

The Rush to Reopen

The Rush to Reopen: Examining Reading Achievement Pre and  
Post Pandemic by Modality of Instruction

by

Tara Reed

Submitted in Partial Fulfillment of the Requirements

for the Degree of

Doctor of Education

in the

Educational Leadership

Program

YOUNGSTOWN STATE UNIVERSITY

May 2024

The Rush to Reopen: Examining Reading Achievement Pre and  
Post Pandemic by Modality of Instruction

Tara Reed

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*Tara Reed, Student* Date

Approvals:

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*Jane A. Beese, EdD, Committee Chair* Date

---

*Lauren Cummins, EdD, Committee Member* Date

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*Richard Rogers, PhD, Committee Member* Date

---

*Salvatore A. Sanders, PhD, Dean, College of Graduate Studies* Date

## ABSTRACT

This quantitative study was designed to investigate whether a relationship existed between reading achievement and instructional modality during the COVID-19 pandemic. In the fall of 2020, school districts developed return-to-school plans that outlined if they would provide in-person, hybrid, or remote instruction to students following the state mandated closure of schools. The central question being addressed was whether or not the modality of instruction during the 2020-2021 school year made a difference in reading achievement scores in third grade. Using publicly available school district achievement data from the Ohio Department of Education, a multivariate analysis of variance (MANOVA) procedure was conducted. Research concerning learning and development factors, existing achievement gaps, and remote learning challenges was used to develop the hypothesis that districts who were fully remote for the 2020-2021 school year would have significantly lower student achievement scores than those that were in-person. Findings from this analysis revealed significant associations between instructional modality groups in the overall district data ( $p < .001$ ), the White population ( $p = .029$ ), and economically disadvantaged population ( $p < .001$ ). Implications for school leaders highlights the need for continued progress monitoring and developing a strong multi-tiered system of support to meet individual student needs. Further research is recommended to investigate long-term implications of remote learning during the pandemic, qualitative factors, and an inclusion of mathematics achievement over time.

Keywords: COVID-19, hybrid learning, in-person learning, online learning, remote learning, student achievement, student learning loss

## **ACKNOWLEDGEMENTS**

I would like to express sincere appreciation for my professor and chair, Dr. Beese, for her consistent guidance and support. Her knowledge and ability to simplify complicated matters helped me navigate this path successfully. I also could not have accomplished this goal without the support of my dissertation committee, Dr. Cummins and Dr. Rogers, whose expertise and feedback were invaluable throughout this time.

Sincere gratitude goes out to my family, especially my husband and children. Their understanding and encouragement during this process have kept me motivated through an intense few years.

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## **CHAPTER I**

### **INTRODUCTION**

In the elementary school setting, reading achievement has been synonymous with student success and school accountability for many years (Cramer et al., 2018). This remains true as schools struggle to recover from the disruptions caused by the COVID-19 pandemic (DeArmond et al., 2022). Legislation within federal and state governments have historically emphasized utilizing achievement scores as a method of highlighting areas that need improvement (VanGronigen & Meyers, 2019). The development of literacy skills during the elementary years lays the foundation for understanding more complex standards as students' progress through their educational career. Students who reach the middle school years with lower reading abilities have an increased chance of dropping out of school (Singh et al., 2022). Literacy skills have been considered an essential skill for future student success, and as such, several measures have been put in place to collect data in order to make informed decisions in regard to the progress of students in this critical area (Cramer et al., 2018; Dickinson, 2016; Huddleston & Rockwell, 2015). Analyzing student achievement trends in the area of English Language Arts through the use of state testing data is one way that administrators and educators can identify students who are at-risk or not progressing in this area and plan interventions.

Academic achievement of students has been tracked by the government since the Elementary and Secondary Education Act of 1965 (ESEA) (Dickinson, 2016). Supplemental funding for schools with large at-risk populations has been allocated by the United States Department of Education in order to support higher academic achievement. This began affecting the way students were taught in the public schools in order to meet the guidelines outlined in the Act and strict accountability measures were later developed (Bruno & Goldhaber, 2021). The

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No Child Left Behind Act of 2001 placed a tremendous emphasis on school accountability and established the concept of adequate yearly progress (NCLB, 2002). All schools, not just those with high at-risk populations, became subject to meeting Adequate Yearly Progress (AYP) in order to obtain federal funding (United States Department of Education, 2002). An emphasis on increasing achievement, meeting AYP, and reducing the achievement gaps between student groups led to a mandate on the development of statewide accountability systems and standardized assessments to test reading and math achievement for all students.

In 2015, the development of Every Child Achieves Act removed the requirement of AYP and gave states more control, however, standardized testing and accountability systems involving students' achievement remained in place (VanGronigen & Meyers, 2019). The state of Ohio solidified their stance on the importance of reading achievement and literacy skill development in the elementary years with the adoption of the Third Grade Reading Guarantee in 2012 (Ohio Department of Education., n.d.). This piece of legislation, intended to ensure that all third-grade students were proficient in reading before moving on to fourth grade, led to more extensive progress monitoring and tracking of students' reading abilities. It also led to a penalty on the state report card if students were not making progress. Students who failed to pass the state tests or other alternative assessments approved by the state were not permitted to be promoted to fourth-grade (Ohio Department of Education., n.d.), creating further concern for school districts, parents, and students.

In March of 2020, state standardized testing was canceled due to a global pandemic caused by the novel coronavirus, also called COVID-19. Schools around the world shut their doors and began using various forms of remote learning through online platforms as a way to continue educating students while on lock down in their homes (Barbour, 2021; Streich et al.,

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2021). For the remainder of the 2019-2020 school year, which was approximately 10-12 weeks, in-person learning was suspended, forcing school leaders and educators to rely heavily on synchronous and asynchronous modes of online instruction in an attempt to continue student learning (Barbour, 2021; Pattison et al. 2021).

During this time, many important questions were raised in regard to teacher preparedness, educational equity, student inclusivity, family support, reliability, and the use of age appropriate instructional strategies (Holt & Kreamer, 2020; Kuhfeld et al., 2020; Liao et al., 2021; Mann et al. 2021; Simmons, 2020). Time out of school became a concern when considering that several students were either not logging in to complete assignments, lacked access to devices or reliable internet, or were receiving ineffective instruction. Concerns increased as researchers pointed out that summer months would add to the time out of school and the traditional summer slide would be compounded as some students would have up to five months without instruction (Atteberry & McEachin, 2020; Kuhfeld et al., 2020).

Predictions on the impact on student achievement in the areas of reading and math were mixed. Some researchers predicted that students would lose up to a year of growth, while others were more conservative in their estimates (Kuhfeld et al., 2020; Pier et al., 2021). The concern regarding student achievement led many lawmakers to encourage schools to reopen to in-person learning as soon as possible. Approximately 38% of schools reopened full time with students in physical classrooms five days a week (Ohio Department of Education, 2022b). When standardized testing was resumed in the spring of 2021, proficiency scores in English Language Arts dropped, reflecting the disruptions to student education due to the pandemic (Ohio Education by the Numbers, 2022). More significant drops were reported for some grade levels and subgroups of students, with minorities and students living in poverty showing the most

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significant declines. Overall, statewide third grade proficiency levels in English Language Arts dropped from 66% to 61%, fourth grade proficiency levels dropped from 63% to 56%, and fifth grade proficiency levels dropped from 59% to 54% (Ohio Education by the Numbers, 2022). This could result in long term negative effects for students if recovery efforts fail.

### **Statement of the Problem**

The closure of schools in March of 2020, and the extreme shift away from traditional K-12 educational practices throughout the COVID-19 pandemic created an unavoidable disruption to student learning. Students in elementary settings were highly impacted due to their lack of independence, a need for interaction, support, and scaffolding from teachers to reach learning goals (Munastiwi & Puryono, 2021). Reports from the National Center for Education Statistics state that there has been a 5-point average drop in reading achievement scores nationwide for third grade students, which is the largest decline in 30 years (U.S. Department of Education, 2022). This is highly concerning considering that student test scores at the elementary level are often predictive of educational paths and overall success later in their school career. Research indicates that students who are behind in reading ability are less likely to graduate from high school or attend college (Singh et al., 2022). Theories by Bronfenbrenner, Walberg, and Vygostky emphasize that changes to the environment can significantly impact student learning (Bronfenbrenner & Evans, 2000; Reynolds & Walberg, 1992; Vygotsky, 1978). Until now, there has been no account of a sudden wide-spread shift of learning to the online environment for any population in history. Research in this area is increasing, however, there is a lack of literature focusing on elementary students who attended school districts that opened in the fall of 2020 with full time in-person learning. This study will explore the impact that the COVID-19 pandemic had on district reading achievement scores and whether or not opening to full time in-



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person learning in the fall of 2020 helped to minimize negative effects on elementary reading proficiency.

### **Purpose of the Study**

The purpose of this quantitative study is to add to the current body of knowledge on the effect that long-term periods of school closure had on student achievement in reading. This study will seek to determine the changes in academic performance during the COVID-19 pandemic by examining existing achievement scores as measured by Ohio State Standardized Assessments in English and Language Arts. The focus of this study will be school districts that reopened to full time in-person learning in the fall of 2020. The study will examine the district percentages of students scoring proficient or above on the ELA Ohio State Test over four school years (2018 - 2022), to determine if immediately reopening full time to in-person learning increased achievement levels in the area of English Language Arts in third grade. The results will then be compared to school districts that remained in hybrid or fully remote learning modalities in the fall of 2020. The goal is to determine if there is a significant difference in achievement levels for students who were enrolled in districts that prioritized returning to in-person learning as quickly as possible.

### **Research Questions**

The overarching question being investigated is whether or not the modality of instruction during the 2020-2021 school year made a difference in reading achievement scores based on district proficiency levels on the third grade State Test for ELA. Specific research questions to be addressed are:

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1. Is there a significant difference in ELA scores of third grade students who attended Ohio school districts that fully reopened to in-person learning in the fall of 2020 when compared to districts that remained hybrid or online?
2. Is there a significant difference in the ELA scores of third grade students based on district typology when comparing Ohio districts that were in-person to districts that remained hybrid or online?
3. Is there a significant difference in the ELA test scores of third grade students based on race/ethnicity when comparing Ohio districts that were in-person to districts that remained hybrid or online?
4. Is there a significant difference in the ELA test scores of third grade students who are economically disadvantaged when comparing Ohio districts that were in-person to districts that remained hybrid or online?

### **Methodology**

For this quantitative study archival data from the Ohio Department of Education was obtained for the 2018-2019 through the 2021-2022 school years in order to conduct an analysis to identify if there were differences in the proficiency levels of students that could be associated with the COVID-19 pandemic-related school closures. Due to utilizing previously collected state data among non-randomized groups, this study is a quasi-experimental design (Trochim et. al., 2016). The instrument used to collect data is the Ohio State ELA Assessment from 2018 – 2022. The analysis examines the reported percentage of students in the third grade who are achieving scores at proficient levels or above on the Ohio State Tests in the area of English Language Arts. The design of this study and the selection of third grade will allow for multiple data collection points over time. The independent variable in this study will be whether the school was open for

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in-person learning, five days per week, as of September 10, 2020. This information will be derived from a spreadsheet provided from the Ohio Department of Education indicating the instructional modality by week for the 2020-2021 school year. The dependent variable will be the percentage of students scoring proficient or above on the Ohio State Test as indicated for each district on the District Achievement Ratings spreadsheet from the Ohio Department of Education's Advanced Reports for each school year.

### **Significance of the Study**

Research surrounding academic achievement rates and the suspension of in-person learning due to the pandemic is emerging, however, studies focusing on modality of learning following the initial closures and the connection to achievement levels is limited. The purpose of this study is to add to the current body of knowledge exploring the impact that COVID-19 had on student progress based on reading achievement rates at the elementary level. Schools have been under tremendous pressure to raise student achievement outcomes on standardized tests for years. This is even more pronounced as students returned to school following the COVID-19 pandemic in 2020. Despite an unprecedented disruption to traditional schooling, parents, community members, and state officials still have high expectations for schools and accountability measures are in place (Ohio Department of Education, n.d.). Serious concerns have been raised as recent state testing data suggest significant declines in student achievement levels when examining pre and post pandemic data (Holt & Kreamer, 2020; Ohio Education by the Numbers, 2022; Streich et al., 2021). As a result, recovery efforts to address learning loss and raise achievement levels is a primary focus of school districts nationwide.

