Colorado Skip Year SGP Analyses
A Historical Comparison of the 2019 SGP Results

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Executive Summary

DRAFT REPORT - DO NOT CITE!

The COVID-19 pandemic is having far reaching-effects on all facets of our lives. The impact on education included school closures in Spring 2020 and a 2020-2021 academic school year that likely will look quite different from pre-pandemic times. Colorado, like all states, is currently grappling with uncertainty regarding the summative spring assessments and accountability systems built from the results. Student academic growth is a significant component of Colorado's accountability system and the lack of Spring 2020 results has necessitated an investigation of what alternatives there are to the annual student academic growth calculations normally conducted.

This report summarizes findings of an investigation of using skip-year growth as a substitute for the typical annual (i.e., one-year) student growth calculation. To pursue this investigation, historical Colorado Measures of Academic Success (CMAS) data in ELA and Mathematics was used in order to compare the SGPs derived from skip-year analyses (i.e., 2017 to 2019) versus sequential-year (non-skip, or one-year) analyses (i.e., 2018 to 2019). Comparisons between skip-year and sequential-year growth are examined at both the individual student level as well as the school level.

At the individual student level there is, not surprisingly, a very high correlation (~ 0.9) between skip-year SGPs and one-year SGPs (when the student has both). A very high correlation, however, does not preclude the existence of large differences for a substantial number of students. This is the case where more than 25 percent of the students have skip-year and one-year SGP differences that exceed 15 in magnitude.

At the school level there is, again not surprisingly, a very high correlation (~ 0.85) between skip-year mean SGPs and one-year SGPs. However, the high correlation does mask approximately 10 percent of the schools whose mean SGP differs by 10 or more. The majority of schools demonstrating these large differences are elementary schools who have 4th grade SGPs when one-year SGPs are calculated but do not have 4th grade SGPs when skip-year SGPs are calculated because of the absence of a prior score. Thus, for those elementary schools, substantially different numbers of students are used to calculate the mean/median. As school grades are comprised of other quantities besides student growth, the overall impact on school grades is muted with only a handful of schools having their grades change using skip-year versus one-year student growth.

As spring 2021 approaches and state summative assessments are scheduled to be given in Colorado, the historical growth analyses discussed in this report support several recommendations:

- Historical analyses contained in this report do not unequivocally support or reject the use of skip-year student growth in lieu of sequential-year student growth for state accountability calculations at the school level. There is a high correlation between skip-year and sequential SGP results. However, there are a non-trivial number of schools where the differences are large enough to result in differing conclusions about student academic learning at the school.
- Historical analyses contained in this report are done under much better educational circumstances than currently exist. We think that the current circumstances only adds to skepticism of using skip-year student growth in lieu of one-year student growth. Based upon current evidence, the best stance is to assume that skip-year growth is *not* a valid substitute for one-year growth in 2021 *unless* 2021 skip-year

growth analyses align well with historical skip-year analyses. Given current disruptions to student education due to COVID-19 in Fall 2021, we do not expect the analyses will align well.

- Even with analyses that align well in 2021, it is not clear whether business as usual accountability is politically tenable. The issue of summative testing in 2021 is only partly technical in nature. There is a large pragmatic, non-technical, component to consider.
- Skip-year growth is extremely valuable to calculate even if not used for traditional accountability. Skip-year growth can be used to conduct investigations about the overall and differential impact of COVID-19 on the education of students. This has the potential to inform policy discussions about myriad of COVID-19 related issues including, for example, which modes of education best served students during the crisis.

1 Background

The COVID-19 pandemic is having far reaching-effects on all facets of our lives. The impact on education included school closures in Spring 2020 and a 2020-2021 academic school year that likely will look quite different from pre-pandemic times. Colorado, like all states, is currently grappling with uncertainty regarding the summative spring assessments and accountability systems built from the results. Student academic growth is a significant component of Colorado's accountability system and the lack of Spring 2020 results has necessitated an investigation of what alternatives there are to the annual student academic growth calculations normally conducted.

The most prominent alternative to the standard one-year (sequential) student academic growth SGP utilized by Colorado is to calculate a two-year (skip-year) student academic growth SGP from 2019 to 2021. The first question to such a proposal is, "Can you do that?" The answer is easy in one sense and not so easy in another.

- In terms of performing the actual calculation, it is no more difficult to calculate skip-year growth than one-year growth. In fact, skip-year growth is often calculated in states where students skip a grade (grade 8 to 10 growth) or where students take an end-of-course test and the most immediate prior test is two years prior.
- Even though it is possible to calculate a skip-year growth quantity, it is not at all clear that it can be used in the manner that one-year growth is used in state accountability systems.

Due to the many unknown aspects of school, testing, and accountability in the coming year, the best that any state can do at this point in time is to examine historical data in anticipation of different situations that might arise in 2021. This report is part of the due diligence being conducted by the Colorado Department of Education (CDE) in preparation for Spring 2021.

2 Data

Colorado has extensive historical state summative assessment data from the Colorado Measures of Academic Success (CMAS) in English language arts and mathematics for grades 3 to 8 to examine how skip-year growth and one-year growth are related. To do so we calculated skip-year growth for 2019 (using 2017 and 2016 as priors). These skip-year growth quantities were then compared to the one-year growth at the individual level and, when aggregated by school, at the school level.

Table 1 provides frequencies and proportions associated with student skip-year and one-year SGP counts by year, content area, and grade. The most important aspect of Table 1 is the fact that there are no 4^{th} grade skip-year SGPs. This is due to the fact that there exists no prior score with which to calculate growth with since there is no grade 2 exam. The absence of 4^{th} grade SGPs has a significant impact on comparisons done at the elementary school level. Since one-year growth summaries (mean or median) can include the 4^{th} grade SGPs, one-year to skip-year comparisons for elementary schools are not well aligned (using all growth data) since different grades exist. We discuss this issue later and supplement analyses at the school level based upon only grades and content areas that could have both one-year and skip-year SGPs calculated.

Table 1: Sequential and Skip-year SGP counts and percentages for 2019 by content area and grade.

