomes. Some have questioned the quality of the schools and programs educating our children, noting that often our most needy high school students attempt to recapture lost credits in a virtual setting with little support (Heinrich et al., 2019).

Taken together, growing enrollment and questions of educational quality provide the impetus for further investigation. Research in the area of the quality of K-12 online schools should consider the manner in which K-12 online schools differ from their in-person counterparts, including in relation to student outcomes. This is particularly important when it comes to schools that receive public funding. Within the realm of fully online K-12 schools that receive public funds, some schools directly provide their online courses while others outsource to private companies. This serves to transfer public dollars to private hands. The public has an interest in knowing if its money is being well-spent.

Public schools have already experimented with privatizing many of their services, such as busing and food service. However, privatization comes with a cost. Private services mean less control by school management and potentially decreased quality (Hunter, 2010). When fully virtual K-12 schools outsource the educational services they provide to students, they risk passing the costs of privatization to the children we serve. The problem we seek to explore is the quality of online K-12 schools that receive public funding. Within this group of schools, we plan to investigate the differences between online K-12 schools that directly provide their virtual courses and those that outsource virtual education.

### **Research Purpose**

Our research has two purposes. The first purpose is to determine whether online K-12 schools that receive public funding are of similar quality to in-person schools. The second purpose is to determine whether fully virtual schools that outsource their virtual courses differ in quality from those that directly manage their virtual courses. We consider these relationships over the span of five years, noting trends.

### **Research Questions**

Our study will address its purposes by investigating the following research questions:

1. How has the student-teacher ratio of virtual schools compared with the national average over a five-year period? (Table 5, p. 30)
2. How have the student-teacher ratios of virtual schools compared across independent, nonprofit, and for-profit status over a five-year period? (Table 5, p. 30)
3. How has the percentage of virtual schools with acceptable school performance ratings compared across independent, nonprofit, and for-profit status over a five-year period? (Table 7, p. 34)

4. How has the graduation rate of virtual schools compared with the overall average national graduation rate over a five-year period? (Table 9, p. 36)
5. How have the graduation rates of virtual schools compared across independent, nonprofit, and for-profit status over a five-year period? (Table 9, p. 36)

## **Literature Review**

### **Introduction**

The following literature review focuses on identifying studies and bodies of knowledge that address and analyze the quality of K-12 virtual schools. The sources relate to institutional operator status, graduation rates, student-teacher ratios, and overall school performance. Sources were reviewed and selected for their applicability to the analysis of K-12 virtual school performance. Virtual learning environments have historically been described as substandard to the face-to-face learning environment, despite the continuous growth in online learning options over the last several years (DiFrancesca & Spencer, 2022). For example, Fitzpatrick et al. (2020) found that student academic performance in reading and mathematics declined when K-12 students switched from brick-and-mortar schools to virtual charter schools. They voiced particular concerns over student enrollment in charter schools operated by for-profit educational management organizations (EMOs) subject to little accountability.

As of the 2017-2018 academic year, online learning was the fastest-growing school choice for K-12 students nationwide (DiFrancesca & Spencer, 2022). Furthermore, the COVID-19 pandemic rapidly intensified the momentum already in progress for virtual K-12 school options, given the immediate need to protect student health and safety (Molnar et al., 2021). However, given the steadily increasing enrollment in virtual schools, many have voiced concerns over potential negative effects on students. In addition, a comprehensive study of 356 existing

journal articles on K-12 online learning was found to be heavily grounded in theoretical frameworks, creating a gap in the analysis of data-based inferences and interpretations (Arnesen et al., 2018). Analyzing the quality of online K-12 schools in the period just ahead of the COVID-19 pandemic (2020-2015) will lead to data interpretations that can help fill this void and detail the state of online K-12 schools before and shortly after the start of the pandemic. Areas of potential investigation include operator status, graduation rate, student-teacher ratio, and school performance. The following will highlight some of the most recent publications in the area of virtual school performance.

### **Operator Status**

Operator status refers to the organization responsible for administering a virtual school's program. Across the varying laws of the states, virtual charter schools may be operated by for-profit EMOs, nonprofit EMOs, public school districts, and independent schools (Fitzpatrick et al., 2020). For-profit EMOs have a dominant share of total virtual school enrollment (Gulosino & Miron, 2017). However, they also tend to have lower school performance ratings and larger student-teacher ratios.

