Mitigating Learning Loss for Virginia's Low-Income Elementary School Students

Prepared for the Virginia Joint Legislative Audit and Review Commission

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Client Profile

This project was completed for the Virginia Joint Legislative Audit and Review Commission (JLARC). JLARC is a non-partisan agency that conducts program evaluation, policy analysis and oversight of state agencies on behalf of the Virginia General Assembly. The primary goal of JLARC is to inform the legislature in their deliberations and make recommendations to improve the effectiveness of state agencies (JLARC, 2020). As such, JLARC can use the analysis and findings of this project as part of their effort to inform the legislature and make recommendations to the Virginia Department of Education (VDOE).

Disclaimer

The author conducted this study as part of the program of professional education at the Frank Batten School of Leadership and Public Policy, University of Virginia. This paper is submitted in partial fulfillment of the course requirements for the Master of Public Policy degree. The judgments and conclusions are solely those of the author, and are not necessarily endorsed by the Batten School, by the University of Virginia, or by any other agency.

Honor Statement

On my honor as a student, I have neither given nor received unauthorized aid on this assignment.

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Key Acronyms

CPI: Consumer Price Index

FPL: Federal poverty level

GDP: Gross Domestic Product

JLARC: Joint Legislative Audit and Review Commission

MAP: Measures of Academic Progress

SD: Standard deviation

SOL: Standards of Learning

USDA: U.S. Department of Agriculture

VDOE: Virginia Department of Education

Executive Summary

Prior to the COVID-19 pandemic, disparities in standardized test scores between low- and moderate- to high-income elementary school students in Virginia were already prevalent (Virginia Department of Education SOL Test Results, 2020). As a result of schools' abrupt transition to virtual learning in March 2020, these disparities in education quality and outcomes have widened due to factors such as lack of broadband and technology access, ineffectiveness of virtual learning environments, and lack of parental support (Ahn & McEachin, 2017; Allison, 2020; Holmund et al., 2008). Alarmingly, estimates indicate that low-income elementary schoolers potentially lost up to 63 percent of learning gains in math and 37 percent of learning gains in reading during the 2019-2020 school year (Kuhfeld et al., 2020).

To mitigate learning loss for Virginia's low-income elementary school students, this report considers three distinct alternatives:

1) Incentivize school divisions to expand summer school programs

2) Incentivize school divisions to adopt a year-round calendar

3) Reduce student/teacher ratios in low-income areas

I evaluate each alternative above using the criteria of cost-effectiveness and political feasibility. Based on this analysis, **I ultimately recommend that the commonwealth pursue option one: incentivize school divisions to expand summer school programs**.

While this alternative is far more costly than the least-costly option, the effectiveness of summer school is proven through rigorous research making it the most cost-effective alternative. Current high-ranking officials in the commonwealth have also exhibited support for funding summer school programs as a way to mitigate learning loss. This report concludes with advice on implementation including the roles of key actors and ensuring that mitigating learning loss remains a priority for the next gubernatorial administration.

Problem Statement

Too many low-income elementary school students in Virginia are at risk of suffering learning loss as a result of virtual instruction.

Virginia's low-income students perform worse on standardized testing than their more privileged peers in normal school years. In 2018-2019, for example, the average Standards of Learning (SOL) pass rate for low-income students was less than 68 percent, compared to about 76 percent for all students (Virginia Department of Education SOL Test Results, 2020). These achievement gaps are likely to widen as a result of schools' transition to virtual instruction during the COVID-19 pandemic. Research estimates that while all elementary students experienced significant learning loss during the 2019-2020 school year, low-income students likely experienced the most (CREDO, 2020; Kuhfeld et al., 2020). SOL tests were not administered during the spring of 2020 due to the abrupt transition to virtual learning, so more current data specific to Virginia students is lacking. However, the threat of growing achievement gaps between low-income and more privileged elementary schoolers necessitates the commonwealth to mitigate learning loss for Virginia's most vulnerable students as schools transition back to in-person instruction.

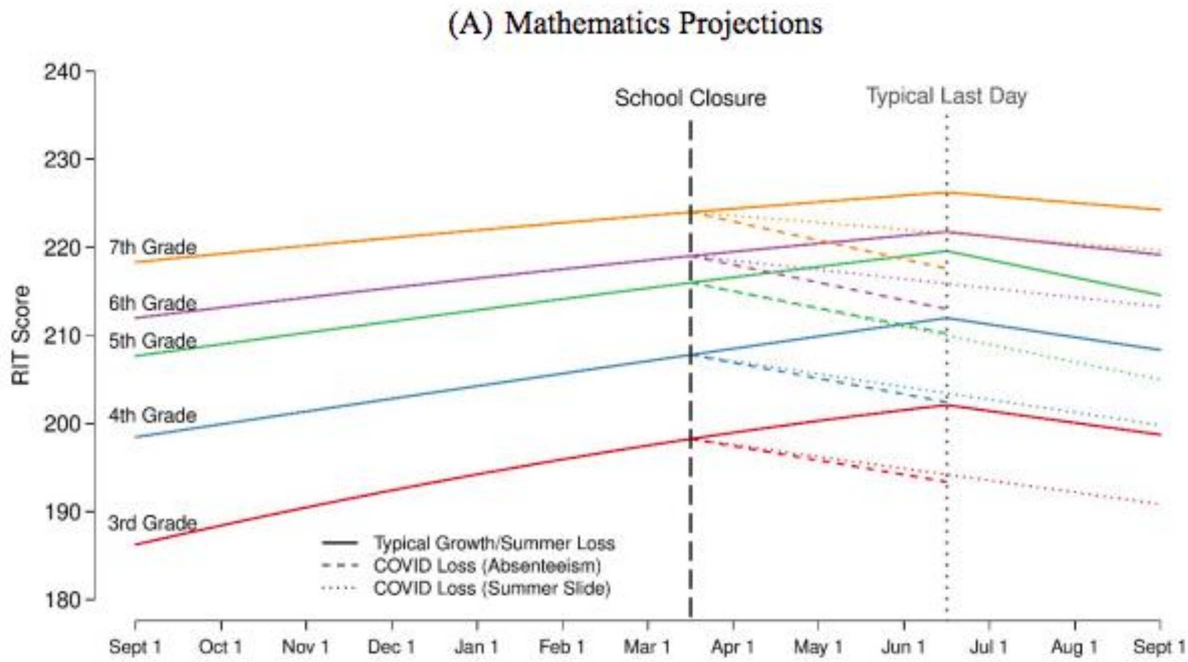
Background

Effect of low-income status on learning

A report by the Commonwealth Institute detailed many detrimental effects of low-income status on student learning in Virginia as of the 2013-2014 school year. Specifically, this report compared high-poverty schools, where at least three-quarters of students qualified for free or reduced price meals, versus low-poverty schools where one-quarter of students or less qualified. Differences between these two types were drastic. High-poverty schools had less experienced teachers, spent less on instructors and instructional materials, and offered fewer courses. As a result, about one-third of high-poverty schools (69 out of 204) were fully accredited compared to almost all low-poverty schools (410 out of 413). Additionally, students in high-poverty schools were twice as likely to be chronically absent and three times more likely to fail to advance to the next grade (Duncombe, 2017).

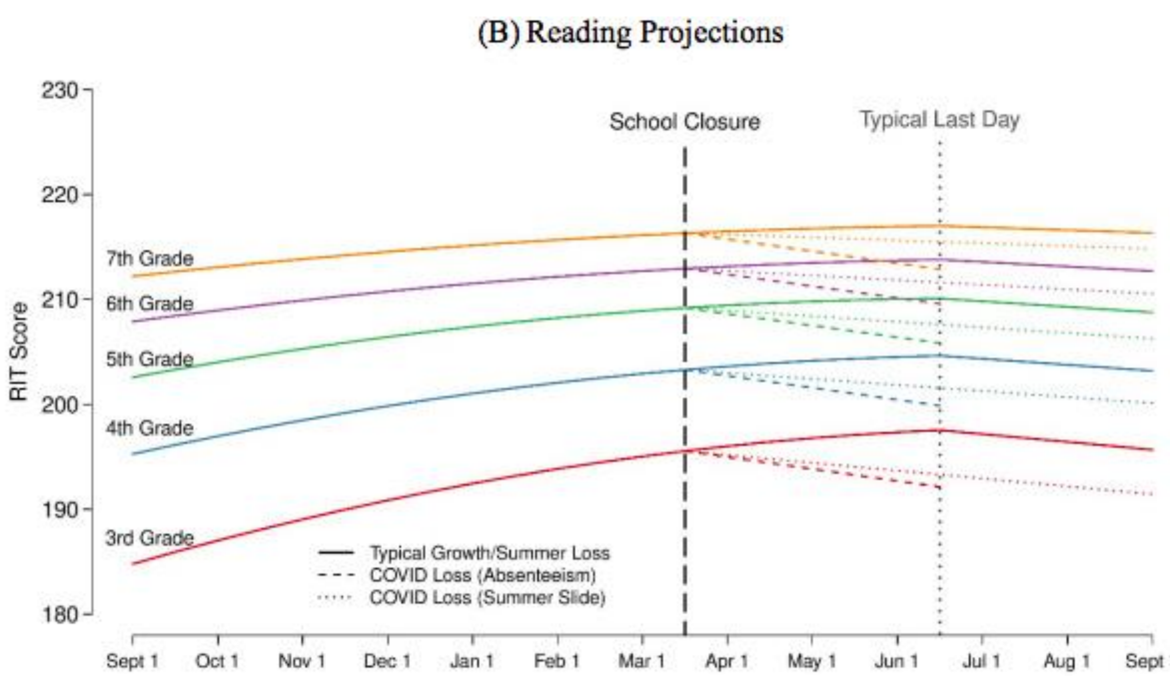
These differences in education quality are likely exacerbated by the shift to online learning beginning in March 2020. Researchers have estimated the impact of online learning by comparing the pandemic to other events which cause students to miss school. These include summer breaks, inclement weather days, and absenteeism. Studies examining the impact of these events consistently show that students experience larger learning losses in math than in reading. Combining the findings of these studies, a recent paper estimated that students only obtained between 37 and 50 percent of learning gains in math during the 2019-2020 school year compared to a normal year as shown in Figure 1. Additionally, students only obtained between 63 and 68 percent of learning gains in reading as shown in Figure 2. The authors noted that low-income students are likely on the lower end of these estimates (Kuhfeld et al., 2020).