			Sequential		Skip Year	
Content Area	Grade	Total Students	Count	Percent	Count	Percent
ELA	4	60,483	57,016	94.3	–	–
	5	63,129	59,069	93.6	55,502	87.9
	6	62,000	58,502	94.4	55,099	88.9
	7	60,066	56,384	93.9	53,457	89.0
	8	56,449	52,607	93.2	50,131	88.8
Mathematics	4	61,519	58,558	95.2	–	–
	5	63,210	60,182	95.2	57,148	90.4
	6	62,080	58,623	94.4	55,873	90.0
	7	60,137	56,444	93.9	53,498	89.0
	8	56,461	51,699	91.6	50,172	88.9

In general, there are fewer students with a skip-year SGP (prior from two years ago) than a one-year SGP. For all grades and content areas for which both skip-year and one-year SGPs can exist, 87.2% of students having both a one-year and skip-year SGP, while 6.6% of students have a one-year SGP but no skip-year SGP. Only 1.9% of students have a skip-year SGP but not a one-year SGP. And 4.3% of students have neither.

Overall, based upon counts, there is not any systematic under-representation of students that would the representativeness of the group of students used for skip-year growth calculations. For 2021, Table 1 should have an additional column added indicating counts for students with skip-year growth. If the values differ dramatically from those in 2019 then that would undermine claims about their representativeness. In the next section we investigate the results more thoroughly to determine whether skip-year growth can be used in lieu of one-year growth.

3 Analyses and Results

Analyses were conducted for grades 4 to 8 for one-year SGPs and in grades 5 to 8 for skip-year SGPs in both ELA and mathematics for the 2019 CMAS administration. All analyses were conducted using the R Software Environment (R Core Team, 2019) in conjunction with the SGP package (Betebenner, VanIwaarden, Domingue, & Shang, 2020). Source code associated with one-year analyses is available at this link and source code associated with skip-year analyses is available at this link.

As mentioned previously, both sets of analyses are considered "standard" and resulted in no warnings or errors during calculation. Goodness of fit plots associated with one-year and skip-year SGP analyses are provided in the appendix. In general, both one-year and skip-year SGP analyses yielded excellent data fit. This is consistent with the excellent fit of analyses run previously in Colorado. Goodness of fit plots for one-year and skip-year analyses 2019 for ELA

and mathematics are available in Appendix A. Because percentiles are uniformly distributed, mean, median and standard deviation for one-year and skip-year SGPs are practically identical. In the following we discuss further results comparing one-year and skip-year SGPs at the individual level followed by results at the school level.

3.1 Individual Level Results

One-year (sequential) and skip-year SGPs quantify growth for students across different time spans. For sequential SGPs, the time span is, at a minimum, a single year. For skip-year SGPs the time span is, at a minimum, two years. In general one would not communicate that a skip-year SGP is the same as a one-year SGP because they quantify something over a different time span.

As Colorado data analyses shows, however, the two quantities are highly similar. Correlations between one-year SGP and skip-year SGP by content area and grade ranged between 0.83 and 0.91. This indicates that though the quantities are for different time spans, those students showing high or low growth across one of the time spans often showed the same across the other time span. The mean and standard deviation of SGPs at the individual level is also similar for the analyses, as shown in Table 2. These results are consistent with those found in all other states examined thus far.

Table 2: Sequential and Skip-year SGP correlation and mean/standard deviations for 2019 by content area and grade.

			Sequential		**Skip Year**	
Content Area	Grade	SGP Correlation	Mean	SD	Mean	SD
ELA	4	–	50.1	28.8	–	–
	5	0.86	50.2	28.9	50.1	28.8
	6	0.91	50.2	28.9	50.3	28.9
	7	0.87	50.2	28.9	50.3	28.9
	8	0.88	50.1	28.9	50.3	28.8
Mathematics	4	–	50.1	28.8	–	–
	5	0.83	50.1	28.9	50.1	28.8
	6	0.91	50.2	28.9	50.2	28.9
	7	0.85	50.2	28.9	50.3	28.8
	8	0.89	50.3	28.9	50.4	28.9

High correlations imply that the results demonstrate a strong linear relationship but do not imply that the results are identical or interchangeable. Looking at individual differences between skip-year and one-year SGPs for students having both quantities shows that in 2019 in ELA and mathematics for all grades approximately 20 percent of students showed differences between one-year and skip-year SGPs of at least 18 (or, equivalently, 80 percent had differences of less than 18). The results are not surprising in that an examination of student achievement

scores over time show a substantial number of students whose scores have wide fluctuations. Dropping the most recent score from growth calculations when it was in fact very different will lead to highly discrepant SGPs.

Lastly, we examined whether there are systematic differences in terms of student achievement between the group of students with one-year SGPs but not skip-year SGPs. Recall that students without a skip-year SGP are a small minority of students comprising approximately 5 percent of students in each grade and content area. In general, those students with no skip-year SGP (i.e., they do not have a prior from two-years earlier) were slightly lower achieving (z-score approximately -0.1 versus a z-score of 0.0 for all students). However, despite being lower achieving on average, these students did not display any meaningful differences in terms of their academic growth (i.e., mean SGP = 49.96). It is unclear, based upon the data provided, whether there are systematic reasons for these students to not have a skip-year SGP (e.g., highly transient).

At the individual student level, the proposition of reporting skip-year (i.e., two-year) student growth in lieu of one-year student growth would unnecessarily misrepresent what skip-year growth actually quantifies (growth over two years instead of a single year). The investigations carried out with historical Colorado data suggest that there's a close relationship between the skip-year growth and one-year growth that could be used to draw inferences about what the one-year growth would be if the student tested in 2020. In general, however, skip-year growth is the most relevant and accessible indicator available and can serve many valuable investigative purposes apart from being a proxy for one-year growth.

3.2 School Level Results

Of most interest to states in their investigation of skip-year growth is how well skip-year growth and one-year growth compare when aggregated to the school level. Aggregation of SGPs to the school level is usually accomplished by taking the median or mean of the SGPs for the students attending the school in the given year in each content area. One critical difference in skip-year growth and one-year growth is the absence of SGPs for 4^{th} grade students. A school with 4^{th} graders would have student growth for those students included with one-year growth but would not be included with skip-year growth. Elementary schools comprising grades K-5 or K-6 would have between a third and a half of their students without skip-year growth when, previously, they had one-year growth.