Virtual K-12 schools represent an opportunity for private companies to benefit from public dollars without the significant costs of operating brick-and-mortar schools. For example, a virtual school has little to no need to purchase and maintain buildings to house students. It can also operate free from concerns related to other obligations such as food services and busing. Many virtual charter schools operate with little of the government oversight to which in-person schools are subject (Fitzpatrick et al., 2020). There is also a dearth of data related to best practices in the online K-12 school environment, perhaps making it difficult to judge virtual school quality (Toppin & Toppin, 2016). With inconsistent oversight, regulatory disparities, and

limited data on best practices, the influx of virtual K-12 schools, due in part to the impacts of the COVID-19 pandemic, creates gaps in school accountability. These gaps lead to limited relevant literature analyzing operator status's impact on the quality of virtual school performance ratings. Identifying the variations in school performance according to operator status will be critical to ensuring consistent and robust school performance as online K-12 schools continue to emerge in a post-pandemic world.

### **Graduation Rate**

Graduation rate, a metric that applies to high schools, describes the percentage of students that complete their high school tenure within the expected four-year timeframe. While limited in quantity, the vast majority of current literature concerning the graduation rate of virtual K-12 schools precedes the onset of the COVID-19 pandemic and the K-12 school systems' responses to moving instruction entirely online. Therefore, available resources align well with the chosen time period for this study (2015-2020).

The graduation rate is an indicator of school quality. Students must successfully accrue credits in a degree plan to graduate on time. Much of the research regarding online K-12 education has been in the realm of credit recovery courses, focusing on the relationship between the use of online credit recovery and student on-time graduation outcomes. A credit recovery course is a course a student takes to regain credit after initially failing a course. Heinrich et al. (2019) found that students who failed in-person courses and attempted online credit recovery struggled in their attempts to regain credit. However, two years later, the two lead authors of the 2019 study found a positive link between online course-taking and high school graduation rates (Heinrich & Darling-Aduana, 2021). Likewise, Eddy and Ballenger (2016) find that online credit recovery courses help students graduate on time.

There is less literature pertaining to the graduation rate of students enrolled in virtual schools. However, what literature exists paints a dim picture. For example, in the 2013-2014 school year, virtual schools graduated only 40.6% of their students on time (Gulosino & Miron, 2017). Additionally, enrollment declines over the high school grades, perhaps in response to lower student outcomes. A thorough analysis of the graduation rates for online K-12 schools prior to the COVID-19 pandemic will pave the way for approaches to continuous improvement as new virtual K-12 schools come online, and current institutions seek to revise and realign their practices.

### **Student-Teacher Ratio**

Student-teacher ratio refers to the ratio of students to teachers across the school and is a measure of average class size. Schools with low student-teacher ratios may be able to provide more individualized attention to their students. The student-teacher ratio is a commonly reported metric on many school accountability reports, such as the Texas Academic Performance Reports (TAPR) and California's School Accountability Report Card (SARC) (Texas Education Agency, 2022; California Department of Education, 2022).

School administrators strive for a lower student-teacher ratio in the in-person setting out of many considerations. Though student learning may be a concern, classes with higher student-teacher ratios may entail more classroom management issues than smaller ones. Sometimes, physical constraints limit the number of students in a class, such as limited space or access to specialized equipment or areas. School administrators often assume that online courses should contain more students than in-person courses because online courses lack physical constraints and in-person classroom management issues (Zhang et al., 2018).



However, this may prove to be a mistake in the online setting. In the place of face-to-face interaction, online instructors must devote considerable time to giving feedback either in written form or through the use of other technology tools. A high class size may leave a professor with less time to give students individualized feedback crucial to their learning and growth (Sorensen, 2015). Analyzing the student-to-teacher ratio of online K-12 schools prior to the COVID-19 pandemic will provide a baseline for standard practices as virtual institutions continue to proliferate nationwide.

### **School Performance**

School performance refers to school ratings on state or national accountability measures. Current research on virtual school performance is heavily skewed toward postsecondary education, leaving gaps in our understanding of virtual school performance at the K-12 level (Hart et al., 2019). Nonetheless, there is a growing number of free, public virtual schools across the country. Despite being public schools, many have virtual programs that are managed by for-profit EMOs and continue to operate despite poor accountability rankings (Nespor & Voithofer, 2016). For example, Ohio's Classroom of Tomorrow (ECOT) is a public school and a for-profit business. ECOT's graduation rate was around 40%, and it received an "F" rating on state accountability reports. However, ECOT is also a political actor capable of influencing the regulations in the environment in which it operates.