Figure 1: Projections of math MAP Growth Test scores in the 2019-2020 school year



Source: Kuhfeld et al., 2020

Figure 2: Projections of reading MAP Growth Test scores in the 2019-2020 school year



Source: Kuhfeld et al., 2020

These projections are consistent with another recent paper which used similar MAP Growth Test score data. In a meta-analysis of simulations across 19 different states, the Center for Research on Education Outcomes projected that elementary school students would have scored, on average, between 0.1 and 0.3 standard deviations (SD) worse on standardized reading tests and between 0.2 and 0.4 SDs worse on standardized math tests in the spring of 2020 **(**CREDO, 2020). Additionally, learning loss projections suggest students will not experience homogenous effects across grade levels. For example, kindergartners and first graders are projected to lose the most in general reading growth, while fifth graders are projected to lose the most in reading aloud (Bielinksi et al., 2020). Similar to Kuhfeld and others' findings, however, the authors of both of these studies assert that low-income elementary schoolers have likely experienced the most learning loss (Bielinksi et al., 2020; CREDO, 2020).

Low-income students in Virginia

The best indicator of low-income students are those who are eligible for free and reduced-price meals. Eligibility requirements are set by the U.S. Department of Agriculture (USDA). Currently, students eligible for reduced-price meals are those with a household income up to 185 percent of the federal poverty level (FPL). Those eligible for free meals have a household income of 130 percent of the FPL (Child Nutrition Programs, 2020). In Virginia, over 525,000 students (40.6 percent) are eligible for free meals and an additional 68,000 (5.24 percent) are eligible for reduced-price meals (VDOE Free and Reduced Eligibility Report, 2020).

Although we may expect the majority of these students to be located in the most impoverished areas of the commonwealth, they are in fact located in the most populous areas. The following table details the top ten school divisions with the highest totals of students eligible for free and reduced price meals as of the 2019-2020 school year. All of these divisions are located in the northern and eastern regions of the commonwealth which, as will be discussed later, transitioned to in-person instruction later than less populous regions. This suggests that on top of the fact that these divisions make up about 40 percent of all students in the commonwealth who are eligible for free and reduced-price meals, they are also at the highest risk of learning loss (VDOE Free and Reduced Eligibility Report, 2020).

Table 1: Total number of students eligible for free or reduced-price lunch by school division

School division	Total eligible
Fairfax County	57,899
Prince William County	39,258
Virginia Beach City	27,188
Chesterfield County	24,452
Henrico County	23,168
Norfolk City	22,208
Richmond City	22,086
Newport News City	21,763
Chesapeake City	16,278
Loudon County	15,929

Source: VDOE Free and Reduced Eligibility Report, 2020

There is a difference, however, between the total number of students eligible for free and reduced price meals and the percentage of students who are eligible. Examining percentages provides a better understanding of the localities where impoverished students are most highly concentrated. The following table shows the top ten school divisions with the highest percentages of students eligible for free and reduced-price lunches (VDOE Free and Reduced Eligibility Report, 2020).

Table 2: Percentage of students eligible for free or reduced-price lunch by school division

School division	Percent eligible
Richmond City	100
Petersburg City	100
Martinsville City	100
Franklin City	100
Danville City	100
Greensville County	98.8
Hopewell City	98.7
Brunswick County	97.7
Roanoke City	96.4
Lee County	94.4

Source: VDOE Free and Reduced Eligibility Report, 2020

Contributing factors to low-income student learning loss

Broadband and technology access

The most apparent contributing factor to learning loss in low-income students is a lack of access to broadband and necessary technology. According to the State Council of Higher Education for Virginia, 14 percent of all K-12 students in the commonwealth do not have access to high speed internet (202,622 total) and 12 percent do not have a laptop, desktop, or notebook computer in their home (173,039 total). These shares are higher for low-income students as 16 percent lack internet access, and 19 percent lack necessary devices to participate in virtual learning (Allison, 2020).

Effectiveness of online learning

For those students who are able to virtually learn in their own homes, additional questions arise regarding the effectiveness, or lack thereof, of online learning. On one hand, a meta-analysis of online learning studies conducted by the U.S. Department of Education found statistically equivalent learning outcomes for fully in-person and fully virtual students. The authors note a few limitations to this analysis, however. Namely, many studies did not attempt to equate curriculum, methods of instruction, or learning time in the treatment and control conditions (Means et al., 2010).

Conversely, evidence from online charter schools suggests negative effects of online learning environments. These studies show students score between 0.1 and 0.4 SDs worse on math and reading tests compared to their traditional public school counterparts (Ahn & McEachin, 2017; Woodworth et. al., 2015). These estimates may be the best case scenario for Virginia students, however, considering the transition to virtual instruction was abrupt and many schools were ill-prepared. Additional evidence shows students in online charter schools in California had significantly lower test scores in reading and math than traditional public school counterparts, and reading test scores of nearly 3,000 full-time online charter school students in Colorado dropped six percent over a one-year period **(**Buddin & Zimmer, 2005; Hubbard & Mitchell, 2011).

Such conflicting results suggest that while some students may be indifferent to online versus in-person instruction, many others may not experience a sufficient amount of interaction with their teachers in a virtual environment to continue learning at an appropriate pace.

Parental involvement

A third contributing factor to the elevated risk of learning loss for low-income students is discrepancies in parental involvement. Higher-educated parents spend more time with their children, are typically more involved in their learning process, and are more efficient at helping their children with schoolwork (Holmund et al., 2008; Sayer et al., 2004). Additionally, higher-income parents are significantly more likely to hire private tutors for their children (Andrew et al., 2020). Such discrepancies in parental involvement have likely contributed to widening achievement gaps between advantaged and disadvantage students.

Costs of learning loss

Opportunity costs of income and GDP reduction

The broadest measure of learning loss's opportunity costs in low-income students is a reduction in future income and therefore GDP. Assuming current learning loss will affect some students significantly enough to change their future academic plans, we can examine three different scenarios of how differences in education attainment will impact yearly earnings. The following statistics are based on median weekly earnings in Virginia.

In the first scenario, a student's learning loss may be so severe as to cause them to drop out of high school in the future. In doing so, they will earn $177 less per week on average than a student who graduates high school, equating to a little over $9,200 per year. Second, some students may finish high school but would have otherwise attended community college had they not experienced learning loss, causing them to earn $132 less per week on average than if they obtained their associate's degree. This equates to nearly $6,900 less per year. Finally, assuming a student receives an associate's degree but would have otherwise attended a four-year university, they will earn an average of $336 less per week than if they received their bachelor's degree. This equates to over $17,400 per year (Kestner et al., 2019).

While these numbers show how an individual student's income may be affected, McKinsey and Company estimated the total impact of learning loss on income and GDP (Dorn et al., 2020). Specifically, the firm utilized previous methodologies which assess the relationship between GDP growth and academic achievement to create more current models (Hanushek & Woessmann, 2008). Assuming that full-time in-person classroom instruction does not resume until the fall of 2021, these models estimated a $306-$483 billion reduction in Gross Domestic Product (GDP) by 2040 in the entire United States (Dorn et al., 2020) As Virginia makes up about 2.6 percent of total GDP in the U.S., this equates to a total reduction of Virginia's GDP by $7.96-$12.56 billion per year by 2040 (Bureau of Economic Analysis, 2020). It is important to note, however, that these models simply show an association between learning loss and GDP reduction, and do not necessarily indicate a causal relationship.