Because of disparities caused due to the fact that one-year analyses included 4^{th} grade growth and skip-year analyses did not, school level results were summarized in two ways:

1. Aggregates were calculated using all available skip-year and one-year growth scores.
2. Aggregates were calculated including only grades/content areas for which *both* skip-year and one-year growth could be calculated.

The first method just takes the available growth scores (either skip-year or one-year) and calculates the mean and standard deviation from those. This method would include 4^{th} grade one-year SGPs for schools but those same schools would not have skip-year growth for those students. The second method filters students to only those in grades/content areas in which growth could be calculated in both analyses. This method omits 4^{th} graders since they do not have a skip-year SGP.

Table 3 shows basic descriptive statistics for school level growth and prior achievement. Unlike when reporting SGPs at the individual level, when aggregating to the group level (e.g., school) the correlation between aggregate prior student achievement and aggregate growth is rarely zero. The correlation between prior student achievement and growth at the school level is a compelling descriptive statistic because it indicates whether students attending schools serving higher achieving students grow faster (on average) than those students attending schools serving lower achieving students. In traditional sequential analyses, school level results typically show a correlation between prior achievement of students associated with a current school (quantified here as mean *standardized* scalse score) and the mean SGP between 0.1 and 0.3 (although higher numbers have been observed in some states as well). That is, these results indicate that on average, students attending schools serving lower achieving students tend to demonstrate less exemplary growth than those attending schools serving higher achieving students. Therefore, this relationship is a critical component to assessing the comparability between sequential and skip-year analysis results.

Mean and standard deviations of the school mean SGPs (MSGPs) are provided for additional context and comparison. All statistics in Table 3 are restricted to schools with at least 10 students, and the measure of prior achievement used is the mean prior standardized scale score.

Table 3: School level mean and standard deviation of MSGPs, and correlation of MSGPs with mean prior achievement.

		Sequential			**Skip Year**		
Filter	Content Area	Mean	SD	Corr	Mean	SD	Corr
All Students	ELA	50.2	7.5	0.29	50.4	9.5	0.17
	Mathematics	50.0	8.5	0.25	50.1	11.0	0.15
Skip-Year Subset	ELA	50.6	8.7	0.16	50.4	9.5	0.17
	Mathematics	50.4	10.1	0.13	50.1	11.0	0.15

3.2.1 School mean SGP correlations

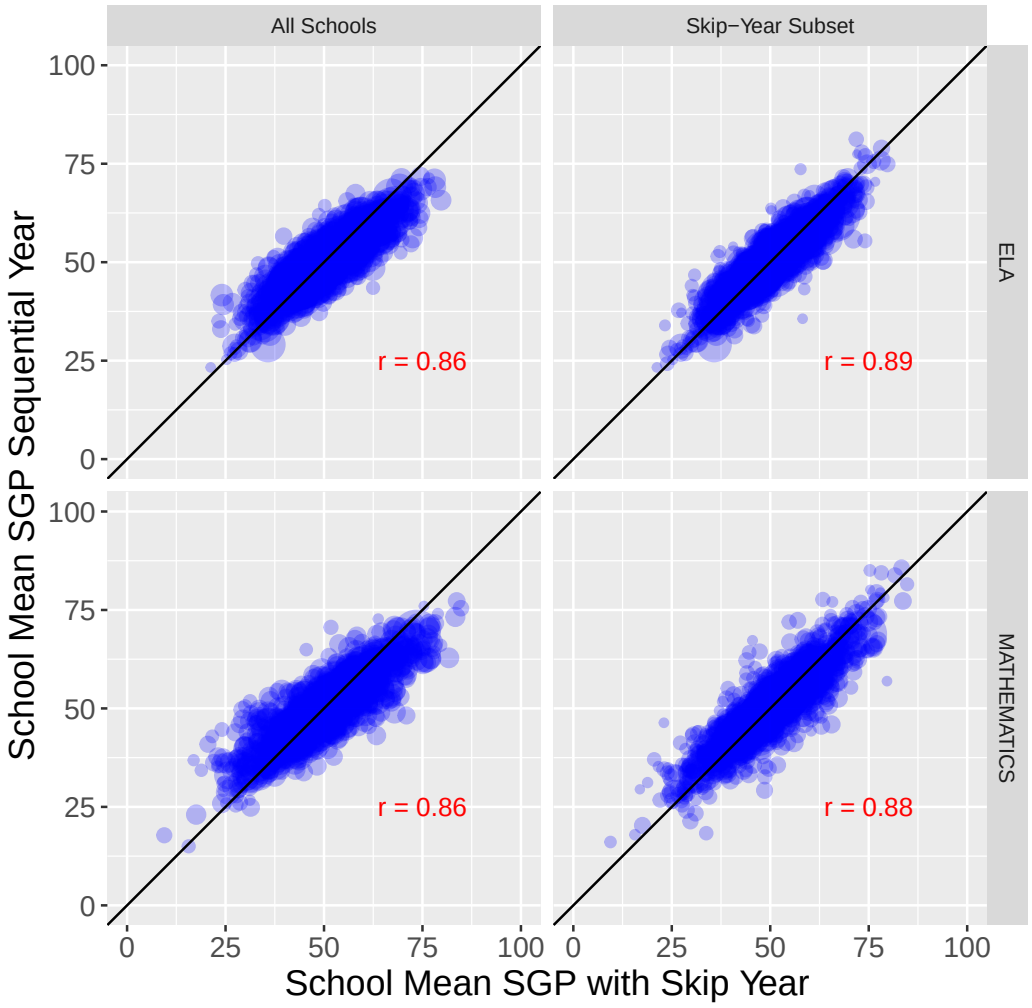
Like with individual level results, correlations at the school level between one-year and skip-year mean SGPs are very high. Table 4 reports the correlations (restricted to schools with 10 or more students) which approach 0.9 based upon approximately 1,500 Colorado schools. The results demonstrate that those schools with high mean one-year SGPs predominantly have high mean skip-year SGPs and vice-versa. Though not reported, similarly high correlations are observed within schools at the grade level, as well as at the district level.

Table 4: School level correlations between mean SGPs with unfiltered and filtered students.

Content Area	All Students	Skip-Year Subset
ELA	0.86	0.89
Mathematics	0.86	0.88

Figure 1 provides a visual representation of the relationship between school level MSGP and prior achievement by content area and student inclusion filters. Bubble sizes are representative of school size, and the black diagonal line represents perfect correlation (i.e. no difference).