The size of a virtual school may also have a relationship to its performance. For example, Waddell (2017) studied the relationship between virtual school size and performance, finding that larger virtual schools tend to also have lower accountability ratings. On a related note, schools that are managed by for-profit EMOs tend to be among the largest (Molnar et al., 2021).

Student persistence may also be used as an indicator of virtual school performance. As of 2018, student persistence, defined by students that remained enrolled for two or more years, varied substantially for virtual K-12 students across the nation (Beck et al., 2018). High degrees of student mobility and transfer-out rates may contribute to difficulties in assessing virtual school performance, indicating the need for additional research in this area.

However, a great deal can still be learned from the more prominent online school systems that exist solely to provide virtual school accessibility. In a 2021 study comparing the performance of virtual schools to the brick-and-mortar schools that provided emergency online instruction in the wake of the COVID-19 pandemic, virtual schools significantly outperformed brick-and-mortar schools across all areas of communication, classroom management, and pedagogical efficacy (Kingsbury, 2021). Not surprisingly, private schools generally fared much better in their efforts at online instruction when compared to their publicly funded counterparts (Kingsbury, 2021). However, much of the published literature on virtual K-12 school performance has been completed in hindsight of the COVID-19 pandemic. It may serve as a predictive measure of the state of virtual K-12 schools prior to the pandemic.

## **Conclusion**

Currently, virtual schools hold a steadily growing share of student enrollment. Concerns about virtual school quality and limitations of currently available research create an impetus for further investigation. As the nation moves into the post-pandemic world, these concerns are now amplified by the rapid emergence of online K-12 schools across all types of operator status: independent, public, nonprofit, and for-profit. An analysis of operator status, graduation rate, student-teacher ratio, and school performance of virtual K-12 schools over the span of five years (2015-2020) will give not only a picture of the current state of affairs, but an idea of whether the

situation appears to be improving or deteriorating. Analyzing school performance for online K-12 schools before and just after the start of the COVID-19 pandemic will provide a retrospective view of virtual school performance, which will be critical to future online K-12 administrators, teachers, and students.

### **Significance of the Study**

Though the pandemic put a spotlight on K-12 virtual learning, the number of students served by K-12 virtual schools was already on the rise (DiFrancesca & Spencer, 2022). The critical need for virtual schooling has diminished, but the demand for virtual K-12 schools has not, leading to the proliferation of online K-12 schools from a variety of operator types (public, nonprofit, for-profit, and independent). The largest growth has been among for-profit EMO, which seek to augment their revenue through the use of public funds (Molnar et al., 2021). Questions abound regarding the quality of online K-12 schools (Beck et al, 2018; Eddy & Ballenger, 2016; Fitzpatrick et al., 2020; Hart et al., 2019; Heinrich et al., 2019; Heinrich & Darling-Aduana, 2021; Kingsbury, 2021; Nesper & Voithofer, 2016).

Despite the abundance of discourse, there is a dearth of literature on the quality of online K-12 schools (Arnesen et al., 2018). Much of the existing research has focused on the use of virtual courses for credit recovery. Outside of credit recovery, the small amount of extant literature suggests that students are likely to experience higher student teacher ratios and lower graduation rates in the online K-12 setting (Gulosion & Miron, 2017). Despite negative student outcomes, online K-12 schools exist in a gray area with inconsistent government oversight and little data from which to hold such schools accountable (Fitzpatrick et al., 2020; Hart et al., 2019; Toppin & Toppin, 2016). This is particularly alarming due to the fact that the online setting has

allowed private companies indirect access to public funds even though for-profit EMOs are typically the lowest performing (Nespor & Voithofer, 2016).

Our study will create a greater understanding of the interplay between operator status, graduation rate, student-teacher ratio, and school performance among online K-12 schools. Beyond this, it will shed light on trends over among these variables over the past five years. If current enrollment projections hold, there will continue to be an increase in the number of students opting for an online K-12 education. Thus, it is of paramount important that educational leaders understand online K-12 school quality and its underlying factors.

### **Description of the Data**

Our data set consists of three reports published biennially by the National Education Policy Center (2022). These reports can be accessed via the following URLs:

- <https://nepc.colorado.edu/publication/virtual-schools-annual-2021>
- <https://nepc.colorado.edu/publication/virtual-schools-annual-2019>
- <https://nepc.colorado.edu/publication/virtual-schools-annual-2017>

The reports contain data on full, virtual, and blended programs that receive federal funds in the United States. Our study concerns the quality of online K-12 schools. Variables in the data set of interest to our study include student-teacher ratio, school performance on state or national ratings, student graduation rate, and operator status.