Direct costs from high school dropouts

Specific to elementary schoolers who may drop out of high school in the future, low-income students are 2.4 times more likely to drop out than middle-income students, and 10 times more likely than high-income students (Bustamante, 2020). High school dropouts place a significant cost burden on the government and taxpayers. In fact, estimates indicate the average high school dropout will cost about $292,000 over the course of their lifetime in lower tax revenues, increased welfare expenditures, and increased incarceration costs relative to the average high school graduate (Sum et al., 2020) The high school dropout rate for all students in Virginia was about five percent in 2020, yet economically disadvantaged students were 1.7 percentage points more likely to dropout (VDOE State Summary Cohort Report, 2020). This percentage is projected to increase, however, as McKinsey and Company estimated that an additional two to nine percent of students will drop out as a result of low-quality education provided in virtual environments (Dorn et. al, 2020). Because low-income students are more likely to drop out of high school in Virginia, it is also likely they will make up a larger portion of those who drop out in the future as a result of learning loss they experienced during the pandemic.

Decision-making authorities

A number of decision-making authorities are delegated powers which were necessarily exercised at the onset of the pandemic to ensure students' and teachers' safety. Over the course of the pandemic, decisions made at the following levels of government have influenced the material students continue to learn as well as how instruction is delivered to them. Moving forward, they will also play a role in implementing the best solutions to mitigate learning loss and ensure the costs of learning loss are minimized.

Virginia Department of Education

After Governor Northam announced the closure of schools for the remainder of the 2019-2020 academic year, VDOE formed the Continuity for Learning Task Force to develop guidance and recommendations for educators to be successful in an online environment. Among these guiding principles, the most important for the task force was a consideration of equity and prioritizing the physical and emotional needs of students. Other guidance included instructional models such as the learner-centered model which gives students more autonomy in how they choose to learn, or the teacher-centered model which provides more structure in the virtual classroom (Continuity for Learning Task Force, 2020).

In addition to this guidance, VDOE still enforced many previous policies related to core instruction time requirements which could be met through any combination of virtual, remote, synchronous, asynchronous, or in-person instruction (Lane, 2020). These included:

- A minimum of 680 hours of the required 990 hours of instructional time to students in elementary school in the four disciplines of English, math, science, and social studies.
- A minimum of 375 hours of the required 540 hours of instructional time to half-day kindergarten students in the four disciplines of English, math, science, and social studies.
- A total of 560 instructional hours to middle school students in the four disciplines of English, math, science, and social studies.
- A requirement to offer non-core subject areas such as art, music, and career and technical education.

State-level

More broadly, Virginia's Constitution grants a number of powers and duties to the Board of Education. Among these, the board has the power to (Board of Education, n.d.):

- Divide the Commonwealth into school divisions.
- Make annual reports to the Governor and General Assembly concerning the conditions and needs of public education.
- Identify school divisions that fail to meet standards of quality.
- Approve textbooks and other instructional materials for use in course.

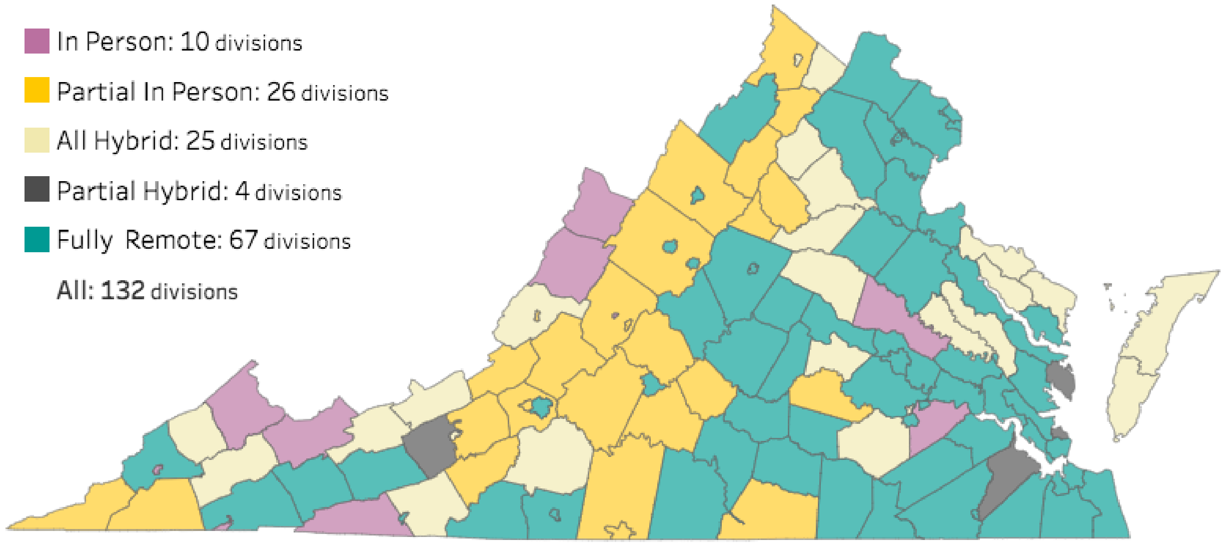
School divisions

While state-level authorities maintain a significant amount of power, many duties are also given to local school boards. Among others, the most relevant power given to local school boards during the pandemic is to determine the methods of teaching insofar as these decisions are consistent with state statutes and regulations (Powers and duties, n.d.). As such, school divisions have exhibited a wide variety of approaches to instruction, including fully in-person learning, fully remote learning, and everything in between. VDOE classifies five different approaches to instruction according to the following definitions (VDOE State Snapshot, 2020):

- In-person: Four or more days of in-person instruction for all grade-levels.
- Partial in-person: Four or more days of in-person instruction for some students (mostly younger students) and hybrid or remote learning for the rest.
- All hybrid: All students with some in-person and some remote learning, but in-person learning occurs less than four days per week.
- Partial hybrid: Some students with some in-person and some remote (mostly younger students and all going less than four days per week), while all others are fully remote.
- Fully remote: Learning is remote for the vast majority of students while only a few have in-person experiences.

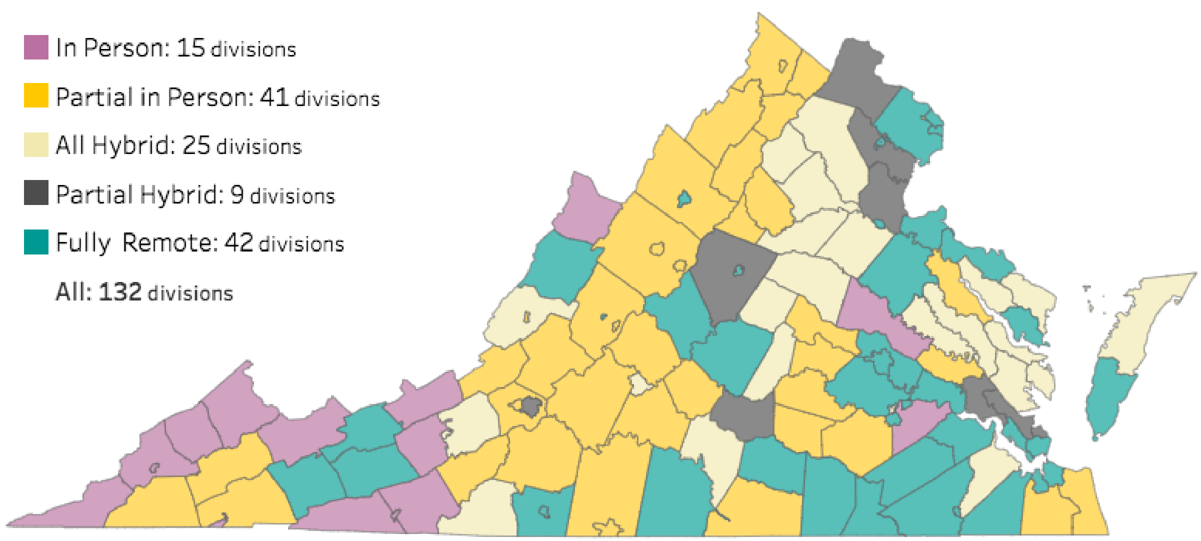
The maps below detail changes in how Virginia's school divisions delivered instruction to students at various times during the pandemic (VDOE State Snapshot, 2020).