One strategy that some districts implemented to minimize the impact on student learning was returning to in-person learning as quickly as possible for the nation's youngest students.

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These districts implemented reopening plans that allowed elementary students to return in-person, five days per week, at the beginning of the 2020 school year (Ohio Department of Education, 2022b). However, as research is emerging highlighting state data about learning loss during the pandemic, it is unclear if this strategy made any difference in the achievement levels of students. This study will examine the district reading achievement proficiency rates for third grade students pre and post pandemic and whether or not the modality of learning during the 2020-2021 school year made any significant difference in reducing learning loss. It is worth investigating if rushing back to in-person learning had any impact on student learning or if scores were similar to those districts that remained in a hybrid of fully online format.

The results of this study could provide policy makers, district leaders, and educators with information on the difference in reading achievement levels for elementary students pre and post pandemic in order to guide recovery efforts and plan for any future school disruptions where closures of schools may be considered. Alternatives to closing schools, such as utilizing smaller class sizes to allow for social distancing, extensive cleaning measures, and the wearing of masks have been shown to limit the spread of disease in schools. If the outcomes of the study show a significant difference between districts that remained in-person and those that did not, these alternatives may be prioritized over the closure of buildings. Additionally, this study will seek to provide information on how different populations were impacted by disaggregating the data based on topography, gender, and socio-economic status. Lastly, the findings of this study may help to influence the allocation of resources and assist educators in targeting interventions to at-risk populations. If no significant difference is found, then broad interventions may be justified. Conversely, if stark differences arise in the data, then school leaders may take steps to ensure interventions align with the most significantly impacted populations.

### **Role of Researcher**

Due to this being a quantitative study, the role of the researcher is limited in scope and participants acted independently of the researcher. The researcher did not have control over the treatment and studied pre-existing data sets of groups of participants that received different treatments (full time in-person learning compared to those not learning in-person full time). The researcher requested archived data reports from the Ohio Department of Education to collect the information necessary to conduct the study. The first is a download of public data from the ODE website for District Achievement Ratings for three school years (2018 -2019, 2020-2021, 2021-2022). Data could not be obtained for 2019-2020 school year due to the closure of schools and the cancellation of state testing. The second report was an excel sheet of instructional modality by week during the 2020-2021 school year. The data set was completed through weekly responses by districts to their local ESC. Due to inconsistent start dates and logistics of reporting, the Ohio Department of Education recommended utilizing the data reported on September 10th. Finally, public data was also downloaded from the ODE website to run reports needed to obtain information regarding district test results with students disaggregated by gender, topography, and socio-economic status. This research was set up in a way to allow others to conduct similar studies.

### **Assumptions, Limitations, and Delimitations**

The researcher made several assumptions during this study. The first assumption is that the reported percentage of students scoring at or above proficient as recorded on Ohio State data sheets indicates how many students in each district are achieving proficient levels of understanding in the area of reading and language arts. Higher percentages mean more students are performing at or above proficient. In order to be considered proficient, students must have

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met or exceeded the state cut-off score on the Ohio State Assessment for English Language Arts. The achievement score designated as the cut-off score for the 2018-2019 school year was 677. It was then raised during the 2019-2020 school year to 683 (Ohio Department of Education, n.d.). Additional assumptions that were made were that student test scores were accurately reported and the percentage of students at proficiency or above were calculated correctly for each school district. The final assumption is that the Ohio State Test for English Language Arts is representative of the proficiency level of all students taking the test.

This study was limited to a sample of schools from the state of Ohio only. The data came solely from the Ohio State Assessment for English Language Arts in grade three and participants included students enrolled in grade three in Ohio public schools. Therefore, this study has the potential to not be representative of all states across the nation. The researcher made this decision to keep the sample size manageable considering the large data set in use. Grade three was selected to be examined based on the state's emphasis on reading achievement in this grade level to be predictive of future success and the high stakes nature of Ohio's Third Grade Reading Guarantee.

Another limitation for this study is the non-equivalent groups quasi-experimental design and a lack of random assignment of participants (Trochim et al., 2016). Due to the nature of educational research and the assignment of students to particular school districts by location, the population of participants were not able to be randomly designed. Trochim et al. (2016) explains this design further, noting that it includes an existing group of participants who receive a treatment (those who returned to in-person learning 5 days per week) and another existing group that serves as a comparison group (those who did not return to in-person 5 days per week). This

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limits the study's ability to prove causality, however, it can show a relationship between the closure of schools and a change in student achievement levels.

### **Definition of Terms**

The following terms are provided with operational definitions to assist in understanding their use throughout this research study.

**COVID-19.** This term refers to the acronym for the full name of the Novel Coronavirus Disease “discovered in December 2019” (Center for Disease Control and Prevention [CDC], 2021). This disease spread quickly, causing a global pandemic, affecting countries worldwide, resulting in the unprecedented closure of public schools.

**Hybrid Learning.** Hybrid learning refers to educational models where students have a mixture of learning remotely, through distance and online learning, and attending some days in-person (Diliberti & Kaufman, 2020; GAO, 2022).

**In-Person Learning.** In-person learning refers to education models where “teaching and learning occur in the same classroom” (United States Government Accountability Office [GAO], 2022) and instruction is given in a face-to-face manner.

**Online Learning.** Online learning refers to educational models where teaching and learning are occurring entirely through the use of virtual tools and other information technology systems, including instruction through virtual conferencing, such as Zoom or Google Meet, and/or document sharing in a synchronous or asynchronous manner (GAO, 2022; Grazianno & Bryans-Bongey, 2018).

**Remote Learning.** Remote learning refers to a “temporary shift of instructional delivery to an alternate delivery mode due to a crisis of circumstance” (Hodges et al., 2020, para. 13).

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Remote learning includes the use of online learning as an alternative to in-person learning during school closures (Huck & Zhang, 2021).

**Student Achievement.** Student achievement is the dependent variable in this study and is measured by student growth on standardized achievement tests, such as the Ohio State Assessments in English Language Arts. The Ohio Department of Education (2022a) defines achievement in the context of state testing as the number of students who pass the state test and how well they did on them.

**Student Learning Loss.** Student learning loss refers to the loss of knowledge or the decline in a measurable academic skill over time (Kuhfeld et al, 2020). In this study learning loss is discussed in connection with time out of school due to the COVID-19 pandemic.

### **Organization of the Study**

With continued concerns over school performance and the effects that COVID-19 had on student learning, it is imperative that research surrounding this time in history continues to develop. Betebenner and Wenning (2021) note that the impact of the pandemic was uneven across different populations of students. As a result, there is no one-size-fits-all intervention to fix the current academic crisis. Creating a better understanding of how the pandemic related school closure affects student learning over time is essential as educational leaders conduct long term planning and gauge whether or not recovery efforts are meeting the needs of students.

This study is organized into five chapters. Chapter one includes a brief background on the overall context of student learning during the COVID-19 pandemic and the statement of the problem. This chapter also provides the purpose and significance of the study, the research questions, the role of the researchers, assumptions, limitations, and delimitations. Key terms are also defined in this chapter to aid the reader in understanding the language utilized in the



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study. The second chapter will provide a comprehensive literature review highlighting the effects that the COVID-19 pandemic had on varying areas of teaching and learning. This chapter outlines the challenges and unexpected positive outcomes that resulted from the forced closure of schools. The literature review also addresses achievement testing and studies surrounding learning loss connected with time out of school. Chapter three will describe the research design, methodology, and procedures for this quantitative study. Chapter four will present details on how the data was analyzed with a graphical and written summary of the results. Lastly, Chapter five will include an interpretation and discussion of the results as it relates to the existing body of knowledge related to this study. summary of the study and implications for future research.

## **CHAPTER II**

### **LITERATURE REVIEW**

#### **Introduction**

Tracking student achievement is a common practice in the United States and has been so for many years. Public school systems function as well-oiled machines for administering standardized tests, reporting results, and analyzing data to determine levels of student proficiency. However, the arrival of a highly contagious and dangerous virus, the novel coronavirus, also known as COVID-19, changed the educational system throughout the United States and the world. Schools and businesses were shut as the public was ordered to stay home, maintain social distance, and wear masks around others in an effort to contain the spread of the disease (Streich et al., 2021). According to Pattison et al. (2021), more than 124,000 public and private schools were closed until the end of the 2019–2020 school year. During these initial phases of the pandemic, these decisions were made in the interest of public health.

School administrators were instructed on short notice to make necessary arrangements for the shutdown and to devise a plan to continue student learning as best they could. What was originally thought to be a short-term change in response to the public health crisis, quickly turned into schools being closed for the remainder of the school year (Holt & Kremer 2020; Huck & Zhang, 2021). Challenges and obstacles soon emerged as educators and families began to understand the new reality. Some students had access to electronic devices to transition into online learning, however some did not. Those students in the primary grades and those in high-poverty schools were far less likely to have access to resources needed for remote learning, meaning their school year was essentially cut short, ending their instruction two months earlier than planned (Pattison et al., 2021; Shaw et al., 2021).

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State testing was canceled in Spring 2020, and long-term online learning plans had to be developed (Huck & Zhang, 2021; Keng et al., 2020). The effects of the COVID-19 pandemic and the unprecedented action of ordering the closure of all schools impacted student learning and academic achievement in multiple ways. The academic trends of student achievement will need to be measured in the years to come to fully understand the long-range effects. This literature review examines the basic background of achievement testing, an overview of the COVID-19 pandemic, and the perceptions of the impact this event will have on student learning and reading achievement for elementary school-age students.

### **Theoretical Framework**

Intelligence is not the only determining factor of student achievement. Multiple variables can be considered influencers when examining achievement data and student progress models. Two important variables that influence student achievement are the learning environment, traditionally the school and classroom environment, and a student's home environment. The stability of both these environments was disrupted by the COVID-19 pandemic. Thus, examining the achievement levels of students during this period can help educational leaders understand the extent student learning may have been affected by the pandemic. The theoretical frameworks involve viewing the research through the lens of how changing societal factors impact student learning and academic achievement. The first is Bronfenbrenner's bioecological theory (Bronfenbrenner & Evans, 2000), that provides a framework for the influence relationship systems and interconnectedness affects student development. These interactions contribute to students' behaviors, cognition, and overall development. Secondly, Walberg's (1981) theory of educational productivity (as cited in Wang et al., 1993) guides the study; the variables of student-instructor interaction and home

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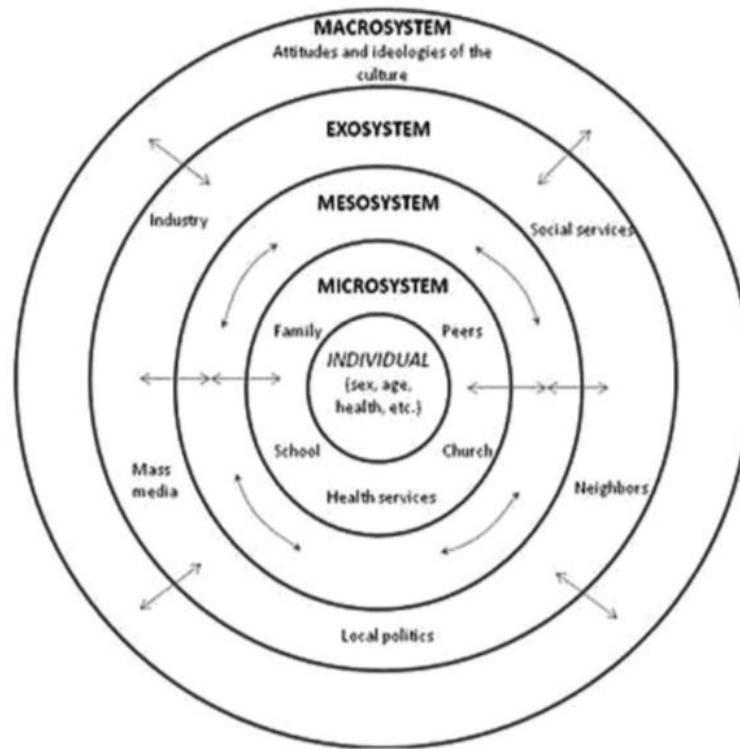
environment are considered the primary learning environment and are examined in correlation with student achievement data. Finally, Vygotsky's sociocultural theory helps one to view the research, according to which, learning is a social process, and appropriate interactions are an essential part of academic growth.