Figure 1: Sequential- and Skip-Year Mean SGP by Content Area and Student Filter.



3.2.2 School mean SGP differences

Like at the individual level, a high correlation does not imply the quantities are identical or interchangeable. Absolute differences between mean SGPs were calculated for schools to

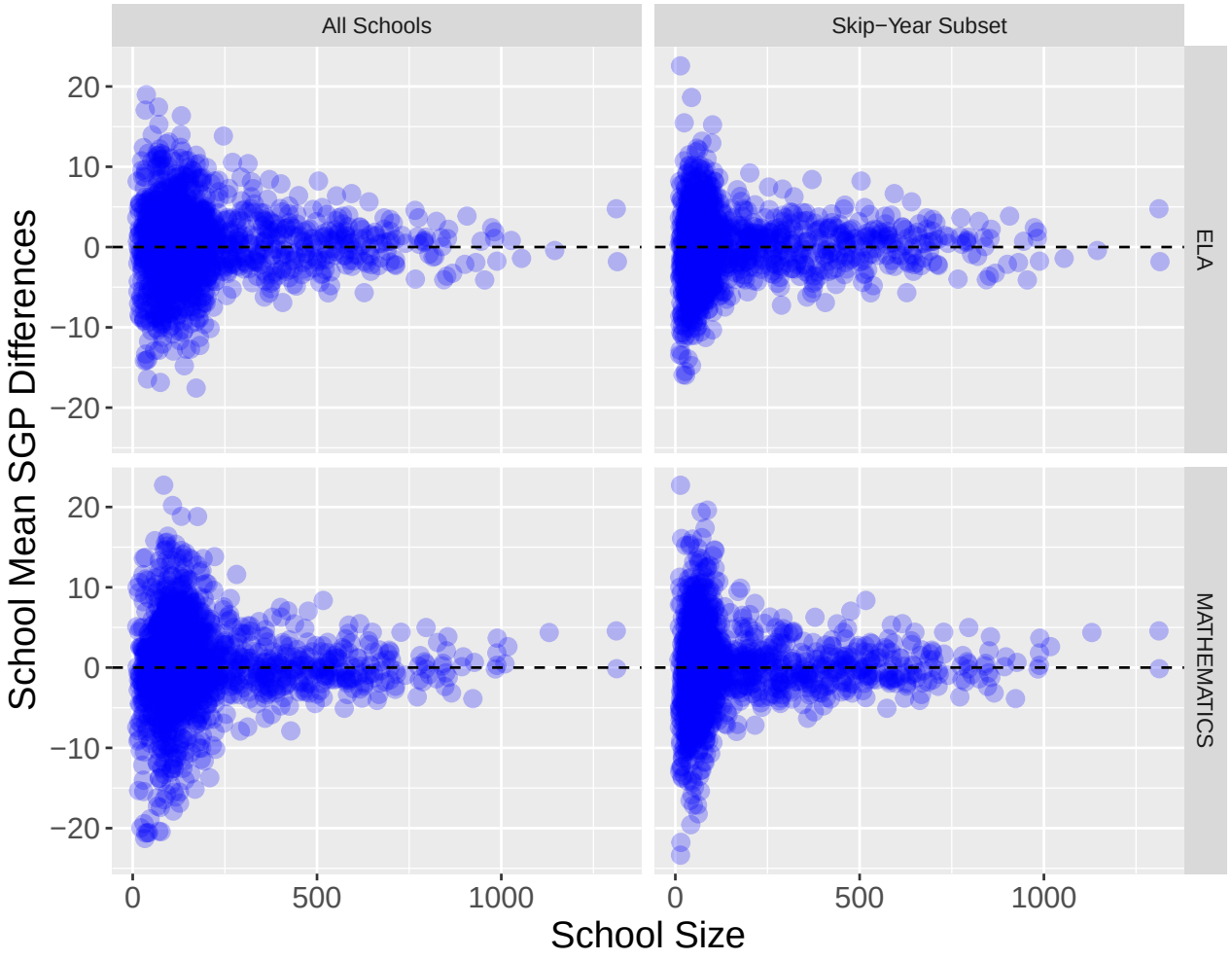
examine the average magnitude of difference between one-year mean SGP and skip-year mean SGP. Table 5 reports differences in school mean SGP for all students and those students with both a skip-year and one-year SGP. On average the differences are small. However, as the 95^{th} percentile shows, 5 percent of schools report differences in mean skip-year and one-year SGPs of nearly 10 in ELA and more than 12 in mathematics. From a practical standpoint, differences of more than 5 are associated with a small effect size. Moreover, a difference of 5 or more is likely to have some impact on the accountability designation that figures into the larger school rating. Overall, the differences are neither insignificant nor egregious.

Table 5: School level skip-year to one-year median and 95th percentile absolute differences.

Filter	Content Area	Median Difference	95%ile Difference
All Students	ELA	2.83	9.96
	Mathematics	2.93	12.41
Skip-Year Subset	ELA	2.48	8.52
	Mathematics	2.87	10.61

School size is one driver of the differences in one- and skip-year mean SGPs to consider. Figure 2 provides a visual representation of the school level MSGP observed (*not absolute*) differences as a function of school size by content area and student inclusion filters. In this plot, MSGP differences are defined as **skip-year MSGP *minus* one-year MSGP**, and therefore can be interpreted as positive numbers showing an increase in schools' MSGP when using skip-year calculations, and vice-versa.

Figure 2: Mean SGP Differences by Content Area and Student Inclusion Filter.



School level differences like student level differences were, on average, minor. There were, however, numerous schools with one-year/skip-year differences that were not minor and would possibly lead to a different accountability determination. Further analysis should include re-running 2019 accountability calculations to determine what impact using skip-year growth in place of one-year growth has on school grades. Those results could be added to this report if made available or done in cooperation with the Center for Assessment.

3.3 Demographic Subgroup Results

One way in which issues related to opportunity to learn can be examined is by looking at growth gaps for relevant demographic subgroups. The following subsections examine existing differences in three demographic groups: economically disadvantaged students (as indicated by free/reduced lunch eligibility status), English language learners (for Colorado, English learners designated as either "Limited English Proficient" - LEP, or "Non-English Proficient" - NEP), and students with disabilities (as indicated by having an individualized education program - IEP).