Figure 3: VA school divisions' instruction delivery as of September 8th, 2020



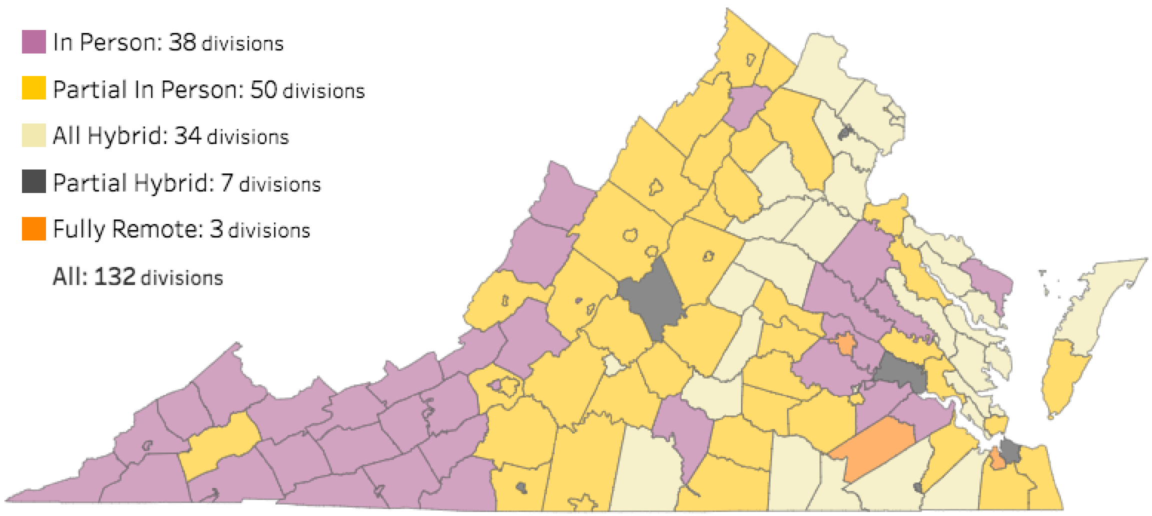
Source: VDOE State Snapshot (2020). Retrieved from https://www.doe.virginia.gov/support/health_medical/office/reopen-status.shtml

Figure 4: VA school divisions' instruction delivery as of January 26th, 2021



Source: VDOE State Snapshot (2020). Retrieved from https://www.doe.virginia.gov/support/health_medical/office/reopen-status.shtml

Figure 5: VA school divisions' instruction delivery as of April 5th, 2021



Source: VDOE State Snapshot (2020). Retrieved from https://www.doe.virginia.gov/support/health_medical/office/reopen-status.shtml

These maps suggest that the risk of learning loss has not been uniform across the commonwealth. Many districts such as those in the more populous eastern and northern regions transitioned away from virtual instruction slower than those in the southwestern region where almost every district is now administering fully in-person instruction. As a result, it is likely that students who have spent the most time learning in virtual environments have experienced greater learning loss than those who went back to in-person learning sooner.

Criteria

I evaluate three proposed alternatives to mitigate learning loss based on the following two criteria. These criteria are listed in the order of importance preferred by JLARC representatives. Accordingly, I give 66.67 percent weight to the first criterion and 33.33 percent weight to the second. The first criterion is quantitative in nature and will therefore provide a number estimate, while the second is qualitative and will provide a score of "low", "medium", or "high." After calculating each alternative's score on these two criteria, I then multiply the scores by their weighted percentages and add them together for a cumulative score. These calculations appear in the outcomes matrix below.

Cost-effectiveness (66.67%)

Definition: This criterion measures the projected cost-effectiveness of each alternative. This is the highest priority for JLARC and it is especially important to consider the costs of each alternative due to the impact of COVID-19 on state budgets. Because of the current tight budget, funding may need to be raised or reallocated from other state programs to target learning loss of low-income elementary school students.

Measurement: The projected cost of each alternative will appear in 2021 U.S. dollars and be rounded to the nearest $100. Effectiveness estimates the extent to which each alternative will improve test score SDs for low-income elementary school students. Additionally, estimates of effectiveness will be multiplied by the alternative's percentage of total elementary schoolers targeted (take-up rate) to maintain consistency across all alternatives. Cost-effectiveness will appear as a dollar value per 0.1 standard deviation increase in test scores and alternatives will be ranked on a 0-2 scale.

$$Cost - effectiveneness = \frac{Projected\ cost\ of\ alternative\ (2021\ dollars)}{(\%\ of\ VA's\ elementary\ schoolers\ targeted) * (Projected\ increase\ in\ SOL\ test\ score\ SDs\ per\ student\ targeted)}$$

The most cost-effective option will receive a score of 2 as a baseline and the other two alternatives will be scored based on how much less cost-effective they are. Thus I will divide the cost-effectiveness of the highest rated alternative by the cost-effectiveness of the other two alternatives and multiply by 2 to determine their relative cost-effectiveness scores. I then multiply these scores by 0.67 based on the weight I assign to this criterion.

$$Cost - effectiveneness\ weighted\ score = \left(\frac{Cost - effectiveness\ of\ highest\ rated\ alternative}{Cost - effectivness\ of\ evaluated\ alternative} * 2\right) * 0.67$$

Political feasibility (33.33%)

Definition: This criterion measures how feasibly either VDOE, the legislature, or the Governor can implement each proposed alternative. Because students have suffered so much learning loss already, it is important to consider the political feasibility of each alternative so that actions to mitigate this loss are swiftly undertaken.

Measurement: I project political feasibility based on whether VDOE or the Governor has the jurisdiction to enact each alternative, whether new legislation is required, as well as the legislature's and other state officials' support for similar interventions. Consistent with the cost-effectiveness criteria, alternatives will be ranked on a 0-2 scale (*low* = 0, *medium* = 1, *high* = 2). See below for the weighted scoring formula.

$$Political\ feasibility\ weighted\ score = (0,1,2) * 0.33$$

Evaluation of Alternatives

Alternative 1: Incentivize school divisions to expand summer school programs

This alternative would incentivize school districts to expand summer school programs to all K-5 students during the summer of 2022. Two highly studied summer school programs serve as the model for this intervention. Chicago's Summer Bridge Program is provided to third and sixth grade students for six weeks of instruction, three hours per day. Eighth-grade participants attend for seven weeks, four hours per day, and participation is mandatory in these three grade levels for any student who does not pass the Iowa Test of Basic Skills (Bakle, 2010). Analyses indicated that the program had positive impacts on student achievement in reading and math for all three grade levels, with eighth graders receiving the greatest impacts. Furthermore, learning growth rates were greater for participants during the program than during the regular school year (Roderick et al., 2004). Boston's Public Schools Transition Program is another highly studied summer school program and is required for all students who do not meet promotion requirements in grades 2, 3, 5, 6, 8, and 9. This programs operates four hours per day, four days per week for five weeks. Similar to Chicago's Summer Bridge Program, the Transition Program showed greater achievement in both reading and math across all grade levels. Students who completed the program were also more likely to be promoted to the next grade than those who were recommended to attend summer school but did not (Portz, 2004).

These programs provide, on average, about 100 additional hours of schooling for summer school attendants. This alternative would therefore provide the same amount of additional schooling for all K-5 students after their district's scheduled last day of class. Students would attend school five hours per day, four days per week for five weeks, totaling 100 additional hours of instruction. This equates to about a 10 percent increase in the current required instruction time of elementary school students from 990 hours in a traditional school year, and the commonwealth would therefore cover additional costs associated with more instruction time (Lane, 2020).

Cost-effectiveness

I estimate this alternative will cost an additional $228,957,300 for the 2021-22 school year assuming 50 percent of K-5 students attend summer school. To calculate the cost, I first establish a baseline by inflating 2019 per-pupil expenditure to 2021 dollars (U.S. Bureau of Labor Statistics CPI for All Urban Consumers, 2021; Virginia Department of Education, 2019, Table 15). I then multiply this baseline by the estimated increase in per-pupil expenditure stemming from a 10 percent extension in the school year to arrive at an estimated additional per-pupil expenditure amount (Van Beek, 2009).

To estimate changes in enrollment, I average Virginia's year-over-year change in K-5 enrollment from 2016 to 2020 and multiply this percentage change by the fall 2020 enrollment total to project fall 2021 enrollment (Virginia Department of Education Fall Membership Reports, 2020). Finally, I multiply the projected fall 2021 enrollment by the additional per-pupil costs of implementation and divide this amount by two based on my assumption of a 50 percent take-up rate to reach my final cost estimate.

In terms of effectiveness, only two recent studies have used test score standard deviation outcomes to measure the effects of summer school programs. First, a meta-analysis comprised of 93 summer school evaluations found that, on average, mandatory summer school improved test scores of those who attended by between 0.14 and 0.25 standard deviations (Cooper et. al, 2000). Second, a more recent and rigorous regression discontinuity analysis of nearly 340,000 3rd and 5th graders found similar positive effects. Specifically, summer school raised student achievement on math and reading standardized tests by about 0.12 standard deviations (Matsudaira, 2008).

Because this effect is smaller in comparison to the average effect found in Cooper and others' meta-analysis, I place this at the lower bound of my estimate. I then average the effect size found by Cooper and others for the upper bound of my estimate. I therefore estimate that attending summer school will improve SOL test scores by between 0.12 and 0.195 standard deviations per student.