### **Bronfenbrenner's Bioecological Theory**

This theory recognizes that human development is influenced on multiple levels by shared interactions between the individual and others, such as interpersonal, cultural, and social factors (Bronfenbrenner & Evans, 2000). The framework has four specific systems that influence an individual: microsystem, mesosystem, ecosystem, and macrosystem. All of the systems are interconnected, and each system influences the others, thereby contributing to the individual's development, which is located in the center of the system. The most influential is the microsystem, as it is the closest to the individual (Bronfenbrenner, 1977; Bronfenbrenner & Evans, 2000). These factors are directly impactful and include school, peers, family, and their interactions directly with the child. A visual representation of Bronfenbrenner's Bioecological Theory is illustrated in Figure 1 (Vélez-Agosto et al., 2017).

**Figure 1**

*Bronfenbrenner's Bioecological Theory Model*



*Note.* (Vélez-Agosto et al., 2017)

The mesosystem is the next layer and involves indirect interactions that still greatly affect development, such as the parent's interaction with the school and relationship with the teacher. The bioecological theory focuses on the mutual interaction between the individual and the environment based on the systems, emphasizing that changes and stressors affect development.

Considering this theory, it is important to note that school closures due to the pandemic had a direct impact on family life, as caregivers became learning coaches and homeschool parents overnight, causing stress for family members, as well as students (Munastiwi & Puryono,

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2021; Wortham & Grimm, 2022). Relationships between the child, teacher, school, and parents were disrupted during the pandemic. Other elements in the parents' workplace, health system, and larger social systems, which are part of the eco- and macrosystems were impacted as well. Examining literature through the lens of this theory highlights the learning environment differences that were caused by COVID-19 and the possible connection related to negative or positive growth in academic achievement.

### **Walberg's Theory of Educational Productivity**

This theory helps to examine information gathered, noting that the immediate environment of the student influences educational outcomes (Reynolds & Walberg, 1992). The way the environment interacts with the students plays an important role. Further, the way the student engages and interacts with their environment as a response also influences the outcomes. The theory goes on to outline key variables of influence, including a student's prior achievement, motivation, age, amount and quality of instruction, climate of the classroom, home environment, peer interactions, and the media (Wang et al., 1993). Several of these systems of influence were affected during school closures, particularly those associated with the instructional day of students.

### **Vygotsky's Sociocultural Theory**

This theory states that all learning is social and influenced greatly by one's environment. He noted the importance of passing information from learner to facilitator and vice versa (Vygotsky, 1978), indicating that students learn through their social interactions and surroundings. Vygotsky also emphasized learning through imitation of adults, instruction from other students, and collaborative group processes in a shared learning environment. Ultimately, children learn from parents, teachers, and peers who have more experience or knowledge and are

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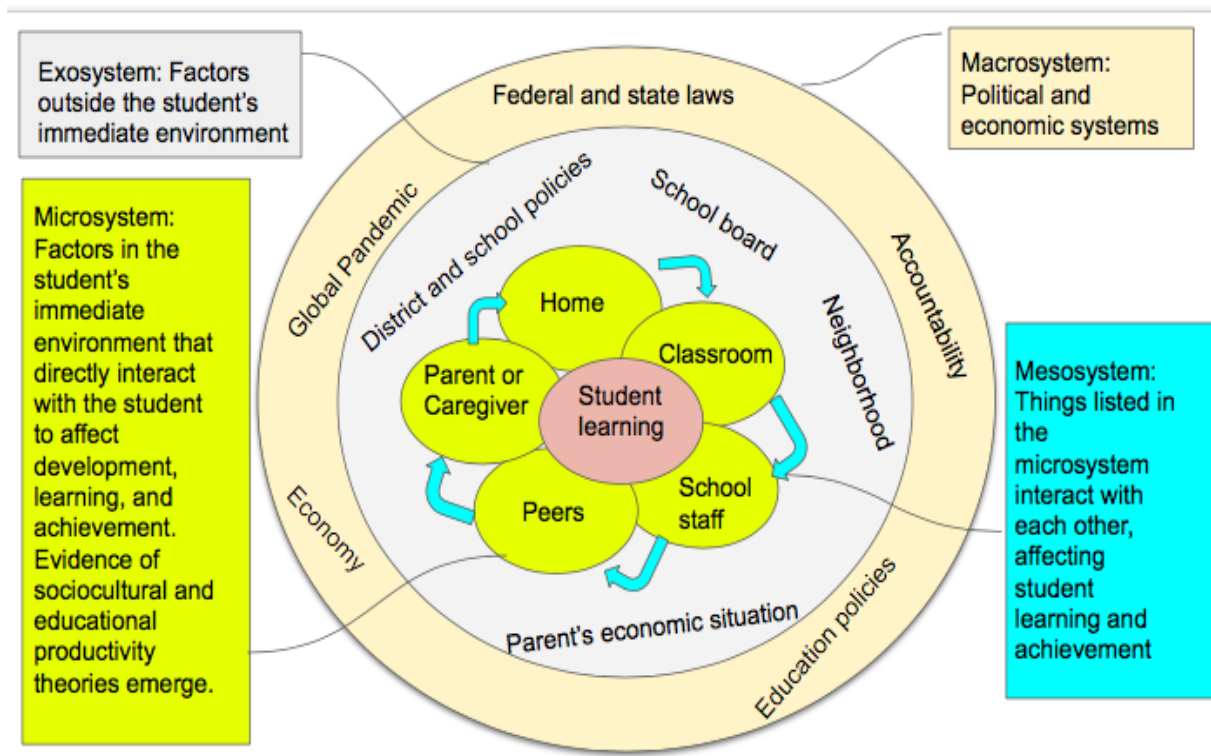
considered influencers and supporters. Studies support the concept that literacy instruction based on social interactions can improve oral narrative and written composition skills (Bowers & Schwarz, 2018). The social interaction, collaboration, and facilitation of lessons and instruction from knowledgeable teachers contribute to a rich learning environment that is well equipped to maximize student learning. The closure of schools and the possible elimination of classroom environments with positive social opportunities for learning during the pandemic set the stage for potential learning loss. The shift to home learning and the stay-at-home orders made creating such an environment a difficult task.

Overall, there were significant modifications to students' learning environments during the COVID-19 pandemic (Huck & Zhang, 2021; Kuhfeld et al., 2020; Shaw et al., 2021; Troxler, 2021). The most impactful may be the elimination of in-person learning within the physical classroom setting and the shift to learning at home for all students. The purpose of this study is to look at the reading achievement data for elementary students within the context of environmental factors that were affected due to the pandemic and the closure of schools in 2020. The variables considered and outlined in the literature review include the changes to the microsystem, specifically the school system and the home environment according to Bronfenbrenner's bioecological systems theory (Bronfenbrenner & Evans, 2000). An examination of inequalities among students, the changing role of caregivers, and the impact of time out of school on student achievement were all factors in projecting potential learning loss. Select variables outlined in Walberg's educational productivity theory (Reynolds & Walberg, 1992) and Vygotsky's sociocultural theory were also examined, specifically challenges associated with remote learning and the home learning environment, as well as the significant change in interaction with others throughout the pandemic.

The conceptual diagram illustrated in Figure 2 represents a bioecological model of student learning through the lens of the theories mentioned above.

**Figure 2**

*Theoretical Framework Visual Representation*



*Note.* Based on Bronfenbrenner, 1977; Bronfenbrenner & Evans, 2000; Reynolds & Walberg, 1992; Spears & Young, 2022

### **Student Achievement Testing**

Measuring student achievement has been in place in American education systems since the 19th century (Cramer et al., 2018; Dickinson, 2016; Huddleston & Rockwell, 2015). Initially used to determine if students had mastered content and were ready to proceed to the next level in their learning, the use of testing was mostly locally controlled and analyzed (Huddleston & Rockwell, 2015). The shift towards standardized testing and measuring achievement levels,



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including related factors, and comparing them nationally was initiated by James Coleman as he researched to compile a report titled *Equality of Educational Opportunity* (Coleman, 1966), which is now known in the educational world as simply the Coleman Report. This desire to compare students and schools on a grand scale was in response to the civil rights movement and a need to examine equal access to education and possible discrimination within the educational system as a whole (Dickinson, 2016). The analysis of student data illuminated a glaring achievement gap between black students and white students, as well as those from differing socioeconomic statuses (Coleman, 1966). While educational resources were equitable, student outcomes were not. Black students and those from low-income families often tested several grades lower in the areas of math and reading, exposing educational inequality and prompting several future initiatives to address this issue (Dickinson, 2016).

Analyzing student achievement and tracking student records over time continued after this report. Disaggregating data by race, religion, socioeconomic status, and gender soon became commonplace in schools and mandatory by the state. In 1981, a National Commission on Excellence in Education was created by the Secretary of Education in order to examine education in the United States; this was followed by a report titled *A Nation at Risk* (United States. National Commission on Excellence in Education, 1983). This report further revealed inadequacies in the current education system and listed five overarching recommendations to improve the system. These five recommendations focused on content standards, teaching practices, time, leadership, and fiscal support. The report also highlighted low teacher salaries, inadequate teacher preparation programs, high turnover rates, and lacking literacy rates (United States, 1983). This trend eventually led to the federal government taking steps to intervene with

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the intention of monitoring and judging schools based on performance to instill accountability and higher proficiency levels.

With the authorization of the No Child Left Behind Act (NCLB, 2002), standardized testing shifted to high-stakes testing within public schools, which put accountability measures in place for schools based on standardized test data and requirements to meet adequate yearly progress on educational objectives. A school voucher program was also promoted as a way to give parents in low-performing schools a choice to enroll their children in schools that were considered higher performing. The goal of NCLB was to make all American students proficient in the areas of reading and math by the year 2014, subsequently closing the achievement gap among all learners, with federal funding tied to school accountability (Bruno & Goldhaber, 2021; United States Department of Education, 2002). Another goal of this initiative was to utilize educational reforms to assist in battling poverty across the nation (Hursh, 2007). The federal government permitted states to develop their own accountability protocols and assessments to be administered, which led to data being reported in many different ways, causing rankings to be determined by several different measures. The result was a flawed system that set unattainable goals for districts, however, the government eventually adjusted during the Obama administration. During this time, the Common Core State Standards Initiative was implemented in response to the shortcomings of NCLB and to equip students with 21st-century skills (Bruno & Goldhaber, 2021; VanGronigen & Meyers, 2019). Standardized testing has continued, and student performance on achievement tests has become the primary indicator of student achievement.

The Every Student Succeeds Act was signed into law in 2015 by President Obama (VanGronigen & Meyers, 2019). This Act considered the diversity of our nation's schools and

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the needs of vulnerable populations of students. Further, accountability structures were maintained. However, there was increased emphasis on preschool programs, student assessment, innovative skills, and protections for disadvantaged students. These measures were taken in an effort to improve the schools that were struggling the most, according to the national student achievement data. States were also granted more control over achievement measures and accountability plans (VanGronigen & Meyers, 2019).

Measuring student achievement in the areas of reading and math and using that information to drive academic improvement in schools continues to be a priority and a challenge for districts. This was proven especially true in Spring 2020 when the novel Coronavirus, also known as COVID-19, emerged on the scene and closed down schools worldwide, greatly affecting learning for millions of students (Shaw et al., 2021). The resulting school closures and continued school disruption presented unique challenges and concerns regarding the teaching environment, test administration, and the outcomes of these achievement tests.