Investigations of (differential) impact on student achievement and growth for already at-risk student populations will be critical to help ameliorate impacts of the disruption to education of the COVID-19 pandemic.

3.3.1 Free/Reduced Lunch Status

Table 6 provides the frequencies and percentage of students who are receiving or eligible for free/reduced lunch (FRL), or not, that had a sequential and/or skip-year SGP calculated in 2019[1]. As the results show, there is not a considerable difference between the two groups' rates of growth calculation under either analysis.

Table 6: Sequential and Skip-year SGP counts and percentages for 2019 by content area and FRL Status

			Sequential		**Skip Year**	
Content Area	FRL Status	Total Students	Count	Percent	Count	Percent
ELA	No	139,907	131,220	93.8	124,094	88.7
	Yes	101,694	95,320	93.7	90,072	88.6
Mathematics	No	139,987	130,414	93.2	124,280	88.8
	Yes	101,859	96,513	94.8	92,389	90.7

Table 7 provides the correlations between sequential and skip-year SGP estimates for FRL/non-FRL students that had both a sequential and skip-year SGP calculated in 2019, as well as the mean and standard deviations for these values. As the results show, there is not a considerable difference *within* the two groups' growth calculation under either analysis. The two growth measures are highly correlated and have similar distributional qualities within each group by content area. However, it is important to note the growth gap *between* the FRL/non-FRL groups in both ELA and Mathematics. This gap is approximately 3 points, on average, for FRL students for the sequential analyses SGP estimates, and this gap increases slightly to roughly 5 points using the skip-year estimates.

[1] All demographic summaries include only counts/percentages for those who *could* have received a skip-year SGP (i.e. the "Skip-Year Subset").

Table 7: Sequential and Skip-year SGP correlation and mean/standard deviations for 2019 by content area and FRL Status

			Sequential		**Skip Year**	
Content Area	FRL Status	SGP Correlation	Mean	SD	Mean	SD
ELA	No	0.88	51.4	28.8	52.1	28.8
	Yes	0.88	48.5	28.8	47.7	28.8
Mathematics	No	0.86	51.4	28.8	52.4	28.7
	Yes	0.89	48.5	28.9	47.4	28.8

Table 8 provides the school level correlations between sequential and skip-year SGP estimates and the school level percentage of students that are receiving/eligible for FRL. As with the school level summary results in the previous section, these summaries are provided for both 1) all students (including 4^{th} graders) and 2) for the subset of students that have both a sequential and skip-year SGP calculated in 2019. As the results show, a negative relationship (correlation) exists between typical school growth and the school percentage of FRL students. That is, the schools with larger FRL populations tend to demonstrate lower academic growth.

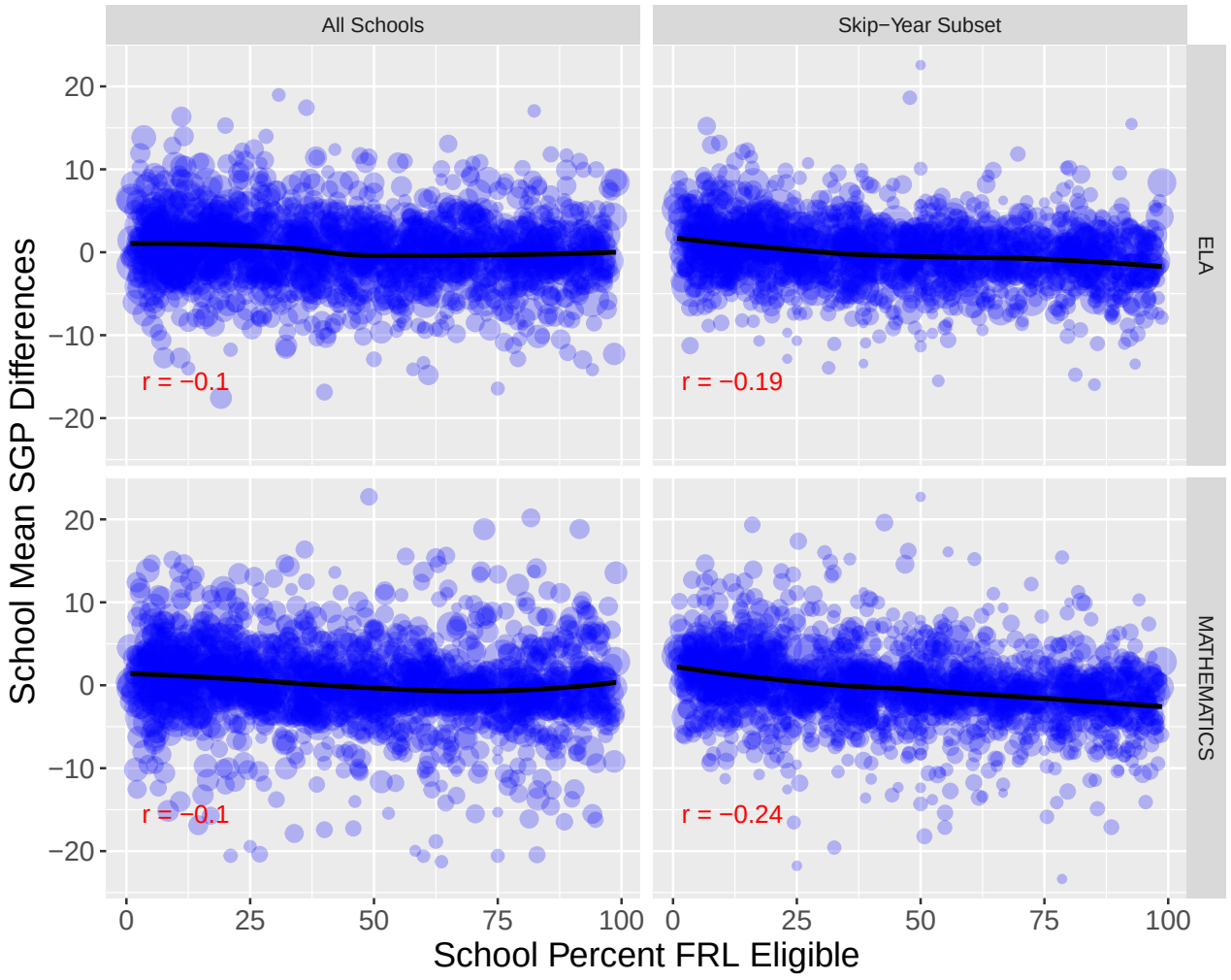
Table 8: School level correlations between mean SGPs and percent FRL by student inclusion filter.