Combining cost and effectiveness, I multiply the average estimated change in test score standard deviations by the assumed take-up rate to arrive at a more accurate estimate of effectiveness. I then divide the total estimated cost by the adjusted effectiveness estimate to reach a final cost-effectiveness estimate of $290,739,400 per 0.1 standard deviation increase in test scores. See Appendix A for more detailed cost-effectiveness calculations.

Political feasibility

I assign a score of "high" to this alternative. Summer school programs have garnered support from various state officials, including Secretary of Education Atif Qarni and State Superintendent of Public Instruction Dr. James Lane (Thomas, 2021). In a letter addressed to superintendents and school boards on February 5th, Governor Northam also expressed his support and called on districts to expand their offering of summer school programs to make up for learning loss that has occurred during the pandemic. To help pay for additional instruction time, Northam cited federal funding dedicated to K-12 education initiatives (Northam, 2021). Specifically, the federal Elementary and Secondary School Emergency Relief fund allocated $1.2 billion to Virginia for K-12 schools, 90 percent of which is to be sub-allocated to school districts. Additionally, the Governor's Emergency Education Relief fund is comprised of $132 million which is allocated to the neediest schools at the Governor's discretion (Sherlock, 2021).

Incentivizing districts to expand summer school options also does not require any additional legislation or executive action. As previously mentioned, school divisions are granted the power to determine the length of their school year insofar as they are consistent with state statute and regulations (Powers and duties, n.d.). Moreover, expanding summer school programs during the summer of 2022 rather than 2021 provides a longer timeline to allocate funds to school divisions, prepare teachers and administrators, and implement any additional health and safety protocols to foster a productive learning environment.

Alternative 2: Incentivize school divisions to adopt a year-round calendar

As previously discussed, researchers have estimated the negative effects of virtual instruction during the pandemic by equating them to learning loss experienced over summer breaks (Kuhfeld et al., 2020). As a way to mitigate summer learning loss, school districts across the U.S. have implemented year-round calendars to provide a more consistent learning schedule without large break periods. Current data indicate that schools in 46 states plus the District of Columbia have adopted some form of year-round calendar, impacting nearly 3 million K-12 students (Chen, 2008). This alternative, therefore, would incentivize districts in Virginia to adopt a year-round calendar for the 2021-22 school year by covering any additional costs that school divisions will incur by doing so.

This alternative does not require any additional school days beyond the traditional required 180 days. Rather, divisions that adopt this calendar would transition to a 45-15 model of instruction meaning students attend school for nine straight weeks followed by three weeks off, eliminating the traditional three month vacation period where students experience the most learning loss. Evidence on the effects of this model are mixed, yet a report issued by JLARC in 2012 showed that economically disadvantaged students in Virginia experience largely positive benefits. For example, at 61 percent of year-round schools in the commonwealth, these students experienced greater improvement in English SOL scores compared to their counterparts at traditional calendar schools. Moreover, at 42 percent of year-round schools, math SOL scores of these students were at least 10 points higher than predicted (Brown et al., 2012). Thus while adopting a year-round calendar may not significantly improve more privileged students' learning, it will specifically target low-income students who have been most negatively affected by virtual instruction.

Cost-effectiveness

I estimate this alternative will cost an additional $258,795,000 for the 2021-22 school year. The primary costs associated with year-round calendars are intersession costs which keep schools functioning during shorter break periods. The aforementioned report on year-round schooling from JLARC in 2012 estimated that, on average, intersession expenditures accounted for about three percent of total expenditures for schools that adopted this calendar (Brown et. al, 2012).

Thus to make up for the additional costs of adopting a year-round calendar, I multiply the estimated 2021 total expenditure amount by this percentage and divide by two based on my assumption of a 50 percent take-up rate to reach my final cost estimate (U.S. Bureau of Labor Statistics CPI for All Urban Consumers, 2021; Virginia Department of Education, 2019, Table 15).

As briefly mentioned above, evidence on the effectiveness of year-round calendars is highly mixed. For example, a longitudinal study from California found negative effects of year-round calendars on performance outcomes for average student as well as students of low socioeconomic status (Graves, 2011). Another study from 22 districts in North Carolina found that year-round calendars had no statistically significant effect on average student achievement, nor on the achievement of any racial subgroup (McMullen & Rouse, 2012).

On the other hand, a meta-analysis of 47 different studies across 39 school divisions indicated positive effects of year-round calendars on student achievement. On average, socioeconomically disadvantaged students scored 0.2 standard deviations higher on standardized tests than their counterparts in school districts with traditional calendars. The authors noted, however, that the average increase in achievement was about 0.05 standard deviations and is unlikely to be greater than 0.1 (Cooper et. al, 2003).

Taking the range of these estimates into account, I estimate that students whose districts adopt a year-round calendar for the 2021-22 school year will score between 0.05 and 0.1 standard deviations higher on their SOL tests than their counterparts in districts who do not. This range accounts for the positive effects found in the literature, yet it is not as high as some estimates to account for the negative or neutral effects found in other studies.

I once again multiply the average estimated change in test score standard deviations by the assumed take-up rate to arrive at a more accurate estimate of effectiveness. I then divide the total estimated cost by the adjusted effectiveness estimate to reach a final cost-effectiveness estimate of $690,120,000 per 0.1 standard deviation increase in test scores. More detailed calculations are available in Appendix A.

Political feasibility

I assign a score of "high" to this alternative. Similar to summer school programs, state officials have also expressed support for districts to adopt year-round calendars beginning with the 2021-22 school year. For example, on January 14th, State Superintendent of Public Instruction Dr. James Lane called on districts who had not yet transitioned to in-person classes to begin considering adopting a year-round calendar (North & Dennis, 2021). Around the same time, Governor Northam also hinted at recommending year-round schooling as an option to mitigate learning loss from the pandemic, yet he has not made any public statement since then on the topic (Domingo, 2021).

Incentivizing year-round calendar adoption can utilize funding from the Elementary and Secondary School Emergency Relief fund and Governor's Emergency Education Relief fund, similar to the previous alternative. Additionally, this alternative does not require any change in legislation or executive action as the Code of Virginia § 22.1-79.1 authorizes school boards to adopt alternative schedules such as the one outlined in this option (n.d.).

Alternative 3: Reduce student/teacher ratios in low-income areas

This alternative would target state funding to low-income areas for the purpose of reducing student/teacher ratios for one year. According to Virginia's Standards of Quality, school divisions must abide by the following student/teacher ratios: (i) 24 to one in kindergarten with no class being larger than 29 students; if the average daily membership in any kindergarten class exceeds 24 pupils, a full-time teacher's aide shall be assigned to the class; (ii) 24 to one in grades one, two, and three with no class being larger than 30 students; (iii) 25 to one in grades four through six with no class being larger than 35 students (Virginia Standards of Quality, n.d.). However, evidence from Tennessee's Student Achievement Ratio (STAR) experiment suggests elementary school students in small classes of 13 to 17 students per teacher experience more positive outcomes than their peers in regular class sizes of 22 to 25 students. For example, students in small classes had higher test scores, were more likely to graduate high school, and more likely to attend college (Chetty et. al, 2011; Murnane, 2013).

Currently, only Richmond City Public Schools have a student/teacher ratio greater than 17 to one (Virginia Department of Education, 2019, Table 17). To expand the reach of this alternative and target low-income students in particular, state funding would be allocated to any district that meets the following criteria: 1) at least 75 percent of students qualify for free or reduced lunch; and 2) the elementary-level student/teacher ratio is greater than 13 to one. The following school districts in Virginia meet these two criteria (VDOE Free and Reduced Eligibility Report, 2020; Virginia Department of Education, 2019, Table 17):

- Richmond City
- Petersburg City
- Nottoway County
- Henry County
- Colonial Beach
- Portsmouth City
- Newport News City
- Buckingham County

To aid these specific districts, state funding would be used for the purpose of hiring enough teacher aides to reduce their student/teacher ratios to 13 to one for the 2021-22 school year.

Cost-effectiveness

I estimate this alternative will cost an additional $13,883,000 for the 2021-22 school year. To begin, I estimate K-5 2021 enrollment in these districts by multiplying the 2020 enrollment totals by the average year-over-year change in enrollment between 2016 and 2020 (Virginia Department of Education Fall Membership Reports, 2020). Current data on the number of teacher positions in each division is aggregated by grades K-7, so I assume an equal number of positions in each grade level and multiply the current totals by .75 to reach an estimate for grades K-5 (Virginia Department of Education, 2019, Table 17). I then assume the number of teacher positions will follow a similar trend to enrollment and multiply the estimated number of K-5 teacher positions by the average year-over-year change in enrollment to reach a final estimate of positions for 2021 (Virginia Department of Education Fall Membership Reports, 2020).