### **The COVID-19 Pandemic**

The COVID-19 pandemic struck the world in March of 2020, which was followed by lawmakers mandating school closures in order to slow the spread of the virus. During this time, more than 124,000 school buildings shut their doors, which affected more than 55 million students nationwide (Troxler, 2021, p.30). Lockdown measures, strict guidelines on social distancing, and encouragement for the population to stay home spread across the country. Educators had to quickly transition from traditional face-to-face teaching practices to online learning platforms to continue educating students. School districts were faced with situations that were never before considered and sweeping policy changes followed in order to adapt to this

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unprecedented event, which required schools to suddenly provide instruction through remote learning strategies (Bruno & Goldhaber, 2021; Troxler, 2021).

### **Remote Learning**

Distance learning has been used in various forms for decades prior to the COVID-19 pandemic. Barbour (2021) notes that the first online learning program for K-12 students was developed around 1991. In 1997 video distance learning was introduced to students in the state of Ohio. Soon after, House Bill 770 established the Interactive Video Distance Learning (IVDL) Pilot to support low income school districts as they created better access to distance learning resources (Ohio Distance Learning Association, 2021). This created the foundation for a focus on distance learning technology development and a professional network of agencies that would become a consortium dedicated to enhancing distance education for students in order to provide better real-world opportunities and positively enhance student achievement (Barbour 2021; Ohio Distance Learning Association, 2021). Several online supplemental programs emerged shortly after.

In the early 2000's around 40,000 to 50,000 students were enrolled in one or more online courses. Almost all 50 states had a form of K-12 online learning program by 2011 (Barbour, 2021; Watson et. al, 2011). According to data collected in the 2012-2013 school year, enrollment in virtual charter schools in the state of Ohio was over 35,000, which was approximately 2% of the total student population (Ahn, 2016). As such, Ohio had one of the country's largest populations of full-time online students and enrollment continued to grow with time (Ahn, 2016). Barbour (2021) notes that during the 2018-2019 school year, 48% of administrators surveyed in a study by Project Tomorrow indicated that online classes were

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available to their students and estimated that approximately 5% to 8% of all K - 12 students were utilizing online learning nationwide prior to the pandemic.

Supporters of online learning note that this form of education could give students opportunities that were not otherwise available to them. Rural students without many class options, those who were high-achieving or identified as gifted and talented living in low-performing districts, and students who were not succeeding in the traditional education setting were among those who could see potential benefits (Ahn, 2016). Flexibility, accessibility, and an opportunity for credit recovery were also noted as potential benefits of online learning (Barbour, 2021).

Unfortunately, not all students were successful in the online learning environment (Ahn 2016; Avery et al., 2021; Barbour 2021). Online charter schools historically performed significantly worse on achievement tests than traditional brick and mortar schools (Ahn 2016). Avery et al. (2021) points out that student engagement is a crucial component to K-12 online learning. Some studies suggest that elementary students face unique challenges in the online environment because they may not yet be independent learners, therefore they a need for facilitators and extra support from teachers, tutors, or family members exists. Frequent and timely communication and feedback from the teacher, age appropriate tools, and technology support were needed in order for all populations to be successful (Burdina et al, 2019; Munastiwi & Puryono, 2021).

Hodges et al. (2020) points out that purposeful instructional planning in true online programs, intended for comprehensive long-term online education, and the remote learning that was developed out of necessity during the global pandemic should be considered two starkly different systems. Remote learning is defined by Huck and Zhang (2020) as a temporary shift in

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instructional delivery models as an alternative mode of instruction due to a crisis of circumstance. The objective of remote teaching and learning is to ensure access to instruction and support in a temporary manner that can be set up quickly and ensure the reliability of the access to instruction during an emergency (Hodges et al, 2020; Huck and Zhang, 2020). In Fall 2020, some districts continued to be fully remote, some returned to in-person learning, allowing students and teachers to return to buildings, and others developed hybrid learning models. For this literature review, hybrid learning refers to educational models where some students have a mixture of learning remotely and attending in-person.

Two years later, the 2021–2022 school year was not without its own challenges. School closures and other disruptions to students’ lives and routines, which impeded students’ social and emotional development, hit schools harder than anticipated (DeArmond et al., 2022). COVID-19 exposure and quarantines required students and staff members to stay home and isolate for 14 days, requiring districts to continue to operate with some sort of remote or hybrid learning plan to accommodate at-home learning. Staff shortages, illness, and a lack of substitutes also caused many districts to close their doors unexpectedly and follow remote learning plans during peak infection times to allow students to continue learning with a limited number of available personnel (DeArmond et al., 2022; Maughan, 2022). Hiring staff and filling vacancies was a challenge for many districts throughout the summer and into the fall, causing many to begin the year understaffed (DeArmond et al., 2022; Goldhaber & Gratz, 2022). Ultimately, what was thought to be a short-term precaution for public health and safety has been in place much longer than anticipated and has now disrupted three academic school years in the United States. The simple question of how to accelerate students and manage instruction in order to help them catch up has become increasingly complex (DeArmond et al., 2022).

### **Inequalities**

What was discovered during the initial phase of the school closures was increased attention to several inequalities in resources, educational opportunity, and access to learning (Holt & Kreamer, 2020; Kuhfeld et al., 2020; Kuhfeld et al., 2021). Mann et al. (2022) noted that certain subgroups of students were more likely to have difficulties in the online learning environment. Those subgroups are considered vulnerable populations and include those from disadvantaged socioeconomic backgrounds, students with specific learning exceptionalities, male students, inner-city students who were more likely to experience longer closures, as well as students in rural areas who were less likely to have access to resources nearby (Mann et al., 2021).

It is well documented that students do not start school with the same opportunities based on their early childhood education and experiences at home prior to enrolling in school (Darmody et al., 2021). The home environment can create exceptional learning opportunities for children or a lack thereof. One of the benefits of attending a school system is to create a more equitable set of opportunities using appropriate resources, materials, and skills of educators. Families from higher socio-economic backgrounds and low-poverty areas are more likely to be able to accommodate extra tutoring, learning assistance applications, and ensure an adult is at home to assist with learning. Other significant inequalities exist in the social system setting, including access to healthcare and screenings, as well as nutrition, which many students are dependent on as part of school services (Charland et al., 2021).

One major challenge for school districts was to deal with the digital divide, which is defined as a gap between people who have access to electronic devices and internet capabilities at home and those who do not have access to these necessities (Correia, 2020; Mann et al., 2021;

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Moore et al., 2018). Correia (2020) points out that even if teachers were able to implement high-quality and effective remote teaching and learning strategies during the final few months of school, students would not have equitable access to learning because of the digital divide. Many districts were not one-to-one with devices across their kindergarten through the twelfth-grade population and were unable to provide devices to all of their students. In a study conducted by Huck and Zhang (2021), responses to the survey indicated that “90% of principals reported that students in their schools lacked internet access and 40% reported that access to technology or internet was also a barrier for their teachers” (p. 53).

The digital divide disproportionately affected low-income families and minorities, with reports indicating that nearly 50% of low-income families and 42% of minority families lacked devices to learn from home (Kuhfeld et al., 2020). Correia (2020) reported that 35% of students living in households that earned less than \$30,000 per year did not have access to the Internet at home, which limited their access to learning opportunities. This left school districts scrambling to find out what could be done with the current budget in order to allocate funds to address these two issues of connectivity and access to devices, which were a pressing concern for families and teachers alike.

### **Challenges for Families**

Parents of all age groups reported not being prepared for the amount of assistance and involvement that was needed to help their children succeed in remote learning and understand the concepts being presented by the teachers (Troxler, 2021). This requirement of family involvement to give their children extra assistance for long periods held especially true for parents of primary students who could not operate devices efficiently and were not independent



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learners, needing a great deal of parental prompting to accomplish tasks (Munastiwi & Puryono, 2021).

Students with learning disabilities were also greatly affected and, in some cases, went without appropriate accommodations due to the limitations of remote learning platforms and teaching strategies (Pier et al., 2021; Troxler, 2021). Parents and teachers saw a large decline in the progress of these students (Pier et al, 2021). Some parents even indicated that students resorted to self-harm due to the need for interventions that were not taking place, which increased their feelings of anxiety and lack of confidence over time. School districts have been accused of not meeting the requirements of providing Free and Appropriate Education, also known as FAPE, for these students; consequently, reports of lawsuits citing violation of the Individual with Disabilities Act are emerging (Troxler, 2021). This is especially concerning for districts that remained in remote or hybrid learning situations for the 2020–2021 school year.

### **Challenges for Teachers**

In many situations, teachers faced additional challenges that they were not prepared for and did not have the skills needed in order to move forward during the initial phases of the school closures (Huck & Zhang, 2021). The Consortium for School Networking reported in an annual survey conducted in 2019 that many districts were successful with a one-to-one implementation of devices. However, 67% of participants still utilized printed materials for at least 50% of instruction (CoSN, 2019). This indicated that teachers were not comfortable utilizing fully online materials. Although most academic programs being utilized by school districts had online components that could translate well to assist with remote learning, a large percentage of teachers experienced discomfort with online tools and were in desperate need of additional training to use these tools effectively (Wyse et al., 2020; Martinez-Lincoln et al.,

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2021; Henderson et al., 2021; Holt & Kreamer, 2020). Unfortunately, many teachers were forced to proceed and learn independently (Huck & Zhang, 2021).

Approaches to remote learning during the initial closure and beyond varied considerably across the country (Holt & Kreamer, 2020). Parent surveys report low-quality student-to-teacher interactions, as well as parent-to-teacher interactions (Henderson et al., 2021). Due to the lack of devices during the initial closure, many primary teachers sent home packets of activities and information for parents on paper. The packets were not returned to the school; thus, there was no feedback to students on their progress unless done so by parents. Teachers also report that students lacked appropriate supplies and manipulatives in the home environment that were needed to build conceptual understanding and foundational knowledge that was essential for later learning (Holt & Kreamer, 2020; Middleton, 2020). As a result, school districts relied heavily on caregivers to assist with instruction at home, especially in the area of literacy and math. The extra pressure that was put on students, families, and teachers, as well as the lack of interpersonal connection and appropriate support, took a toll on the social and emotional well-being of all involved (Holt & Kreamer, 2020; Huck & Zhang, 2021). Goldhaber et al. (2020) note that the correlation between teacher competency and effectiveness has a strong correlation with student achievement levels. Therefore, the mental health and overall well-being of teachers were factors influencing the delivery of instruction and learning growth. The uncertainty, stress, and confusion of teachers were impacted by school closures and the after-effects of the action (Kim et al., 2022). Much of their uncertainty dealt with their inexperience with remote instruction and the uncertainty of how long the closures would last.

### **Social-Emotional Challenges**

Stress and emotional distress increased for families also because of the closure of childcare centers, loss of employment, and the increased financial burden of internet subscriptions that were necessary for learning at home (Kuhfeld et al., 2020; Middleton, 2020). Martinez-Lincoln et al. (2021) reported that the stress felt by families impacted students who were dealing with life-altering events, illness of family members, and uncertainty in their daily lives. When analyzing data surrounding the behaviors of students during remote learning sessions in primary literacy lessons, a survey of teachers reported an increase in anxiety, inattentiveness, and mind wandering for students during online learning compared to their behaviors during in-person learning, before the pandemic (Martinez-Lincoln et al., 2021). There was also a noted decrease in recognition of feelings and social and emotional regulation for elementary students (Munastiwi et al., 2021).

McClusky et al. (2021) surveyed 45 students to gain their perceptions of the closure of schools. While some students felt this was a positive change, the majority of participants stated that learning in the online environment was more stressful and that they felt more pressure than in traditional classrooms. High levels of anxiety regarding the uncertainty of the length of closures and isolation from peers also had a negative impact on mental health, relationships, and participation in learning. McClusky (2021) also noted that these anxiety levels remained high even as students returned to in-person learning. Vulnerable students, those who were isolated before the pandemic, considered marginalized, and those with pre-existing mental health conditions described more severe effects.