Filter	Content Area	Sequential	Skip Year
All Students	ELA	-0.21	-0.22
	Mathematics	-0.20	-0.21
Skip-Year Subset	ELA	-0.12	-0.20
	Mathematics	-0.07	-0.18

Figure 3 provides a visual representation of the school level MSGP differences as a function of school FRL population size by content area and student inclusion filters. MSGP differences are defined as **skip-year MSGP *minus* one-year MSGP**, and therefore positive numbers can be interpreted as showing an increase in schools' MSGP when using skip-year calculations, and vice-versa. Bubble sizes are representative of school size, and the black line is a LOESS smoothing curve that depicts the moving average MSGP difference relative to the percentage of FRL students.

This plot shows a slight negative relationship between the MSGP difference and FRL population size. This suggests that, on average, schools with higher FRL populations have lower difference values (i.e. schools with larger FRL populations may be slightly more likely to be negatively impacted with the use of skip-year analysis).

Figure 3: Mean SGP Difference by Percent FRL by Content Area and Student Inclusion Filter.



3.3.2 English Language Learner Status

Table 9 provides the frequencies and percentage of students who are designated as English language learners (ELL), or not, that had a sequential and/or skip-year SGP calculated in 2019. As the results show, there are some differences between the two groups' rates of growth calculation under both analysis types. In particular, ELL students receive ELA SGPs at a lower rate than non-ELL students and this is exacerbated in the skip-year analyses. In particular, when looked at by grade level, 10 - 15% fewer 5^{th} and 6^{th} grade ELL students receive a SGP estimate when a test score from 2 years prior is required to calculate growth. These students may be more likely to have either just entered the school system within the past two years or to have been administered an English proficiency assessment (e.g. WIDA ACCESS) in place of ELA in prior years, meaning they had only the most recent year's ELA test score available for ELA growth measurement. However, as the difference in number of SGPs calculated shows, this represents a relatively small number of kids overall (between 750 and 1,000 students statewide), which may limit the impact their exclusion would have on a

school's overall accountability determination.

Table 9: Sequential and Skip-year SGP counts and percentages for 2019 by content area and ELL Status

			Sequential		**Skip Year**	
Content Area	ELL Status	Total Students	Count	Percent	Count	Percent
ELA	No	216,918	204,499	94.3	194,430	89.6
	Yes	24,726	22,063	89.2	19,759	79.9
Mathematics	No	216,848	203,539	93.9	194,791	89.8
	Yes	25,040	23,409	93.5	21,900	87.5

Table 10 provides the correlations between sequential and skip-year SGP estimates for ELL/non-ELL students that had both a sequential and skip-year SGP calculated in 2019, as well as the mean and standard deviations for these values. As the results show, the two growth measures are highly correlated and have similar distributional qualities within each group by content area. There is a slight difference *within* the ELL group's growth calculation between the sequential and skip-year analyses. Specifically, this group's typical growth in both ELA and mathematics are about 2 points lower using the skip-year analysis. This results in increasing the otherwise modest growth gap between ELL and non-ELL students between the sequential and skip-year analyses.

Table 10: Sequential and Skip-year SGP correlation and mean/standard deviations for 2019 by content area and ELL Status

			Sequential		**Skip Year**	
Content Area	ELL Status	SGP Correlation	Mean	SD	Mean	SD
ELA	No	0.88	50.2	28.9	50.5	28.9
	Yes	0.91	49.7	28.7	48.0	28.6
Mathematics	No	0.86	50.3	28.9	50.6	28.8
	Yes	0.92	48.9	29.0	47.0	28.8

Table 11 provides the school level correlations between sequential and skip-year SGP estimates and the school level percentage of ELL designated students. As with the school level summary results in the previous section, these summaries are provided for both 1) all students (including 4^{th} graders) and 2) for the subset of students that have both a sequential and skip-year SGP calculated in 2019. As the results show, the relationship (correlation) between typical school growth and the school percentage of ELL students is minimal if not non-existent.

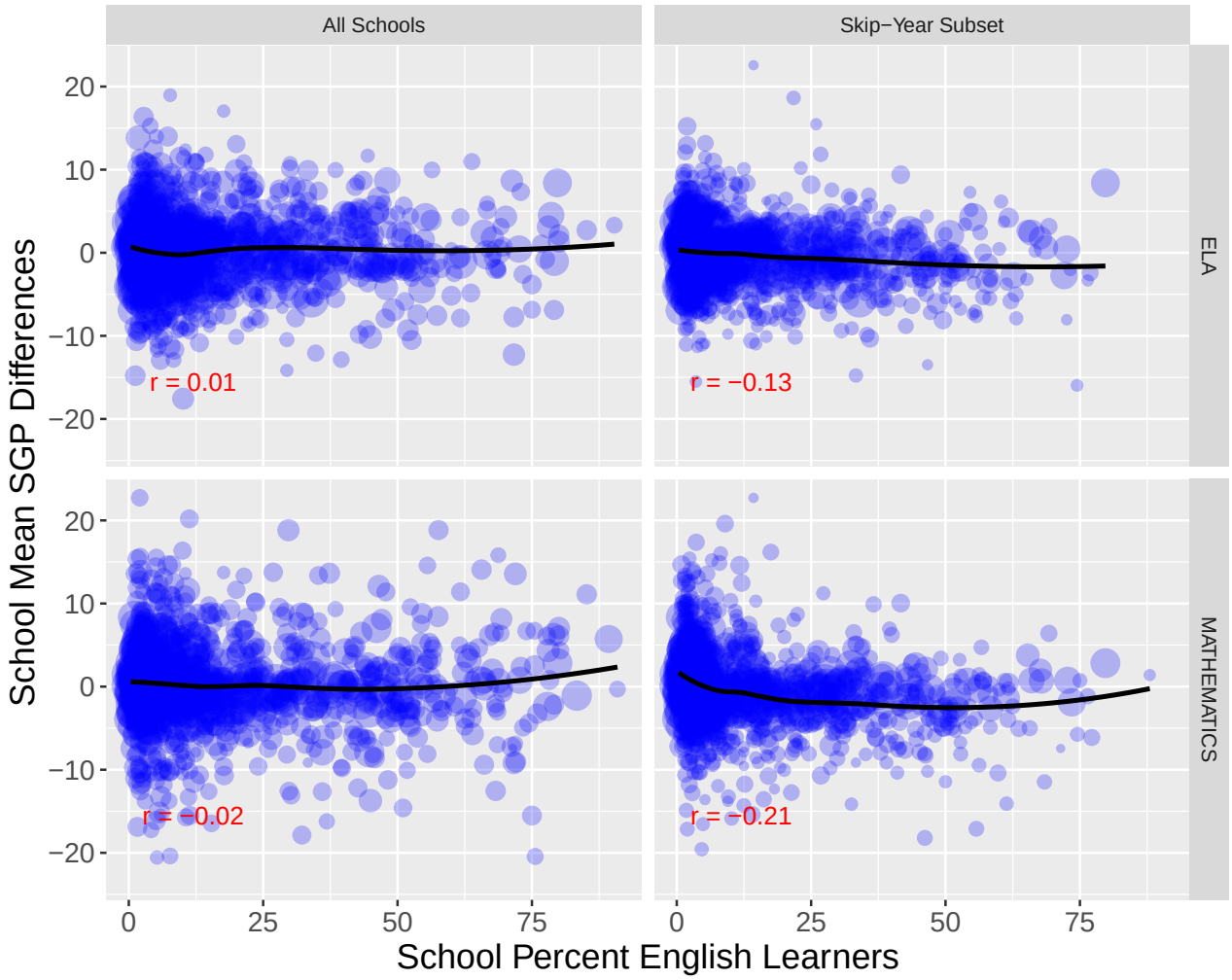
Table 11: School level correlations between mean SGPs and percent ELL by student inclusion filter.