Next, I estimate the number of teacher aides required to reduce student/teacher ratios to 13 by dividing the estimated number of K-5 students in each district by 13, then subtract the 2021 estimated number of positions from the required amount. The following list shows the number of teacher aides each district would require based on these calculations:

- Richmond City: 406
- Newport News City: 22
- Henry County: 3
- Petersburg City: 2
- Colonial Beach: 2

Note that based on these calculations, the three school divisions of Buckingham County, Nottoway County, and Portsmouth City would not require any additional teacher aides. Although at least 75 percent of students in these divisions qualify for free or reduced-price lunch, the estimated changes in enrollment and teacher positions for 2021 reduce their student/teacher ratios below 13 to one.

In total, this equates to 435 teacher aides required. I then multiply this amount by the average teacher aide salary in Virginia and inflate by the average non-wage benefits as a percentage of salary for state and local employees to reach my final cost estimate (Teacher aide salary in Virginia, 2021; U.S. Bureau of Labor Statistics Employer Cost for Employee Compensation, 2021).

In terms of effectiveness, perhaps the most famous study on the effects of classroom size and teacher aides on student outcomes is the Tennessee STAR experiment as discussed above. Evidence from the study suggests that teacher aides have little and statistically insignificant effects on achievement (Gerber et. al, 2001). However, a more recent and rigorous study using two-stage least squares regression models found that teacher aides can slightly improve test scores. Specifically, this study used data from nearly 1,100 elementary schools from 2001-2012 and found that one additional teacher aide per 100 students increased reading scores by about 0.009 standard deviations in reading and did not significantly improve test scores in math (Clotfelter et. al, 2016).

As this option requires an additional 435 teacher aides across five districts which I estimate to comprise a little more than 38,000 students, this represents close to one additional aide per 100 students. Therefore, I estimate this option will increase SOL test scores of students in these districts by between 0 and 0.009 standard deviations.

Combining cost and effectiveness, I multiply the average estimated change in test score standard deviations by the percentage of total students in Virginia targeted in these districts to arrive at a more accurate estimate of effectiveness. I then divide the total estimated cost by the adjusted effectiveness estimate to reach a final cost-effectiveness estimate of $4,226,179,600 per 0.1 standard deviation increase in test scores. See Appendix A for detailed cost-effectiveness calculations.

Political feasibility

I assign a score of "medium" to this alternative. The General Assembly has exhibited a recent push for increasing funding to high-poverty schools similar to what this option calls for, specifically in the form of H.B. 1929 introduced in the 2021 session. Among other requirements, this bill calls for changes to the Standards of Quality by establishing schoolwide ratios of students to teachers in certain schools with high concentrations of poverty and granting flexibility to provide compensation adjustments to teachers in such schools. This bill garnered support from 19 House patrons and two Senate patrons, all of which were Democrats. Despite this support, the bill was left in House Appropriations committee as of February 5th (H.B. 1929, 2021).

As with options 1 and 2, this alternative can utilize funding from the Elementary and Secondary School Emergency Relief fund and Governor's Emergency Education Relief funding. Although this alternative requires significantly less funding compared to options 1 and 2, efforts to reduce student/teacher ratios in high-poverty areas have yet to garner bipartisan support as shown by H.B. 1929's failure to make it out of committee.

Outcomes Matrix

	Cost-effectiveness	Political feasibility	Cumulative score
1 – Incentivize expanded summer school programs	**$290,739,400 per 0.1 standard deviation increase in test scores** ($290,739,400/$290,739,400) x 2 = 2 2 x 0.67 = 1.34	**High** 2 x .33 = .66	1.34 + 0.66 = **2**
2 – Incentivize year-round calendars	**$690,120,000 per 0.1 standard deviation increase in test scores** ($290,739,400/$690,120,000) x 2 = 0.84 0.84 x 0.67 = .56	**High** 2 x .33 = .66	0.56 + .066 = **1.22**
3 – Targeted reduction of student/teacher ratios	**$4,226,179,600 per 0.1 standard deviation increase in test scores** ($290,739,400/$4,226,179,600) x 2 = .14 .14 x 0.67 = 0.09	**Medium** 1 x 0.33 = .33	0.09 + .33 = **.42**

Recommendation

Based on these calculations, I recommend **Alternative 1: Incentivize school divisions to expand summer school programs**. This alternative is estimated to cost far more than a targeted reduction of student/teacher ratios in low-income areas. However, it has the potential to reach a much larger amount of low-income elementary schoolers as the state government would offer to fund any school division who chooses to expand summer school programs. Additionally, literature suggests it is the most cost-effective option and a number of high-ranking officials have already expressed their support of utilizing summer school as a way to mitigate learning loss.

Implementation

Key actors in implementation

Governor

The governor should serve as the primary agenda-setter in enacting this policy. An example of this comes from the State of the Commonwealth Address on January 8th, 2020, where Governor Northam called for increasing education spending and raising teacher salaries among other priorities (Northam, 2020). Lawmakers subsequently came to an agreement on a five percent increase in teacher salary beginning July 1st, 2021 as part of the new fiscal year budget (Gaskins, 2021). Many more examples of agenda-setting are apparent from recent sessions, such as abolishing the death penalty and a wide variety of other criminal justice reform bills which Governor Northam supported (Lavoie, 2021; Legislative Information System, 2021). These examples highlight the governor's power to direct the General Assembly to pass legislation, and the next governor will play an important role in prioritizing further state spending to mitigate learning loss for low-income elementary school students.

Virginia Department of Education

The role of VDOE in enacting this policy is two-fold. First, VDOE should provide guidance to school division on how to offer the highest quality summer school programs. An example of VDOE's guidance comes from the Recover, Redesign, Restart plan published in July, 2020 which provided school districts with extensive recommendations and resources to develop their own plans to safely reopen schools in the midst of the pandemic (Continuity for Learning Task Force, 2020). To specifically address learning loss, VDOE should create a similar comprehensive document on best practices in summer school programs to aid districts in preparing teachers and developing curriculum. While creating this guiding document, VDOE should seek input from teachers, principals, superintendents, and other state-level administrative officials similar to how the Recover, Redesign, Restart plan was created.

A second key role that VDOE will play in implementation is to disburse federal funding to school districts. The federal government recently passed the American Rescue Plan which allocates over $2 billion to Virginia public schools and will remain available until September 2023. 90 percent of this funding is to be directly allocated to school divisions, and 20 percent of that amount is to be used for evidence-based interventions to reduce learning loss such as summer school programs, equating to a total of about $380 million (Jordan, 2021). Thus, VDOE must identify the divisions and students that have been hurt the most by the COVID-19 pandemic and allocate the necessary funds to mitigate learning loss in those divisions. Still, assuming this funding is equally disbursed across the three years it remains available, this leaves a deficit in 2022 of about $102.3 million that additional state funding must cover for the recommended alternative's projected cost.

General Assembly

The General Assembly will play a role in raising the necessary funding or reallocating existing funding to supplement federal aid. One potential way to do so is by raising tax revenue. In 2019, individual income taxes raised over $15 billion in revenue accounting for about 75 percent of general funds. State sales, use, and vending taxes accounted for about $3.5 billion or 17 percent of general funds (Virginia Department of Taxation, 2020). As these are the two largest sources of state revenue, increasing these taxes is the most viable option to raise the necessary funds for expanded summer school programs. Additional options include raising cigarette and other tobacco product taxes, yet these categories only accounted for a combined $150 million in revenue during 2019 (Virginia Department of Taxation, 2020). Finally, the legislature may choose to cover the additional costs associated with this alternative by reallocating existing funding through budget amendments. In any case, the General Assembly should appropriately increase taxes or reallocate existing funding to direct about $102.3 million to school divisions in conjunction with federal aid from the American Rescue Plan (assuming 50 percent of students attend summer school programs).

School divisions

This policy's success depends heavily on the extent to which school districts communicate their expanded summer school programs to students and parents. Because the recommended alternative is not mandatory, students and parents must be made aware of their district's expanded programs in order to decide whether their child can benefit from additional classroom time. Summer school information can be communicated through website pages, mailed flyers, emails, phone calls, and media coverage. In all forms of communication, districts must emphasize the learning benefits associated with summer school programs such as the ones described in this analysis, as well as that federal and state funding will cover the expenses for their child to attend summer school.

Potential barrier to success

The most apparent potential barrier to successful implementation is a change in state-level leadership to those who may be unsupportive of expanding summer school programs. Virginia's general election will take place on November 2nd, 2021 and Governor Northam's last day in office will come in January 2022. With his exit, it is likely that other high-ranking state officials will be replaced, including Secretary of Education Atif Qarni, in favor of the newly-elected governor's appointees. If the newly elected governor and cabinet members do not support this policy, they could choose to direct state spending toward other forms of COVID relief. It will therefore be important for JLARC and VDOE to continue analyzing SOL test data and highlight areas of the commonwealth where students are still suffering from learning loss they incurred during the pandemic. Additionally, newly elected officials should remain informed of the cost-effectiveness of this policy to ensure it remains a top priority.