### **Positive Effects on Education**

Some researchers have made a significant effort to highlight the positive changes observed in education that stem from the pandemic. One such outcome is the emphasis of school districts to increase the number of digital devices and district-provided hotspots to ensure that all students have access to technology. Previous budget limitations were resolved to make equal access to technology a priority for districts. Hilyer et al. (2021) pointed out that there was also an increase in the purchase of digital platforms to support differentiated learning in the area of literacy. Emphasis was placed on platforms that were accessible to elementary-aged students, which was typically overlooked by school districts since they focused on providing these platforms to students in higher-grade levels. A thorough examination of the distribution of resources ensuring that all buildings within the district had similar accessibility to such programs and resources is also another positive outcome. Teachers who were surveyed in this study noted that students were less dependent on physical books as they had been in the past and learned how to take advantage of the many digital books and resources available to continue to utilize literacy skills and practice reading even though public libraries had closed and access to print materials was limited (Hilyer et al., 2021). These changes have positively impacted schools and helped to make the learning environment more equitable for those who do not have access to local libraries.

Konig and Frey (2022) conducted a study on school closures and student achievement in Spring 2020; they found that the negative effect of remote learning diminished as time progressed into the 2020–2021 school year. When studying through learning apps and online learning platforms with which students had prior experience, positive growth was noted. This may be due to the previous technical experience with running the platform and that families and

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students had previous exposure to remote learning in the earlier lockdown phases. This learning environment was no longer new to students or parents, which influenced results positively. When reflecting on initial remote learning performance during the first few months of school closures, Konig and Frey (2022) stated that “the suddenness of the switch from in-person to remote learning in Spring 2020 may have made it impossible to adapt the necessary scaffolding measures adequately to a remote context, which may explain why younger students were affected more by the COVID-19-related school closures than older students in Spring 2020” (p. 21). The growth noted in this research indicates that, as students adapt to remote learning environments and online learning apps, there is the potential to positively promote achievement when compared to traditional learning environments (Konig & Frey, 2022).

### **Characteristics of Student Success**

It is important to note that some students were not as significantly impacted by the mandatory shift to remote learning. According to Duzgun and Basaran (2021), success in online learning was directly correlated to success in the in-person learning environment. Students who had higher academic achievement in school before the arrival of COVID-19 continued to be successful in online learning (Duzgun & Basaran, 2021; Huck & Zhang, 2021). The most important factors predicting success in the online learning environment were the degree of self-motivation, independence in accomplishing learning tasks, family participation, and degree of communication between home and school (Duzgun & Basaran, 2021). This study emphasized the importance of the home–school connection and systems of support in relation to the academic success of students.

Huck and Zhang (2021) suggested that students living in households within the higher-income brackets and those who reside in less rural areas of the country with strong Wi-Fi

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connections, benefitted from parental assistance with schoolwork and additional learning resources, especially in the areas of reading. Some initial findings indicated a minimal loss and even some enhancements in reading performance and written expression in the online learning environment. According to Hilyer et al. (2021), “online teaching revealed new pathways and channels for students to grow and thrive, and some remarkable writing emerged” (p. 105). This was attributed to a lack of peer pressure, allowing more engagement with content without the risk of appearing uncool or socially unacceptable. Teachers also note that they were able to provide better individual feedback to students in the remote learning environment without the classroom management problems that in-person learning situations often come with (Hilyer et al., 2021). This claim of improvement in feedback, however, is in contradiction to the study mentioned above that indicated poor communication between teachers and families throughout remote learning, indicating the vast differences in experiences during this time.

### **Achievement Testing During the Pandemic**

The literature indicates that there were many challenges in the administration of assessments and collection of end-of-year data because several assessments, especially those conducted at the elementary level, could not be performed remotely in the online format (Huck & Zhang, 2021; Wyse et al., 2020). Although measuring student proficiency and learning achievement proved to be a difficult task during this time, many districts still attempted to collect data in order to examine student progress at the end of the 2020 school year. The purpose of this was to begin the process of attempting to create an understanding of how students progressed in their learning during this time.

Standardized testing at the state level was eliminated for the 2019–2020 school year, and any requirements for promotion or based on those test scores were waived. The federal

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accountability measures in place based on the results of standardized student test data were also waived for this academic year (Keng et al., 2020). In the state of Ohio, emergency legislation was enacted to amend the Third Grade Reading Guarantee clause. The language was changed to reflect the lack of reliable data, stating that students who have not yet scored proficient would not be retained based solely on their performance on state standardized tests (Ohio Department of Education, n.d.). During the following school year, 2020–2021, all states required school districts to implement the administration of the required state standardized tests in all areas to gauge progress and try to assess how far behind the norm student test data was in reality.

As schools began to reopen for the 2020–2021 school year, districts were provided with federal funds to support learning, readjustment to the environment, and attempt to mitigate learning loss (Office of Elementary and Secondary Education, 2020). The Coronavirus Aid, Relief, and Economic Security (CARES) Act (2020) and the Elementary and Secondary School Emergency Relief Fund provided state education agencies serving K-12 students with resources to help address the effects that COVID-19-induced closure of schools had on students. State officials agreed that state testing must resume as a method of measuring the effects of school closures on achievement levels, how effective online instruction had been, and how different student subgroups were affected. Recovery efforts could be monitored and examined with state testing data as well. The use of standardized summative assessments created a snapshot of academic performance and assisted education officials in understanding student learning levels.

Achievement testing during the 2020–2021 school year was still affected by multiple issues related to the pandemic, such as different reopening dates, quarantines, and safety protocols. Keng et al. (2020) outlined several testing recommendations for administrators to take into consideration for Spring 2021 testing. These included suggestions regarding the

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interpretation and use of the results these tests produced, as well as test design and scoring procedures. Keng et al. (2020) noted the importance of ensuring that the test items be reviewed for emotional triggers related to the pandemic to avoid skewed results based on reactions to challenging emotional content rather than academic ability to comprehend the material and apply concepts to problems. The setting was also to be considered for safety protocols, necessary masking and sanitizing procedures, and test accessibility. There was a suggestion to consider remote proctoring and a flexible schedule to accommodate the isolation and quarantine requirements of students (Keng et al., 2020; Rochelle, 2020). Digital accessibility and technical differences were also to be analyzed, as well as a possible adjustment of cut scores, and ensuring results were examined considering the context of the 2021 learning challenges (Keng et al., 2021).

### **Predictions on Learning Outcomes and Potential Learning Loss**

With the realization that remote learning would be more than just a short-lived event in the lives of students, researchers began making predictions on the effects of the pandemic on learning based on other findings that compared time out of school with achievement levels and recovery rates. Betebenner and Wenning (2021) described learning loss as the “decrease in learning between the non-pandemic and pandemic realities” (p. 7). To apply known effects on learning to the current unknown, studies compared the COVID-19-induced closure of schools to summer vacation, closures due to natural disasters, and absenteeism rates (Atteberry & McEachin, 2020; Kuhfeld, 2019; Bowers & Schwarz, 2018). Examining these areas was an attempt to predict the academic levels of students upon their return to school and what teachers could expect in terms of learning gaps.



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The effects of the summer months spent away from classrooms with a lack of engagement with academic material has been studied for decades (Cooper et al., 1996). The initial findings were that learning losses of around one month happened over the summer. Kuhfeld's (2019) later studies on the effects on elementary-aged students showed a loss of 1–2 months in literacy and 1–3 months in math. Other researchers estimated a higher amount of loss, indicating 17–28% of a year in literacy and 25–34% in math over the summer (Atteberry & McEachin, 2020), noting that the consistency and accuracy of collecting these numbers are difficult due to changing measurement systems, differences in family engagement, and other external factors (Kuhfeld, 2019; von Hippel & Hamrock, 2019).

Nevertheless, researchers tentatively expected academic achievement to decline at a rate comparable to the summer slide, assuming schools would return to in-person learning in Fall 2020 (Kuhfeld et al., 2020). An analysis of the summer learning patterns of 5 million students was conducted to correlate the closure of schools during summer break to learning levels. Under those circumstances, in comparison to a typical school year, returning students were expected to start in Fall 2020 with “approximately 63 to 68% of the learning gains in reading and 37 to 50% of the learning gains in mathematics” (Kuhfeld et al., 2020 p. 560). It was found that many factors such as age and socio-economic status contributed to the extent of the loss (Atteberry & McEachin, 2020; Kuhfeld, 2019; von Hippel & Hamrock, 2019). There were no relationships between gender and performance. However, learning loss did increase as the grade of the student increased (Kuhfeld, 2019). The amount of growth a student displayed over the school year was also a primary predictor of the amount of potential learning loss over the summer, indicating the greater the gain the greater the possible loss.

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Projections were also made based on correlations to other natural disasters in our country that have happened in the past, causing attendance at school to be disrupted for long periods. Natural disasters such as hurricanes and floods also cause unplanned school closures, psychological trauma, and economic hardships for families who get displaced. One correlation to Hurricane Katrina indicated a worst-case scenario of sorts, as affected students took two years to recover from the loss following four months out of school (Kuhfeld et al., 2020); researchers thus predicted a similar scenario to those impacted by long-term closures due to the pandemic. Throughout the research, hope for a lesser impact on students came from the fact that some type of remote learning was taking place for many learners, which led researchers to label this time with more positive terms such as learning lag and disrupted learning rather than learning loss (Pier et al., 2021). These researchers noted that, in the scenario mentioned above, those students received approximately half of their typical instruction during the school closures; thus, the researchers predicted the return of students in Fall 2020 with approximately 60–87% of their typical learning gains (Kuhfeld et al., 2020).

Student absence was another consideration made when attempting to predict the impact of COVID-19 on academic achievement. The Ohio Department of Education considers absenteeism of 38 hours in a month or 65 hours in any given school year to be habitual absenteeism (H.B. 166, 2019). Excessive and chronic absences cause students to miss out on necessary content needed for equal opportunity in the curriculum and the information needed to be successful, as compared with peers who attend school regularly (Kurtz, 2020). Liu et al. (2019) noted that there is a direct correlation between student absences and achievement levels and emphasized the fact that those with chronic absenteeism are 8% less likely to graduate high school on time and 7% less likely to enroll in higher education or other post-secondary programs.

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Lieberman (2020) noted that absences have increased dramatically since the arrival of COVID-19 and the subsequent changes in instructional methods. Kurtz (2020) conducted a study in October of 2020 and discovered that absenteeism rates increased 10% by Fall 2020 for in-person or hybrid districts and 12% for fully online districts. These increases in absences present challenges for teachers to help students catch up on material while continuing to move other students in the class forward. Ultimately, all were affected due to this struggle to balance keeping students on track and reteaching missed material, affecting overall academic achievement (Kurtz, 2020).

Another noteworthy concern for schools was the amount of new content, or lack thereof, that was presented during school closures. Henderson et al. (2021) reported that many teachers used the last three months of school to review concepts instead of moving forward in the curriculum based on uncertainties regarding the length of the closure and the challenges that school districts and families faced, ensuring all students had access to their education. A disproportionate number of low-income families and minorities were affected by this trend, leading to additional inequalities in equal access to education. According to Henderson et al. (2021), “about 80% of students in the top quartile of household income received mostly new content compared to only 64% of students in the lowest quartile” (p. 12). Those students who were impacted by long-term remote learning during the 2020–2021 school year in addition to this time were projected to start the 2021–2022 school year close to a full year behind in mathematics (Kuhfeld et al., 2021). Reading was predicted to be less affected, with the possibility of some students who were independent learners and those with high levels of parent involvement being impacted minimally and possibly even making gains in some areas (Streich et al., 2021). This study was contradictory to many of the predictions of other researchers.

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Drew et al. (2021) also noted concerns regarding income-based achievement gaps for students due to several factors. Research indicates that economically disadvantaged students are more likely to have parents who work in roles with higher exposure to the COVID-19 virus. Access to quality healthcare is a concern, which would affect a parent's ability to support their child academically during school closures. These families are also less likely to have reliable internet accessibility, access and ability to pay for private tutoring, and attend school districts with fewer resources to support online instruction. These concerns support researchers' predictions that the achievement gap between economically advantaged and disadvantaged groups will widen as a result of the pandemic.