A school's student-teacher ratio expresses the quantitative relationship between the amounts of students and teachers present in the school. School performance is defined as a rating of at least acceptable under state or national standards. A school's graduation rate is the percentage of students who graduate on time. Operator status describes the entity in control of a

virtual or blended school. Operator status can be independent, non-profit education management organization (EMO), and for-profit EMO.

Comparison data for traditional in-person school on student-teacher ratio, school performance, and graduation rate are also included in the reports. The reports span multiple years, enabling insight into the trends of these variables over time and the relationships between them.

### **Description of the Sample and the Sampling Technique**

The sample for this data set includes all full-time, publicly funded elementary and secondary virtual and blended schools in the United States. Sampling of this targeted population included the collection of publicly available data and information from the National Center for Education Statistics. Individual school websites and state reporting agencies were solicited for data not provided through the National Center for Education Statistics. With the entire population of the data set being representative of all public virtual and blended schools in the United States, the study used a total population sampling method to divide the population into virtual school and blended school samples to further investigate student demographics, school performance, student-teacher ratios, enrollment trends, and operator status. Sampling methods were identical for all time periods being considered for this study.

### **Method of Data Analysis**

The method of data analysis used for our research study is the Chi-Square Test for Association, and this test will allow for determining the presence or absence of an association between two categorical, independent variables (Hachem, 2022). The Chi-Square Test for Association was determined to be appropriate and applicable to all five research questions of this study. Use of the Chi-Square Test for Association requires the following assumptions: there must

be two categorical variables that are either nominal or ordinal; there must be independence of observation (i.e., participants are only counted once), and all cells should have expected counts greater than or equal to five (Hachem, 2022). Observed frequencies are reported as the student-teacher ratio for questions one and two, the percentage of schools with acceptable performance ratings for question three, and graduation rates for questions four and five.

The independent variables for each of our five research questions are qualitative in nature and serve as the two categorical variables for which we will seek to analyze for association across a period of five years. This approach will allow us to determine if the independent variables are associated and, if so, the power and direction of the association (Hachem, 2022).

The hypotheses for our proposed research questions are as follows:

1. How has the student-teacher ratio of virtual schools compared with the national average over a five-year period?

H<sub>0</sub>: School type and time are independent.

H<sub>a</sub>: School type and time are not independent.

2. How have the student-teacher ratios of virtual schools compared across independent, nonprofit, and for-profit status over a five-year period?

H<sub>0</sub>: Operator status and time are independent.

H<sub>a</sub>: Operator status and time are not independent.

3. How has the percentage of virtual schools with acceptable school performance ratings compared across independent, nonprofit, and for-profit status over a five-year period?

H<sub>0</sub>: Operator status and time are independent.

H<sub>a</sub>: Operator status and time are not independent.

4. How has the graduation rate of virtual schools compared with the overall average national graduation rate over a five-year period?

H<sub>0</sub>: School type and time are independent.

H<sub>a</sub>: School type and time are not independent.

5. How have the graduation rates of virtual schools compared across independent, nonprofit, and for-profit status over a five-year period?

H<sub>0</sub>: School type and time are independent.

H<sub>a</sub>: School type and time are not independent.

Use of the Chi-Square Test for Associations allows for the construction of contingency tables based on the number of variables being analyzed. Pairwise comparisons used to determine if and where differences in observed and expected frequencies exist among and between groups (Hachem, 2022). Testing for associations between and among school types, operator status, and time will provide statistical analysis of the frequency data for student-teacher ratio, the percentage of schools with acceptable performance ratings, and graduation rates. If statistical significance is found, analysis of adjusted residuals will reveal if observed frequencies are statistically significantly different from expected frequencies; adjusted residuals greater than 2 or less than -2 indicate significance (Hachem, 2022).

### **Data Analysis and Findings**

For each of the five questions of interest in this study, a chi-square test of association was used to determine whether there were statistically significant associations between variables.

#### **Question 1**

How has the student-teacher ratio of virtual schools compared with the national average over a five-year period? To answer this question, a chi-square test of association was conducted

between type of school and school year. All expected cell frequencies were greater than five.

There was not a statistically significant association between type of school and school year,  $\chi^2(2) = 1.31, p = .520$ . The association was small (Cohen, 1988), Cramer’s  $V = .092$ . Table 1 displays observed frequencies of student-teacher ratios for virtual schools and the national average in the 2014-2015, 2016-2017, and 2019-2020 school years.