Filter	Content Area	Sequential	Skip Year
All Students	ELA	-0.07	-0.05
	Mathematics	-0.07	-0.07
Skip-Year Subset	ELA	0.03	-0.03
	Mathematics	0.04	-0.07

Figure 4 provides a visual representation of the school level MSGP differences as a function of school ELL population size by content area and student inclusion filters. MSGP differences are defined as **skip-year MSGP *minus* one-year MSGP**, and therefore positive numbers can be interpreted as showing an increase in schools' MSGP when using skip-year calculations, and vice-versa. Bubble sizes are representative of school size, and the black line is a LOESS smoothing curve that depicts the moving average MSGP difference relative to the percentage of ELL students.

This plot shows a slight negative relationship between the MSGP difference and ELL population size for the skip-year subset. This suggests that, on average, schools with higher ELL populations have lower difference values (i.e. schools with larger ELL populations are slightly more likely to be negatively impacted with the use of skip-year analysis, although this impact appears to very modest).

Figure 4: Mean SGP Difference by Percent ELL by Content Area and Student Inclusion Filter.



3.3.3 Students with Disabilities

Table 12 provides the frequencies and percentage of students with disabilities (or SWD, as indicated by having an IEP), or not, that had a sequential and/or skip-year SGP calculated in 2019. As the results show, there is not a considerable difference between the two groups' rates of growth calculation under either analysis, although students with an IEP do receive a SGP estimate at slightly lower rates than those without.

Table 12: Sequential and Skip-year SGP counts and percentages for 2019 by content area and IEP Status

			Sequential		**Skip Year**	
Content Area	SWD Status	Total Students	Count	Percent	Count	Percent
ELA	No	216,718	203,570	93.9	192,535	88.8
	Yes	24,926	22,992	92.2	21,654	86.9
Mathematics	No	216,922	203,795	93.9	194,758	89.8
	Yes	24,966	23,153	92.7	21,933	87.9

Table 13 provides the correlations between sequential and skip-year SGP estimates for SWD/non-SWD that had both a sequential and skip-year SGP calculated in 2019, as well as the mean and standard deviations for these values. As the results show, the two growth measures are highly correlated and have similar distributional qualities within each group by content area. There is a slight difference *within* the SWD group's growth calculation between the sequential and skip-year analyses. Specifically, this group's typical growth in both ELA and mathematics are about 2 points lower using the skip-year analysis. This results in increasing the existing growth gap between SWD and non-SWD populations in the sequential analysis. This gap is 4 points, on average, for the sequential SGP estimates, and this gap increases slightly to approximately 6 points using the skip-year estimates.

Table 13: Sequential and Skip-year SGP correlation and mean/standard deviations for 2019 by content area and IEP Status

			Sequential		**Skip Year**	
Content Area	IEP Status	SGP Correlation	Mean	SD	Mean	SD
ELA	No	0.88	50.6	28.9	50.9	28.9
	Yes	0.91	46.6	28.4	44.4	28.2
Mathematics	No	0.86	50.6	28.9	50.8	28.8
	Yes	0.92	46.5	28.7	45.0	28.6

Table 14 provides the school level correlations between sequential and skip-year SGP estimates and the school level percentage of students with disabilities. As with the school level summary results in the previous section, these summaries are provided for both 1) all students (including 4^{th} graders) and 2) for the subset of students that have both a sequential and skip-year SGP calculated in 2019. As the results show, a negative relationship (correlation) exists between typical school growth and the school SWD percentage. That is, the schools with larger disabled populations tend to demonstrate lower academic growth.