### **Initial Student Outcomes**

One key difference from findings projected by using summer break and closure due to natural disasters as a baseline was the fact that, during this pandemic, the quality of instruction in an online environment was questionable due to a lack of proper training, support, and resources (Kuhfeld et al., 2020). When actual trends reported in student achievement were examined, researchers presented mixed outcomes (Huck & Zhang, 2021; Pier et al., 2021; Streich et al., 2021). There were large discrepancies in the proficiency scores between those who were learning fully online during the 2020–2021 school year and those who were attending in-person (Streich et al., 2021). There were also disparities between those in high-poverty and low-poverty schools (Bailey et al., 2021; Pier et al., 2021).

Six months after the onset of the pandemic, lower achievement rates were identified in both math and reading on the NWEA MAP assessments for grades four through eight (Streich et al., 2021). The most significant deficits at that time were noted in math. One year after the pandemic, when the national majority of students were analyzed, math continued to be more

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greatly affected than reading (Kuhfeld et al., 2021 & Charland et al., 2021). A study by Pier et al. (2021) of California schools summarized the results of fall-to-winter data that examined student growth of 100,000 students from Fall 2019 to Winter 2021 and how that growth compared to average growth in the last two years. Almost all of the school districts included in the study were engaged in remote learning only, with a few smaller districts providing the option of hybrid instruction at some point between Fall 2020 and Winter 2021. Results indicated that students had an average of 2.6 months of learning lag in reading as compared with 3.3 months of learning lag in math. Minorities and those from low socio-economic status and high-poverty schools had the greatest declines in achievement (Bailey et al., 2021; Pier et al., 2021). The achievement was lower overall for students at the elementary levels; however, American Indians, Alaskan Natives, Blacks, and Latinx were disproportionately impacted (Kuhfeld et al., 2021), further supporting the claim that there is a struggle for equality in online learning and access to education, which impacts student success overall.

### **Current Reading Achievement Levels Based on Standardized Testing**

Acquiring reading and literacy skills at the elementary level is pivotal in determining a student's overall success in school and career in adulthood (Singh et al., 2022). As students progress through school, they are expected to be able to read material and comprehend literature to learn other subject areas. Reading achievement, self-regulation, and motivation are essential in developing literacy skills. Current academic trends in reading are being researched. Data currently presented in the literature are mixed depending on the sample studied, including the geographic area, grade, level, and assessment type. Achievement gaps have long been an issue, even before COVID-19 caused school closures. Differences in educational outcomes between certain subgroups of students in terms of race, gender, and socio-economic status have been

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studied over time. There is evidence that remote instruction has been a key factor in widening this achievement gap (Goldhaber et al., 2022).

A team from the American Institute for Research, Dartmouth College, Harvard's Center for Education Policy Research, and NWEA analyzed the results of a standardized assessment, NWEA MAP, which is routinely administered three times a year to over 2.1 million students across 49 states to gain further insight utilizing actual test data rather than projections (Goldhaber et al., 2022). The researchers examined the trends in the data during a two-year period from Fall 2017 to Fall 2019 and compared those results with those from Fall 2019 to Fall 2021 in order to compare student achievement growth in reading. These growth charts were intended to help researchers better understand if students were making gains as compared with pre pandemic levels. Student data were broken into subsets based on the amount of time spent in remote, hybrid, and in-person learning. The results indicated that remote instruction widened achievement gaps in all areas (Goldhaber et al., 2022; Kuhfeld, 2022). Slowed growth was especially significant for remote students attending high-poverty schools (Goldhaber et al., 2022; Kuhfeld, 2022). Students who were engaged in remote learning for the majority of the 2020–2021 school year showed lower levels of academic growth in all subgroups, resulting in a learning loss of approximately 13 weeks of in-person instruction at low-poverty schools and approximately 22 weeks in high-poverty schools (Kuhfeld, 2022).

Researchers also examined test data for students who returned to in-person learning settings as early as possible, noting that about 50% of students returned to in-person learning in Fall 2020 (Kuhfeld, 2022). Positive gains were noted in reading for these students; however, they were still performing behind pre pandemic achievement levels (Lewis et al., 2022). These students lost an average of 7–10 weeks of in-person instruction due to the closure of schools in

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March of 2020 and unplanned additional closures and remote learning periods during the next school year (Kuhfeld et al., 2022). Contrary to math scores, where there was no significant widening of the achievement gap between subgroups, reading achievement gaps continued to grow for those who remained in-person (Kuhfeld et al., 2022). After they returned in Fall 2020, reading levels held steady, but there were sizable drops in achievement levels between Fall 2020 and Fall 2021. The gaps in reading are now approximately 15% wider than before the pandemic (Kuhfeld, 2022, p. 4). Goldhaber et al. (2022) noted the importance of parental and family influence on reading growth, pointing out that this trend may be partially due to challenges with in-person learning throughout the school year and family stressors.

### **Summary**

Measuring student achievement during the pandemic has proven to be a difficult task, but one that is necessary to analyze the impact that this event has had on student learning.

Examination of the literature showed that projected outcomes were mixed, indicating that learning experience and educational losses were not consistent among all students. Some researchers predicted students to be close to a year behind, while others predicted little to no change and possibly even improvement (Atteberry & McEachin, 2020; Kuhfeld, 2019; Goldhaber et al., 2022). This presents educators and leaders with a very difficult task of addressing a wide range of academic levels, leading to discrepancies and possible large gaps in students' academic performance levels.

When examining actual data, the trends continued to vary depending on how the data is disaggregated and which groups were the focus of the study. Nevertheless, student test scores and academic achievement were affected by several independent variables during this time. Those independent variables are access to electronic devices, connectivity to the internet

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that is necessary for learning remotely, amount of time removed from in-person learning, home support, teacher self-efficacy in their online teaching skills, teaching methods, student ability or disability, and students' self-motivation in the online environment (Huck & Zhang 2021; Kuhfeld et. al, 2020). Family income, education level, and socioeconomic factors continue to be influencers of achievement as well. The previously mentioned report titled *Equality of Educational Opportunity*, written by Coleman (1966), found that the socioeconomic status of a child's family is a powerful predictor of achievement levels and proficiency in school, as is the socioeconomic status of the school that a child attends. This conclusion still holds true as we track the data and analyze evidence surrounding how student learning was impacted by the pandemic. After schools reopened in the fall of 2020, there were additional independent variables to consider, such as mode of instruction (hybrid, fully online, or fully in-person), number of unplanned remote days for in-person learners, and academic intervention strategies implemented by teachers. A direct connection was made between student age, as well as poverty level, and academic performance, noting that elementary students and those in high-poverty schools were more greatly affected than other groups (Goldhaber et al., 2022).

Upon comparing the actual learning trends with the initial projections reported by researchers, evidence suggests that some academic subjects for groups of students fared worse than originally anticipated and some were less affected (Betebenner & Wenning; Goldhaber et al., 2022; Kuhfeld, 2022). These initial predictions stated that test scores in the area of reading showed a less worrisome trend than math during the initial phases of the closures. That is understandable because students more readily use reading skills outside of school in their everyday lives and continue to utilize those skills while using the online learning platforms for other subjects as well. These platforms naturally required students to be reading and writing.



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However, as new information continues to emerge, reports indicate that reading rates are not holding steady, but rather showing evidence of decline over time, even with the return to in-person learning (Goldhaber et al., 2022; Kuhfeld, 2022). Although this trend began before the pandemic, additional factors such as the use of masks, social distancing protocols, and staffing issues should be examined to determine their level of contribution. Reading and literacy skills are an essential part of measuring student learning, academic readiness, and overall academic achievement. Frequent progress monitoring and universal screening can help districts identify students who are not progressing, and design improvement plans to meet their needs. This can also help districts to better understand the effectiveness of their recovery plans in hopes to mitigate the effects COVID-19 pandemic-induced school closures following disruptions to learning had on student growth. “Because of the pandemic’s uneven impact, we cannot simply treat everyone with the same intervention and fix what ails them academically - there is and will be no one-size-fits-all vaccine that we administer to each child that cures their academic maladies” (Betebenner & Wenning, 2021, p. 3). A long-term analysis is needed before we can truly understand the impact that the COVID-19 pandemic and individual recovery efforts have had on this area of student learning. Identifying students who are struggling is the first step in evaluating the effectiveness of recovery methods.

### **CHAPTER III**

#### **METHODOLOGY**

The closure of schools during the COVID-19 pandemic has had a profound and lasting impact on students nationwide. Disruptions to student learning were unavoidable and widespread (Holt & Kreamer, 2020; Kuhfeld et al., 2020; Liao et al., 2021; Mann et al. 2022; Simmons, 2020). Students in the elementary setting were highly impacted due to several factors and researchers note that many did not reach important learning targets (Munastiwi & Puryono, 2021; Singh et al., 2022). This raises long term concerns as evidence suggest that elementary students who are behind in reading ability are less likely to graduate from high school or attend college (Singh et al., 2022). This study is grounded in educational and child development theories which emphasize that changes to the students' environment can significantly impact student learning both positively and negatively (Bronfenbrenner & Evans, 2000; Reynolds & Walberg, 1992; Vygotsky, 1978). The purpose of this research is to better understand the impact that school closures had on elementary students' academic achievement in the area of reading. Additionally, the study hopes to uncover whether or not reopening schools in the fall of 2020 for full time in-person learning helped to minimize the negative effects on educational outcomes for this group of students.

This chapter outlines the research design, methods, and procedure used to better understand the relationship between school closures and student academic achievement. Sampling procedures, data collection, and instrumentation are discussed, along with data analysis procedures. Finally, the delimitation, limitations, assumptions and ethical considerations complete the chapter.

### **Research Questions**

Specific research questions to be addressed are:

1. Is there a significant difference in ELA scores of third grade students who attended Ohio school districts that fully reopened to in-person learning in the fall of 2020 when compared to districts that remained hybrid or online?
2. Is there a significant difference in the ELA scores of third grade students based on district typology when comparing Ohio school districts that were in-person to districts that remained hybrid or online?
3. Is there a significant difference in the ELA test scores of third grade students based on race/ethnicity when comparing Ohio school districts that were in-person to districts that remained hybrid or online?
4. Is there a significant difference in the ELA test scores of third grade students who are economically disadvantaged when comparing Ohio districts that were in-person to districts that remained hybrid or online?

### **Research Hypotheses**

Each research hypothesis and null hypothesis is listed below:

- Research Hypothesis 1: Reopening to fully in-person learning, five days per week, in the fall of 2020 will result in a higher percentage of students scoring proficient and above on the Ohio State Test in third grade than those remaining fully remote or using hybrid instruction.
- Null Hypothesis 1: There is no statistically significant difference in the percentage of students scoring proficient or above in districts that returned to in-person learning when compared to districts that remained fully remote or hybrid.

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- Research Hypothesis 2: There is a statistically significant difference between test scores based on instructional modality when the data is disaggregated by district typology.
- Null Hypothesis 2: There is no statistically significant difference between test scores based on instructional modality when the data is disaggregated by typology.
- Research Hypothesis 3: There is a statistically significant difference between test scores based on instructional modality when the data is disaggregated by race/ethnicity.
- Null Hypothesis 3: There is no statistically significant difference between test scores based on instructional modality when the data is disaggregated by race/ethnicity.
- Research Hypothesis 4: There is a statistically significant difference between test scores of economically disadvantaged students based on instructional modality.
- Null Hypothesis 4: There is no statistically significant difference between test scores of economically disadvantaged students based on instructional modality.