Conclusion

This report has highlighted the alarming problem that too many low-income elementary school students in Virginia are at risk of suffering from learning loss as a result of virtual instruction. As schools safely transition back to in-person instruction during the spring and fall of 2021, it is imperative that the commonwealth takes steps to mitigate this problem. The recommended policy of incentivizing expanded summer school programs will allow school divisions whose student have been impacted the most by the pandemic to make up for lost time in the classroom. Compared to other potential solutions like year-round calendars or reducing student/teacher ratios, research shows that summer school can significantly improve standardized test scores of students who fall behind during the regular school year. By the commonwealth providing additional necessary funding for these programs, it can improve learning outcomes for the greatest number of low-income students in the most cost-effective and politically feasible way.

Appendix A: Cost-effectiveness calculations

Alternative 1: Incentivize expanded summer school programs

Cost calculations

1) Conversion of 2019 per-pupil spending to 2021 dollars: $12,931 x 1.039 = $13,435 (U.S. Bureau of Labor Statistics CPI for All Urban Consumers, 2021; Virginia Department of Education, 2019, Table 15)

2) Required additional per-pupil expenditure with implementation: $13,435 x 1.065 = $14,308 (Van Beek, 2009)

3) Additional costs of implementation per pupil: $14,308 - $13,435 = $873 additional per pupil

4) Projection of 2021 K-5 enrollment: 535,235 x 0.98 = 524,530 students (Virginia Department of Education Fall Membership Reports, 2020)

5) Total additional cost of implementation assuming 100 percent take-up: $873 x 524,530 = $457,914,700

6) Total additional cost of implementation assuming 50 percent take-up: $457,914,690 x 0.5 = $228,957,300

Effectiveness calculation

1) Projected average increase in test score SDs = (0.12+0.195) x 0.5 = 0.1575

Total cost-effectiveness calculation

$$Cost - effectiveness = \frac{\$228{,}957{,}300}{(0.5)*(0.1575)} =$$

$290,739,400 per .1 SD increase in test scores

Alternative 2: Incentivize year-round calendar adoption

Cost calculations

1) Conversion of 2019 total spending to 2021 dollars: $16,620,113,897 x 1.039 = $17,268,829,340 (U.S. Bureau of Labor Statistics CPI for All Urban Consumers, 2021; Virginia Department of Education, 2019, Table 15)

2) Required additional expenditure with implementation: $17,268,829,340 x 1.03 = $17,786,347,290 (Brown et. al, 2012)

3) Total additional costs of implementation assuming 100 percent take-up: $17,786,347,290 - $17,268,829,340 = $517,518,000

4) Total additional costs of implementation assuming 50 percent take-up: $517,518,000 x 0.5 = $258,759,000

Effectiveness calculation

1) Projected average increase in test score SDs = (0.05+0.1) x 0.5 = 0.075

Total cost-effectiveness calculation

$$Cost - effectiveness = \frac{\$258,759,000}{(0.5)*(0.075)} =$$

$690,120,000 per .1 SD increase in test scores

Alternative 3: Targeted reduction of student/teacher ratios

2021 K-5 projected enrollment

The first number in each equation represents K-5 enrollment in each school division as of fall 2020. These enrollment numbers are multiplied by .98 which represents the average two percent year-over-year decline in enrollment between 2016 and 2020 (Virginia Department of Education Fall Membership Reports, 2020).

- Buckingham County: 848 x 0.98 = 831
- Colonial Beach: 267 x 0.98 = 262
- Henry County: 2,920 x 0.98 = 2,862
- Newport News City: 12,217 x 0.98 = 11,973
- Nottoway County: 792 x 0.98 = 776
- Petersburg City: 1,934 x 0.98 = 1,895
- Portsmouth City: 6,205 x 0.98 = 6,081
- Richmond City: 13,859 x 0.98 = 13,582

2021 K-5 projected number of teaching positions

The first number in each equation represents the amount of teaching positions during 2020 in grades K-7. This is multiplied by .75 to estimate the amount of positions in grades K-5 based on my assumption that each grade level has an equal amount (Virginia Department of Education, 2019, Table 17). Finally, this number is multiplied by .98 to estimate the number of positions in 2021 based on my assumption that the number of positions will follow a similar trend to enrollment (Virginia Department of Education Fall Membership Reports, 2020).

- Buckingham County: (88 x 0.75) x 0.98 = 65
- Colonial Beach: (25 x 0.75) x 0.98 = 18
- Henry County: (295 x 0.75) x 0.98 = 217

- Newport News City: (1,209 x 0.75) x 0.98 = 899
- Nottoway County: (87 x 0.75) x 0.98 = 64
- Petersburg City: (196 x 0.75) x 0.98 = 144
- Portsmouth City: (651 x 0.75) x 0.98 = 478
- Richmond City: (868 x 0.75) x 0.98 = 638

<u>Projected additional teacher aides required</u>

Projections for additional teacher aides by division are generated using the following formula:

$$Projected\ \#\ of\ additional\ aides = \left(\frac{2021\ projected\ enrollment}{13}\right) - 2021\ projected\ \#\ of\ positions$$

- Buckingham County: (831/13) – 65 = < 0
- Colonial Beach: (262/13) – 18 = 2
- Henry County: (2,862/13) – 217 = 3
- Newport News City: (11,973/13) – 899 = 22
- Nottoway County: (776/13) – 64 = < 0
- Petersburg City: (1,895/13) – 144 = 2
- Portsmouth City: (6,081/13) – 478 = < 0
- Richmond City: (13,582/13) – 638 = 406

Total projected additional teacher aides required = 435

<u>Cost projections</u>

1) Average teacher aide salary in VA accounting for non-wage benefits: $23,127 x 1.38 = $31,915 (Teacher aide salary in Virginia, 2021; U.S. Bureau of Labor Statistics Employer Cost for Employee Compensation, 2021).

2) Total additional costs of implementation: $31,915 x 435 = $13,883,000

Total cost-effectiveness calculation

$$Cost - effectiveness = \frac{\$13{,}883{,}000}{(0.073)*(0.0045)} =$$

$4,226,179,600 per .1 SD increase in test scores

References

Ahn, J., & McEachin, A. (2017). Student Enrollment Patterns and Achievement in Ohio's Online Charter Schools (1st ed., Vol. 46, Tech.). Sage Journals.

Allison, T. (2020). SCHEV - Insights. Retrieved September 20, 2020, from https://sites.google.com/view/schev-tempsite/home/research-reports/insights

Andrew, A., Cattan, S., Costa-Dias, M., Farquharson, C., Kraftman, L., Krutikova, S., Phimister, A., & Sevilla, A. (2020) Learning during the lockdown: real time data on children's experiences during home learning, IFS Briefing Note BN288.

Bakle, B. R. (2010). Summer learning loss: The influence of summer school programs on student achievement in language usage, math, and reading (Doctoral dissertation, Indiana State University, 2010). Ann Arbor, Michigan: ProQuest LLC.

Bielinksi, J. Brown, R., & Wagner, K. (2020). COVID Slide: Research on Learning Loss & Recommendations to Close the Gap. Illuminate Education.

Board of Education., Va. Stat. §§ 22.1-8 through 22.1-20.4.

Brown, J., Sarte, K., Francis, K., Rest, G., & Reynolds, D. (2012). Review of Year-Round Schools (Rep.). Joint Legislative Audit and Review Commission.

Buddin, R., & Zimmer, R. (2005). Student achievement in charter schools: A complex picture. Journal of Policy Analysis and Management, 24(2), 351-371.

Bureau of Economic Analysis. (2020). GDP by State. Retrieved October 05, 2020, from https://www.bea.gov/data/gdp/gdp-state

Bustamante, J. (2020). U.S. High School Dropout Rate [2020]: Statistics & Trends. Retrieved December 02, 2020, from https://educationdata.org/high-school-dropout-rate

Center for Research on Education Outcomes. (2020). A Meta-Analysis of Simulations of 2020 Achievement Assessments in 19 States. Stanford University.

Chen, G. (2008). Year-round or traditional schedule? Retrieved February 15, 2021, from https://www.publicschoolreview.com/blog/year-round-or-traditional-schedule#:~:text=Data%20from%20the%20National%20Association,attend%20a%20year%2Dround%20school.

Chetty, R., Friedman, J.N., Hilger N., Saez, E., Schanzenbach, D.W., & Yagan, D. (2011). How Does Your Kindergarten Classroom Affect Your Earnings? Evidence from Project STAR. Quarterly Journal of Economics 126 (4): 1593-1660

Child Nutrition Programs: Income Eligibility Guidelines, 85 Fed. Reg. 16050 (July 1, 2020)

Clotfelter, C. T., Hemelt, S. W., & Ladd, H. F. (2016). Teaching Assistants and Nonteaching Staff: Do They Improve Student Outcomes? National Center for Analysis of Longitudinal Data in Education Research.

raCooper, H., Charlton, K., Valentine, J.C., Muhlenbruck, L., & Borman, G.D. (2000). Making the most of summer school: a meta-analytic and narrative review. Monographs of the Society for Research in Child Development. Vol 65 (1, Serial No. 260). Hoboken, NJ: John Wiley & Sons, Inc.