**Table 1**

*Crosstabulation of Type of School and School Year for Student-Teacher Ratio*

Type of School	School Year		
	2014-2015	2016-2017	2019-2020
Virtual Schools	34	43.9	26.8
National Average	16	16	16

There was not a statistically significant association between the type of school and school year for frequency of student-teacher ratio. Therefore, we cannot reject the null hypothesis and cannot accept the alternative hypothesis.

**Question 2**

How have the student-teacher ratios of virtual schools compared across independent, nonprofit, and for-profit status over a five-year period? To answer this question, a chi-square test of association was conducted between operator status and year. All expected cell frequencies were greater than five. There was a statistically significant association between operator status and school year,  $\chi^2(4) = 12.49, p = .014$ . The association was small (Cohen, 1988), Cramer’s  $V = .142$ . Table 2 displays observed frequencies of student-teacher ratios by operator status in the 2014-2015, 2016-2017, and 2019-2020 school years.

**Table 2**

*Crosstabulation of Operator Status and School Year for Student-Teacher Ratio*



Operator Status	School Year		
	2014-2015	2016-2017	2019-2020
Independent	23 (.6)	43 (-.6)	23 (.2)
Nonprofit	17 (-2.8)	72 (3.1)	26 (-.8)
For-Profit	33 (2.3)	43 (-2.6)	29 (.7)

*Note.* Adjusted residuals appear in parentheses below observed frequencies and they are significant when greater than 2 or less than -2.

There was a statistically significant association between operator status and school year for frequency of student-teacher ratio. Therefore, we can reject the null hypothesis and accept the alternative hypothesis.

**Question 3**

How has the percentage of virtual schools with acceptable school performance ratings compared across independent, nonprofit, and for-profit status over a five-year period? To answer this question, a chi-square test of association was conducted between operator status and school year. All expected cell frequencies were greater than five. There was a statistically significant association between operator status and school year,  $\chi^2(4) = 9.67, p = .046$ . The association was small (Cohen, 1988), Cramer’s V = .112. Table 3 displays observed frequencies of acceptable school performance by operator status in the 2015-2016, 2017-2018, and 2019-2020 school years.

**Table 3**

*Crosstabulation of Operator Status and School Year for Acceptable School Performance*

Operator Status	School Year		
	2015-2016	2017-2018	2019-2020
Independent	26 (-2.0)	59 (2.8)	44 (-1.0)
Nonprofit	44 (.5)	50 (-1.5)	64 (1.0)
For-Profit	33 (1.7)	30 (-1.4)	37 (-.1)

*Note.* Adjusted residuals appear in parentheses below observed frequencies and they are significant when greater than 2 or less than -2.

There was a statistically significant association between operator status and school year for frequency of acceptable school performance. Therefore, we can reject the null hypothesis and accept the alternative hypothesis.

**Question 4**

How has the graduation rate of virtual schools compared with the overall average national graduation rate over a five-year period? To answer this question, a chi-square test of association was conducted between type of school and school year. All expected cell frequencies were greater than five. There was not a statistically significant association between type of school and school year,  $\chi^2 = 0.68, p = 0.712$ . The association was small (Cohen, 1988), Cramer’s  $V = .041$ . Table 4 displays observed frequencies of graduation rates for virtual schools and the national average in the 2014-2015, 2016-2017, and 2019-2020 school years.

**Table 4**

*Crosstabulation of Type of School and School Year for Graduation Rate*

Type of School	School Year		
	2014-2015	2016-2017	2019-2020
Virtual Schools	43	50	55
National Average	82	84	85

There was not a statistically significant association between the type of school and school year for frequency of graduation rate. Therefore, we cannot reject the null hypothesis and cannot accept the alternative hypothesis.

**Question 5**

How have the graduation rates of virtual schools compared across independent, nonprofit, and for-profit status over a five-year period? To answer this question, a chi-square test of association was conducted between operator status and school year. All expected cell frequencies were greater than five. There was not a statistically significant association between type of school and school year,  $\chi^2 = 1.59, p = 0.712$ . The association was small (Cohen, 1988), Cramer’s  $V = .043$ . Table 5 displays observed frequencies of graduation rates for virtual schools by operator status in the 2014-2015, 2016-2017, and 2019-2020 school years.

**Table 5**

*Crosstabulation of Operator Status and School Year for Graduation Rate*

Operator Status	School Year		
	2015-2016	2017-2018	2019-2020
Independent	47	53	53
Nonprofit	35	49	57
For-Profit	40	49	55

There was not a statistically significant association between the operator status and school year for frequency of graduation rate. Therefore, we cannot reject the null hypothesis and cannot accept the alternative hypothesis.