### **Method**

For this quantitative research, a quasi-experimental design with nonequivalent groups was applied (Trochim et al., 2016). The study is looking for a causal relationship between achievement scores and school closures. Archival data from the Ohio Department of Education was obtained for the 2018-2019 through the 2021-2022 school years in order to conduct a statistical analysis to identify if there were differences in the percentage of students scoring proficient or above on the state assessment that could be associated with the COVID-19 pandemic related school closures. According to Trochim et al. (2016) a quasi-experimental design utilizes previously collected data among non-randomized groups. Students are not placed in school districts randomly; therefore, the design utilizes nonequivalent groups and confounding variables should be considered (Trochim et al., 2016). Causal comparative analysis seeks to

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determine if the independent variable is influencing the outcome and identifies associations among variables (Trochim et al., 2016). The independent variable in this study was instructional modality of school districts. Specifically, whether the school district was fully open for in-person learning, five days per week, as of September 10, 2020 or not. This information was derived from a spreadsheet provided from the Ohio Department of Education indicating the instructional modality by week for the 2020-2021 school year. The dependent variable was the percentage of students scoring proficient or above on the Ohio State Test as indicated for each district on the District Achievement Ratings spreadsheet from the Ohio Department of Education's Advanced Reports for each school year.

### **Role of the Researcher**

My role was limited in scope. Participants acted independently of me. I did not have control over the treatment and studied pre-existing data sets of groups of participants that received different treatments (full time in-person learning, hybrid, fully remote). I requested archived data reports from the Ohio Department of Education to collect the information necessary to conduct the study. This included public data from the Ohio Department of Education website for District Achievement Ratings from 2018-2019 school year to the 2021-2022 school year. Data could not be obtained for the 2019-2020 school year due to the closure of schools and the cancellation of state testing. The second report was an excel sheet of instructional modality by week during the 2020-2021 school year, which I requested from the Ohio Department of Education. I downloaded the School District Typology report and Disaggregated District Achievement data from the Ohio Department of Education website to examine district performance based on geographic location, poverty level, and race/ethnicity. This research was set up in a way to allow others to conduct similar studies.

### **Participants**

The population examined for this study were Ohio public school districts with students enrolled in grade three during the 2018-2019, 2020-2021, and 2021-2022 school years (pre and post pandemic). Of these districts, 610 reported their instructional modality during the 2020-2021 school year. These 610 districts were included in this study. This study used a quasi-experimental design to compare groups that were not randomly assigned. Purposive sampling, a nonprobability sampling technique, was used to determine participants based on my knowledge of the group characteristics (Lunenburg & Irby, 2008). Ohio public school districts were purposely selected due to the state's requirement of districts to report their instructional modality for the 2020-2021 school year. I was aware that districts were required to report instructional modality indicating their method of instruction: fully in-person five days per week, fully remote, or hybrid for each week that school was in session. This data was reported to local Educational Service Centers, who then reported the information to the State Department of Education. Some private school districts and charter schools did report instructional modality for this academic year. However, those participants were not included as part of the study. Each school district was also able to select "closed" as a category. However, there were no school districts on the report that selected this option.

### **Data Collection**

For this quantitative study, data was utilized through existing data sets from the Ohio Department of Education that were available to the public. The first source of data for this study was school district achievement data on the Ohio State Test for English Language Arts for third grade students. Data on the percentage of students scoring proficient or above on the state test was collected for three school years: 2018-2019, 2020-2021, and 2021-2022. This was accessed

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through downloadable files entitled “District Achievement Ratings” located on the Ohio Department of Education’s website. Data from the Ohio Department of Education’s advanced reports was also downloaded to show disaggregated test results for students by district based on race and ethnicity.

The second source of data that was utilized for this study was school district modality of instruction for the 2020-2021 school year. This set of data was obtained by emailing a request to the Office of Research, Evaluation & Advanced Analytics at the Ohio Department of Education. A downloadable spreadsheet was provided in an Excel document listing school district instructional modality by week during the 2020-2021 school year. The public school data was sorted into three categories: school districts that committed to full time in-person learning five days per week at the start of the 2020-2021 school year, school districts that were operating in fully remote status, and school districts that were hybrid, meaning they opened the 2020-2021 school year with a mix of in-person and remote instruction. Data under the column date of September 10, 2020 was used to determine the category designation for each school district (in-person and full time, hybrid, or fully remote). This decision was made based on guidance from the Ohio Department of Education which stated that some districts were delayed in their instructional modality reporting. Therefore data prior to September 10, 2020 might not have been accurate.

After the data was sorted and identifiable information removed, it was stored on my computer in order to be analyzed for the study. I reviewed and followed all guidelines and requirements of the Institutional Review Board (IRB) at Youngstown State University. Due to using publicly available archival data from the Ohio Department of Education, informed consent and permission were not needed.

## **Instrumentation**

Two sources of pre-existing data were utilized to conduct this study. Both were available from the Ohio Department of Education and downloadable in an Excel spreadsheet.

**Ohio State Tests for ELA.** The first source of data for this study was the school district achievement data on the Ohio State Test for English Language Arts for third grade students. Data was collected for the school years 2018-2019 to 2021-2022. The Ohio State Tests are a fixed form set of criterion-referenced tests created by the Department of Education. The state of Ohio uses these assessments as an accountability measure for school districts. The overall proficiency score is calculated through a series of sub scores which include reading informational text, reading literary text, and writing (Ohio Department of Education, 2018).

The Ohio State Test scores were used as indicators for the dependent variable because this assessment is considered a valid and reliable predictor of reading comprehension. These assessments “are designed to measure the degree to which students have achieved the academic learning standards defined by Ohio’s Learning Standards” (Ohio Department of Education, 2022a). Third grade students’ achievement on Ohio State Tests indicate if a student is proficient in reading and has the basic skills necessary for reading in grade four. The tests produce scaled scores that fall within five different ranges. The performance level descriptors are listed from high to low: Advanced, Accomplished, Proficient, Basic, and Limited (Ohio Department of Education, 2018). The score ranges for each category during the 2022-2023 school year are listed in Table 1.



**Table 1**

*Scale Score Ranges in English Language Arts*

Performance Level	Score
Advanced	752 or above
Accomplished	725 - 751
Proficient	700 - 724
Basic	672 - 699
Limited	545 - 671

Descriptors were provided by the Ohio Department of Education for each category. Reporting categories represent groups of similar student skills or learning standards assessed within each grade and subject (Ohio Department of Education, 2018). Students need to score at or above a 700 to be considered proficient. The cut off score for the Ohio Third Grade Reading Guarantee has increased over time and is currently set at 685 (Ohio Department of Education, 2022a). Therefore, students must attain a score of 685 in order to move on to fourth grade.

All school districts in Ohio must administer the assessment to all third-grade students, with the exception of those who have extreme cognitive delays and are eligible for an alternative assessment. The Ohio State Assessments are intended to be administered online through the Ohio Assessment System’s online portal, however, paper tests are available for special circumstances and as an accommodation (Ohio Department of Education, 2021a). The data from this assessment is publicly viewable on the Ohio Department of Education website and downloadable in an Excel spreadsheet.

### **Validity and Reliability**

Operational statistics for validity and reliability were provided by the Ohio Department of Education for the Spring 2022 State Test assessment (Ohio Department of Education, 2022a). Trochim et al., (2016) describes validity as the accuracy or the precision in which something is measured in a quantitative study. Reliability is defined as outcomes that are dependable, repeatable, and consistent (Trochim et al., 2016). The validity for the Ohio State Test depends on the alignment of test content to Ohio’s Learning Standards. This is achieved through a rigorous process that includes input from test developers, educators, and stakeholder committees (Ohio Department of Education, 2022a). The statistical report notes that sufficient evidence exists to support claims that a score of proficient or higher means students have demonstrated levels of achievement necessary to meet grade level expectations specific to Ohio's Learning Standards. Reliability estimates for Ohio State Tests were conducted for subgroups of students based on gender, ethnicity, and IEP status. Results indicate that reliability is consistent across subgroups (Ohio Department of Education, 2022a).

### **Description of Variables**

**Dependent Variable.** The dependent variable in this quantitative study is school district level state testing data based on the overall student achievement scores on the Ohio State Test for English Language Arts in grade three. More specifically, this study will be focusing on the school district overall percentage of students scoring proficient or above on the Ohio State Test for ELA. Each district percentage ranges from 0% - 100%. This is a ratio variable because the data has a clear definition of 0 and the distance between two variables is meaningful. The information was collected from a downloadable excel sheet on the Ohio Department of Education School Report Card website. The specific file was the “District Achievement Ratings”

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for each year of the study. Once the file was downloaded, I examined the “Report Only Indicators” page. The percentages used for the study were found in column E entitled “Third Grade English Language Arts Proficient or Above - District”.

**Independent Variables.** The first independent variable in this study is school district modality of instruction. This information was obtained through the Ohio Department of Education in the format of a downloadable spreadsheet listing school district instructional modality by week during the 2020-2021 school year. This variable has three options: 5-Day in-person, hybrid, or fully remote. Definitions of each classification are listed in Table 2.

**Table 2**

*Instructional Modality Type on September 10, 2020*

Instructional Modality	Definition
5-Day In-Person	All students have the option for full time in-person instruction (even if some students are using available alternatives).
Hybrid	Includes full and partial access to Hybrid: District is using a mix of in-person and remote education, in which some students have the option to take at least one in-person class (commonly set by grade level).
Fully Remote	All students receive only remote education (possibly with limited exceptions for students with special needs).

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Instructional modality was considered a nominal variable because the information is listed in categories that do not have a natural order or ranking. Each category was coded prior to analysis.

The second independent variable is school district typology, which is a nominal variable. Geography characteristics and poverty level were combined to create a typology for each school district in Ohio. Geography characteristics included three categories: rural, suburban, urban. Poverty level had five categories: very low, low, average, high, very high. These variables, as well as student population, were combined into eight different categories and reported on the District Typology Report as described in Table 3.

**Table 3**

*2013 School District Typology*

Typology Code	Major Grouping	Full Descriptor	Districts Within Typology
1	Rural	Rural - High Student Poverty & Small Student Population	124
2	Rural	Rural - Average Student Poverty & Very Small Student Population	107
3	Small Town	Small Town - Low Student Poverty & Small Student Population	111
4	Small Town	Small Town - High Student Poverty & Average Student Population Size	89
5	Suburban	Suburban - Low Student Poverty & Average Student Population Size	77
6	Suburban	Suburban - Very Low Student Poverty & Large Student Population	46
7	Urban	Urban - High Student Poverty & Average Student Population	47
8	Urban	Urban - Very High Student Poverty & Very Large Student Population	8

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The typology classifications were created by the Ohio Department of Education in 2013 using several data sources to classify similar districts based on shared demographic and geographic characteristics. The Ohio Department of Education School District Typology Methodology Report (2013) explains that geography characteristics include a location composite dimension using measures on population density, percentage of nonagricultural property value, population within the district, and incorporation of a city larger than 55,000. The four variables were standardized, and a z-score was averaged to calculate a composite value and rate the districts on an urban – rural continuum based on the value. The higher the value, the more urban the district. School poverty was measured by the percentage of students attending the district that are flagged as economically disadvantaged. The Ohio Department of Education (2021b) defines the economic disadvantaged classification as being aligned with the Free and Reduced-Price Lunch eligibility. In the state of Ohio, applicants are eligible for a free lunch with a household income below 130% of the federal poverty level, or if the student receives food stamps, or Ohio Works First benefits. Applicants are eligible for reduced price lunch benefits if the household income is at or less than 185% of the federal poverty level. The information in Table 4 displays the mean poverty rate for districts in each typology cluster in 2013, as well as the location composite for each cluster (Ohio Department of Education, 2013).

**Table 4**

*Cluster Centers for 2013 Typology*

Dimension	1	2	3	4	5	6	7	8
Poverty	0.49	0.39	0.32	0.54	0.29	0.14	0.67	0.86
Location Composite	-0.4	-0.55	-0.16	0.09	0.44	0.6	0.85	3.25

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The final independent variables were race and ethnicity, which are combined into one nominal variable, and poverty level based on the economically disadvantaged descriptor. Race and ethnicity were combined on the state report and sorted into six different categories determined by the Ohio Department of Education. These categories include American Indian or Alaskan Native, Asian, Black, Hispanic, Multiracial, or White. Due to limited sample size in some subgroups, only the Asian, Black, Hispanic, and White race/ethnicity groups were included in the study. This information was available on the Ohio Department of Education School Report Card website. The files were in the format of downloadable spreadsheets entitled District Disaggregated Race/Ethnicity Report and District Disaggregated Economically Disadvantaged Report.