Cooper, H., Valentine, J. C., Charlton, K., & Melson, A. (2003). The effects of Modified school calendars on student achievement and on school and community attitudes. Review of Educational Research, 73(1), 1-52. doi:10.3102/00346543073001001

Domingo, E. (2021). Governor Northam Considering Year-Round schooling for Virginia Students. Retrieved March 07, 2021, from https://www.nbc12.com/2021/01/07/governor-northam-considering-year-round-schooling-virginia-students/

Dorn, E., Hancock, B., Sarakatsannis, J., & Viruleg, E. (2020). COVID-19 and student learning in the United States: The hurt could last a lifetime. McKinsey and Company.

Duncombe, C. (2017). Unequal Opportunities. Retrieved December 02, 2020, from https://www.thecommonwealthinstitute.org/2017/12/11/unequal-opportunities-sample-of-new-format-for-online-reports/

Gaskins, K. (2021). 5% raises for Virginia teachers included in new budget. Retrieved March 17, 2021, from https://www.wavy.com/news/politics/virginia-politics/5-raises-for-virginia-teachers-included-in-new-budget/

Gerber, S.B., Finn, J.D., Achilles, C.M., & Boyd-Zaharias, J. (2001) Teacher aides and student's academic achievement. Educational Evaluation and Policy Analysis 23(2), pp 123-143.

Graves, J. (2011). Effects of year-round schooling on disadvantaged students and the distribution of standardized test performance. Economics of Education Review, 30(6), 1281-1305. doi:10.1016/j.econedurev.2011.04.003

Hanushek, E. A., & Woessmann, L. (2008). The role of cognitive skills in economic development. Journal of Economic Literature, 46(3), 607-668. doi:10.1257/jel.46.3.607

H.B. 1929, 2020 Biennium, 2021 Reg. Session. (Va. 2021).

Holmund, H., Lindahl, M., & Plug, E. (2008) The causal effect of parent's schooling on children's schooling: a comparison of estimation methods, IZA Discussion Paper 3630, Bonn.

Hubbard, B., & Mitchell, N. (2011). Troubling questions about online education. EdNews Colorado. Retrieved from http://co.chalkbeat.org/2011/10/04/analysis-shows-half-of-online-students-leave-programs-within-a-year-but-fundingstays/#.VCkat_mSw_w

JLARC: Joint Legislative Audit and Review Commission. (2020). Retrieved September 20, 2020, from http://jlarc.virginia.gov/about.asp

Jordan, P. W. (2021). What congressional covid funding means for k-12 schools. Retrieved March 17, 2021, from https://www.future-ed.org/what-congressional-covid-funding-means-for-k-12-schools/

Kestner, T., Maher, S., Simmons, L. (2019). Virginia Occupational Career Resource Guide (Rep.). Virginia Employment Commission.

Kuhfeld, M., Soland, J., Tarasawa, B., Johnson, A., Ruzek, E., & Liu, J. (2020). Projecting the potential impacts of COVID-19 school closures on academic achievement (Working paper). Annenberg Institute at Brown University

Lane, J. F. (2020). Statutory and Regulatory Instructional Expectations for the 2020-2021 School Year. Virginia Department of Education.

Lavoie, D. (2021, February 22). Virginia lawmakers vote to abolish the death penalty. Retrieved March 17, 2021, from https://apnews.com/article/virginia-death-penalty-repeal-governor-c98c16a996037a4d1e1d497787b7e6f1

Legislative Information System. (2021). Retrieved March 17, 2021, from https://lis.virginia.gov/cgi-bin/legp604.exe?202%2Blst%2BPAS

Matsudaira, J. D. (2008). Mandatory summer school and student achievement. Journal of Econometrics, 142(2), 829-850. doi:10.1016/j.jeconom.2007.05.015

McMullen, S. C., & Rouse, K. E. (2012). The impact of year-round schooling on academic achievement: Evidence from mandatory school calendar conversions. American Economic Journal: Economic Policy, 4(4), 230-252. doi:10.1257/pol.4.4.230

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies (Rep.). U.S. Department of Education.

Murnane, R. (2013). U.S. High School Graduation Rates: Patterns and Explanations. Journal of Economic Literature, 51(2), 370-422.

North, E., & Dennis, B. (2021). VDOE superintendent weighs in on in-person learning, year-round school years. Retrieved March 07, 2021, from https://www.wric.com/news/education/vdoe-superintendent-weighs-in-on-in-person-learning-year-round-school-years/

Northam, R. (2020). State of the Commonwealth Address [Print]. Retrieved from https://www.governor.virginia.gov/newsroom/all-releases/2020/january/headline-850663-en.html

Northam, R. (2021). In Person Learning [Letter written February 5, 2021 to Superintendents and Members of School Boards]. Retrieved from https://www.governor.virginia.gov/media/governorvirginiagov/governor-of-virginia/pdf/In-Person-Learning-Letter-2.5.21.pdf

Portz, J. (2004). Summer school 2000 and 2001: The Boston Public Schools transition services program. In G. D. Borman & M. Boulay (Eds.), Summer learning: Research, policies, and programs (pp. 103–119). Mahwah, NJ: Lawrence Erlbaum

Powers and duties., Va. Stat. § 22.1-79

Roderick, M., Jacob, B., & Bryk, A. (2004). Summer in the city: Achievement gains in Chicago's summer bridge program. In G. D. Borman & M. Boulay (Eds.), Summer learning: Research, policies, and programs (pp. 73-102). Mahwah, NJ: Lawrence Erlbaum.

Sherlock, J. (2021). Federal COVID funding to Virginia K-12 schools. Retrieved March 07, 2021, from https://www.baconsrebellion.com/wp/federal-covid-funding-to-virginia-k-12-schools/

Sum, A., Khatiwada, I., McLaughlin, J., & Palma, S. (2009). The Consequences of Dropping Out of High School. Center for Labor Market Studies.

Teacher aide salary in Virginia. (2021). Retrieved March 07, 2021, from https://www.salary.com/research/salary/benchmark/teacher-aide-salary/va

Thomas, P. (2021). Governor urges school divisions to plan for back-to-class and summer school. Retrieved March 07, 2021, from https://www.wdbj7.com/2021/02/05/governor-urged-school-divisions-to-plan-for-back-to-class-and-summer-school/

U.S. Bureau of Labor Statistics. (2021). CPI for All Urban Consumers (CPI-U): U.S. city average, All items. Retrieved from https://data.bls.gov/cgi-bin/surveymost?cu

U.S. Bureau of Labor Statistics. (2021). Employer Cost for Employee Compensation. Retrieved from https://www.bls.gov/news.release/pdf/ecec.pdf

Van Beek, M.D. (2009). Longer School Year Won't Improve Student Achievement. Mackinac Center for Public Policy, August 3, 2009. Retrieved from http://www.mackinac.org/article.aspx?ID=10840.

Virginia Department of Education (2020). Fall Membership Reports [Data file]. Retrieved from https://www.doe.virginia.gov/statistics_reports/enrollment/index.shtml

Virginia Department of Education. (2020). SOL Test Results [Data file]. Retrieved from https://www.doe.virginia.gov/statistics_reports/sol-pass-rates/index.shtml

Virginia Department of Education. (2019). Table 15 of the Superintendent's Annual Report for Virginia: Sources of the Financial Support for Expenditures, Total Expenditures for Operations, and Total Per Pupil Expenditures for Operations. Retrieved from https://www.doe.virginia.gov/statistics_reports/supts_annual_report/2018-19/index.shtml

Virginia Department of Education. (2019). Table 17 of the Superintendent's Annual Report for Virginia: Ratio of Pupil to Classroom Teacher Positions, Total Instructional Positions, and Instructional Positions Per 1,000 ADM. Retrieved from https://www.doe.virginia.gov/statistics_reports/supts_annual_report/2018-19/index.shtml

Virginia Department of Education. (2020). VDOE National School Lunch Program Free and Reduced Price Eligibility Reports [Data file]. Retrieved from https://www.doe.virginia.gov/support/nutrition/statistics/index.shtml

Virginia Department of Education (2020). Virginia State Summary Cohort Reports.

Virginia Department of Education. (2020). State Snapshot: How Virginia Schools are Reopening. Retrieved October 24, 2020, from https://www.doe.virginia.gov/support/health_medical/office/reopen-status.shtml

Virginia Department of Taxation. (2020). Virginia Tax Annual Report Fiscal Year 2019. Retrieved from https://www.tax.virginia.gov/sites/default/files/inline-files/2019-annual-report.pdf

Virginia Standards of Quality (n.d.), § § 22.1-253.13:2(C).

Woodworth, J. L., Raymond, M.E., Chirbas, K., Gonzalez, M., Negassi., Snow, W., & Van Donge, C. (2015). Online Charter School Study. Stanford, California: Center for Research on Education Outcomes.