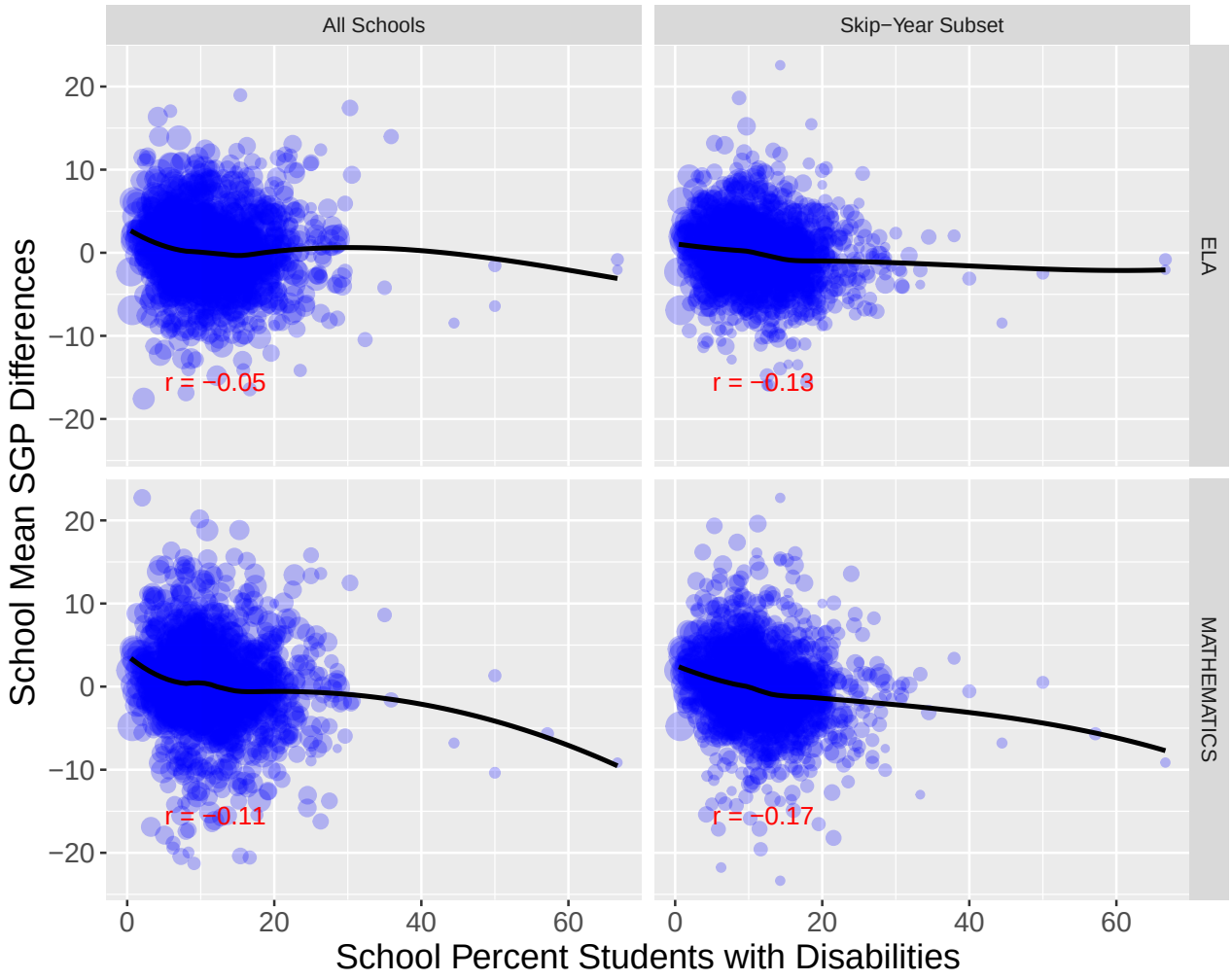
Table 14: School level correlations between mean SGPs and percent SWD by student inclusion filter.

Filter	Content Area	Sequential	Skip Year
All Students	ELA	-0.15	-0.14
	Mathematics	-0.13	-0.16
Skip-Year Subset	ELA	-0.12	-0.17
	Mathematics	-0.09	-0.16

Figure 5 provides a visual representation of the school level MSGP differences as a function of school SWD population size by content area and student inclusion filters. MSGP differences are defined as **skip-year MSGP *minus* one-year MSGP**, and therefore positive numbers can be interpreted as showing an increase in schools' MSGP when using skip-year calculations, and vice-versa. Bubble sizes are representative of school size, and the black line is a LOESS smoothing curve that depicts the moving average MSGP difference relative to the percentage of students with disabilities.

This plot shows a slight negative relationship between the MSGP difference and SWD population size for the skip-year subset. This suggests that, on average, schools with higher SWD populations have lower difference values (i.e. schools with larger SWD populations are slightly more likely to be negatively impacted with the use of skip-year analysis, although this impact appears to modest).

Figure 5: Mean SGP Difference by Percent Students with Disabilities by Content Area and Student Inclusion Filter.



4 Summary

The analyses conducted in the report investigate whether skip-year SGPs can be used in place of the standard one-year SGPs. The report discussed four potential issues:

- Are the students with skip-year SGPs systematically different than those with one-year SGPs?
- Are the one-year SGPs systematically different than the skip-year SGPs at the individual level?
- Are the one-year SGPs systematically different than the skip-year SGPs when aggregated to the school level?
- Are the one-year SGPs systematically (and significantly) different than the skip-year SGPs for different demographic subgroups?

For all the questions the answer is no. However, that is not to say that there weren't differences worth considering for a minority of students and schools. The results produced by these analyses do not disqualify the use of skip-year growth in lieu of one-year growth. However, they also do not qualify their use as well. Moreover, because the results here are generated from historical data derived under "usual" educational circumstances, the current far from usual circumstances are likely to result in deviations that exceed what is reported here. Without confirmation in 2021 that skip-year deviations are no larger than they were historically, it seems imprudent at this point in time to confirm the use of skip-year growth for business as usual accountability.

Beyond the technical characteristics of skip-year growth lie numerous practical and political considerations on the use of skip-year growth for accountability. As Colorado approaches 2021 any decisions related to student testing and accountability will require some technical considerations but much more practical and political calculation to determine the best course going forward.

Assuming testing does occur in some form in 2021, it is highly recommended that growth be calculated regardless of whether it is used for accountability. There are numerous, valuable inquiries that can be addressed with skip-year SGPs available including:

- What was the overall impact on student learning in the state of Colorado due to COVID-19?
- What demographic subgroups fared best and which demographic subgroups fared most poorly in term of learning during the COVID-19 pandemic?
- Are there COVID-19 related instructional approaches that led to greater student learning than others? If so, what were they and how much more learning were they associated with?

Critical to the investigation of COVID-19 related learning loss will be accurate data on COVID-19 related education programs that students were assigned to. Having these data available will allow the Colorado Department of Education to fully take advantage of their student growth data and enlighten stakeholders around the state as to what has occurred due to the COVID-19 pandemic.

References

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