**Implications**

**Practice**

The significant differences in student-teacher ratio among for-profit and nonprofit operators for virtual schools in the 2014-2015 and 2016-2017 school years show an unusual pattern. The 2014-2015 student-teacher ratio was significantly low for nonprofit providers and significantly high for for-profit providers. The 2016-2017 student-teacher ratio was significantly high for nonprofit providers and significantly low for for-profit providers. These dramatic fluctuations suggest that virtual teachers working for for-profit or nonprofit entities should utilize course design features and teaching strategies suitable for highly variable group sizes. For-profit and nonprofit virtual operators should audit their course materials to determine whether they are appropriately adaptable. Likewise, virtual teachers working for for-profit and nonprofit entities should receive training to implement flexible teaching strategies. Among independent operators, acceptable school performance was significantly low in 2015-2016 and significantly high in

2017-2018. This suggests that the performance of virtual schools with independent operators may be highly variable over time. Independent operators should examine their programs and determine the possible causes of inconsistent performance.

### **Policy**

This study provides information that can be used to help shape future policies and practices regarding virtual K-12 schooling. As the number of students who opt for virtual education increases, so too does the public interest in maintaining a quality online learning environment. Managing an in-person classroom presents new challenges as class size increases. This is no less true for the virtual environment. For example, students in settings with higher student-teacher ratios may receive less attention and individualized feedback from their instructors. Policymakers should ensure students and families who opt for a virtual education are making an informed choice. Information on student-teacher ratios should be required to be plainly visible to the public, and where these ratios vary greatly over time, operators should be required to explain irregularities. Policymakers should also consider setting requirements for student-teacher ratios to ensure a more consistent student experience. All of the schools in our data received public funds. Of the three types of operators we analyzed, independent operators showed the most inconsistent performance. The percentage of schools with acceptable school performance among virtual schools with independent operators was significantly low in 2015-2016 and significantly high in 2017-2018. Policymakers should consider setting benchmarks for student performance, and making the availability of public funds contingent upon student outcomes.

### **Future Research**

The analysis provided by our study sets the stage for future research needed to determine if significant associations begin to develop between school year and operator status for graduation rate, student-teacher ratio, and school performance among online K-12 virtual schools with independent, for-profit, and nonprofit operators. This area of research will be particularly important as we move away from the pivotal moments of the COVID-19 pandemic and virtual education continues its steady expansion. Future research should not only monitor trends over time, but provide insights into the reasons for the fluctuations we observed among student-teacher ratio and acceptable school performance. It could be that there are underlying instabilities related to the staffing or enrollment models utilized by online K-12 schools with independent, nonprofit, and for-profit operators. Additional investigation could lead to a more consistent, positive online educational experience for students and better outcomes.

### **Limitations**

Our study is an analysis of a secondary data set contained in a series of reports. The reports aggregated data on full-time virtual schools that received public funding. The way the data were initially gathered may have contributed “noise” to the overall results, masking true significant differences and causing a Type II error. This is essentially a result of measurement inconsistencies. The data we analyzed were aggregated from information from many states, each of which had its own particular methods of defining things like acceptable school performance. In fact, all three reports make mention of frozen accountability systems across states in the study (National Education Policy Center, 2022).

Due to this, the most recent report mentioned that while data on virtual schools in 40 states was included, only 28 of the states contributed to school performance data (National Education Policy Center, 2022). The total number of schools in each school year also varied

substantially, meaning that there could have been great change in the population of virtual schools operated by independent, nonprofit, and for-profit entities from one measured year to the next. These factors may have contributed unaccounted for variance that masked real differences in questions one, four, and five.

Additionally, the operator statuses that were used to characterize virtual schools also differed from one another in important ways. It could be that any variance found among the three types of operator status could be more related to these other important differences. For example, the virtual schools operated by for-profit EMOs tended to be much larger than virtual schools that were independently operated or that were operated by nonprofit EMOs (National Education Policy Center, 2022).

Finally, our questions were constrained by the nature of the data themselves. Because the data permitted only an analysis of the effect of associations between two variables on the dependent variable, we were only able to determine whether the dependent variable was unexpectedly low or high within the level combinations of the two variables for each question. This limits the conclusions that can be drawn. The statistically significant associations that we discovered did not reveal a clear pattern, making it difficult to even speculate as to what may have caused them.

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