### **Data Analysis**

A statistical analysis was done to test the hypothesis for each research question with a regression model. School district data was utilized to find the percentage of students scoring proficient or above on state tests. Individual student data was not analyzed for this study. The outcome variable, test scores, is a ratio variable. This variable includes a clear and definite zero and the difference between values holds meaning (Trochim et al., 2016). The independent variables are non-dichotomous categorical variables. These include instructional modality (fully in-person, hybrid, fully remote), district typology (levels 1 - 8), race/ethnicity (Asian, Black, Hispanic, Multiracial, or White), and poverty level.

A multivariate analysis of variance (MANOVA) procedure was selected for its ability to describe relationships between the dependent variable and a set of independent variables (Field, 2018). This study was seeking to identify causal relationships and asked questions with interconnected independent variables, therefore a model that held the variables constant was

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needed. A MANOVA conducts a regression analysis for multiple variables and has the ability to control independent variables to help a researcher identify which are statistically significant (Field, 2018). Each research question was tested using IBM's Statistical Package for the Social Sciences (SPSS) software Version 29.0.0.0 (241). The results were calculated, and the F statistic was examined to determine if there were statistically significant associations between the means of district proficiency scores for each year based on instructional modality. In the event of statistically significant results, a post hoc was run to further examine individual differences between groups.

### **Delimitations**

The scope of the study was focused on public school districts in the state of Ohio who reported their instructional modality during the 2020-2021 school year. The study did not include any school district that neglected to submit their instructional modality and also did not include private or charter schools. The data came solely from the Ohio State Assessment for English Language Arts in grade three and did not include other grade levels. Grade three was selected to be examined based on the State's emphasis on reading achievement at this grade level and the high-stakes nature of Ohio's Third Grade Reading Guarantee. Students in grade three are also provided with two opportunities to earn a proficient score on the assessment, rather than just one opportunity at the higher grades. I made the decision to focus on one state, one grade level, and one subject area in order to keep the assessment and question set included in the instrument common across all groups and to keep the sample size manageable.

### **Limitations**

This study did include limitations. One limitation is the non-equivalent groups quasi-experimental design and a lack of random assignment of participants (Trochim et al., 2016). Due



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to the nature of educational research and the assignment of students to particular school districts by location, the population of participants were not able to be randomly designed. As Trochim et al. (2016) explained this design further, it is noted that this study included an existing group of participants who received a treatment (those who returned to in-person learning 5 days per week) and another existing group that served as a comparison group (those who did not return to in-person 5 days per week). This limited the study's ability to prove causality, however, it could show a relationship between the closure of schools and a change in student achievement levels.

Another limitation was that the study only included the 610 Ohio public school districts that reported instructional modality for the 2020-2021 school year. According to the Ohio Department of Education website, there are 611 traditional public school districts in Ohio as of 2023, indicating that one district was either not in existence during this time or did not make a report. This study was also limited to the report made on September 10th of 2020. It did not factor in any changes in instructional modality that occurred throughout the school year. Many districts opened and closed based on the rate of illness throughout the school year, which may have influenced student achievement scores. The typology information was also limited to data from 2013 as that was the most recent date the data was collected.

### **Assumptions**

I made several assumptions during this study. The first assumption was that the reported percentage of students scoring at or above proficient as recorded on Ohio State data sheets indicated how many students in each district were achieving proficient levels of understanding in the area of reading and language arts. Higher percentages meant more students were performing at or above proficient. In order to be considered proficient, students must have met or exceeded the state cut-off score on the Ohio State Assessment for English Language Arts. The

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achievement score designated as the cut-off score for the 2018-2019 school year was 677. It was then raised during the 2019-2020 school year to 683 (Ohio Department of Education, n.d.). Additional assumptions made were that student test scores were accurately reported, testing protocols were followed, and the percentage of students at proficient or above were calculated correctly for each school district. The final assumption was that the Ohio State Test for English Language Arts was representative of the proficiency level of all students taking the test.

### **Ethical Considerations**

The research proposal was approved by the Institutional Review Board (IRB) at Youngstown State University to ensure compliance with ethical standards. Following protocol, an email request for permission to utilize and analyze archival data was sent to the Ohio Department of Education to gain the instructional modality information needed for this study. The study utilized publicly viewable school district achievement data and state reports to collect data on overall student test scores and test scores disaggregated by race/ethnicity. Typology information was also publicly available on the Ohio Department of Education website. The data was stored on my computer and password protected. There were no active participants and no physical artifacts requiring disposal due to the fact that all data was electronic.

### **Summary**

This chapter discussed the methods used in the study. A quasi-experimental research design utilizing school district data from the state of Ohio was used to examine outcomes of a regression model. The research questions sought to identify any statistically significant relationships between achievement scores and instructional modality. The participants of the study were Ohio public school districts with students in grade three. Data collection was done using publicly available data available from the Ohio Department of Education. The instrument

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for the study was the Ohio State Test for English Language Arts in grade three, which has undergone a rigorous process to test validity and reliability. The scope was limited to the state of Ohio and did not include any other grade levels in order to keep the instrument constant across all groups. Limitations of the study include the lack of randomization, which affects generalizability for the larger population. I assumed that results were accurate, proper administration of the test was conducted, and that students put forth their best effort. Chapter four will present details on how the data was analyzed with a graphical and written summary of the results.

## **CHAPTER IV**

### **FINDINGS**

The mandated school closures during the initial outbreak of the COVID-19 pandemic was an unprecedented moment in time for public schools. Many researchers feel that the effects on student achievement will most likely be long-lasting (Holt & Kreamer, 2020; Kuhfeld et al., 2020; Liao et al., 2021; Mann et al. 2022). The purpose of this research was to better understand the impact that school closures and subsequent reopening plans had on elementary students' academic achievement in the area of reading. The study hoped to uncover whether or not immediately reopening schools in the fall of 2020 made any significant difference in academic achievement.

To better understand the effects of this event on student achievement, the district level proficiency rates on the Ohio State Test Scores in English Language Arts were analyzed over a three-year time period. Districts were placed in different groups based on the instructional modality that was chosen upon the return to school in the fall of 2020. This study was similar to a before, during, and after treatment analysis, with the treatment being the instructional modality each district chose in September 2020. Data over three time periods were collected, with the first time period being before the initial COVID-19 pandemic school closures (2018-2019 school year). The second time period was the 2020-2021 school year, which was the initial reopening year of the pandemic and considered the treatment. The third year was the 2021-2022 school year, considered after the treatment. District choice of instructional modality is the independent variable with three levels: in-person instruction 5 days per week, hybrid instruction, and fully remote instruction. Other categorical variables that were considered during testing are district

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typology, economically disadvantaged, and racial groups. This chapter includes a description of the data collection and the data analysis organized by research question.

Specific research questions to be addressed are:

5. Is there a significant difference in ELA scores of third grade students who attended Ohio school districts that fully reopened to in-person learning in the fall of 2020 when compared to districts that remained hybrid or online?
6. Is there a significant difference in the ELA scores of third grade students based on district typology when comparing Ohio school districts that were in-person to districts that remained hybrid or online?
7. Is there a significant difference in the ELA test scores of third grade students based on race/ethnicity when comparing Ohio school districts that were in-person to districts that remained hybrid or online?
8. Is there a significant difference in the ELA test scores of third grade students who are economically disadvantaged when comparing Ohio districts that were in-person to districts that remained hybrid or online?

### **Research Hypothesis**

Each research hypothesis and null hypothesis are listed below:

- Research Hypothesis 1: Reopening to fully in-person learning, five days per week, in the fall of 2020 will result in a higher percentage of students scoring proficient and above on the Ohio State Test in third grade than remaining fully remote or using hybrid instruction.

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- Null Hypothesis 1: There is no statistically significant difference in the percentage of students scoring proficient or above in districts that returned to in-person learning when compared to districts that remained fully remote or hybrid.
- Research Hypothesis 2: There is a statistically significant difference between test scores based on instructional modality when the data is disaggregated by district typology.
- Null Hypothesis 2: There is no statistically significant difference between test scores based on instructional modality when the data is disaggregated by typology.
- Research Hypothesis 3: There is a statistically significant difference between test scores based on instructional modality when the data is disaggregated by race/ethnicity.
- Null Hypothesis 3: There is no statistically significant difference between test scores based on instructional modality when the data is disaggregated by race/ethnicity.
- Research Hypothesis 4: There is a statistically significant difference between test scores of economically disadvantaged students based on instructional modality.
- Null Hypothesis 4: There is no statistically significant difference between test scores of economically disadvantaged students based on instructional modality.

To address the research questions, a MANOVA test was used to compare the mean scores during the three separate years. A repeated measures ANOVA was originally considered, however, due to a violation in the assumption of sphericity, as indicated by Mauchly's Test of Sphericity, the method for testing was changed. The outcomes of the Pairwise Comparisons also

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supported using the MANOVA rather than the repeated measures to better address the research questions. Assumptions that must be met for a MANOVA include sample size, normality, outliers, linearity, homogeneity of variance, and multicollinearity. The results of the hypothesis testing are included in this chapter.

### **Sampling and Data Collection**

For this quantitative study, archival data was collected through existing data sets from the Ohio Department of Education that are available to the public. The first source of data collected for this study was school district achievement data on the Ohio State Test for English Language Arts with a focus on third grade proficiency levels. Data on the percentage of students in each district scoring proficient or above on the state test was collected for the following school years: 2018-2019, 2020-2021, and 2021-2022. This was accessed through downloadable files entitled “District Achievement Ratings” located on the Ohio Department of Education’s website. Data from the Ohio Department of Education’s advanced reports was also downloaded to show disaggregated test results by district based on race and ethnicity and the district proficiency levels for the economically disadvantaged population.

The second set of data that was collected for this study was school district modality of instruction for the 2020-2021 school year. This data was obtained by emailing a request to the Office of Research, Evaluation & Advanced Analytics at the Ohio Department of Education. A downloadable spreadsheet was provided in an Excel document listing school district instructional modality by week during the 2020-2021 school year. The public school data was sorted into three categories: school districts that committed to full time in-person learning five days per week at the start of the 2020-2021 school year, school districts that were operating in fully remote status, and school districts who were hybrid, meaning they opened the 2020-2021 school

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year with a mix on in-person and remote instruction. Data under the column date of September 10, 2020 was used to determine the category designation for each school district (in-person full time, hybrid, or fully remote), based on the recommendation from that office.

The data was then coded as follows:

In-person 5 days per week = 1

Hybrid = 2

Fully Remote = 3

School district typology data was also collected and downloaded from the Ohio Department of Education website. Geography characteristics and poverty levels were combined to create a typology for each school district in Ohio. District typology was coded into eight different categories and reported on the District Typology Report as described in Table 3.

### **Assumptions**

Prior to hypothesis testing, preliminary assumption testing was conducted. For Overall District data the sample size of 604 districts overall, with the smallest subgroup being 32 districts, was adequate. Normality was assumed based on the Central Limit Theorem, which states that as samples increase to a number greater than 30, “the sampling distribution has a normal distribution with a mean equal to the population mean” (Field, 2018, p. 49). The assumption of linearity was satisfactory per inspection of the scatterplot of the means (see Appendix C, Figure C1). There were some outliers found in the data set based on the Mahalanobis distance critical value of 16.27; however, when those outliers were removed the outcomes were not affected. When testing for homogeneity of variance and multicollinearity, some data subsets did indicate a *p*-value less than .05 and the Levene’s Test of Equality of Error



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Variances is significant for all groups at  $p < .001$ ; therefore the data should be viewed with caution.

Next, preliminary assumption testing was conducted with the data set for each race/ethnicity group's scores. The sample sizes were all adequate with the smallest sample group consisting of 32 districts. Normality was assumed based on the Central Limit Theorem (Field, 2018). The assumption of linearity was satisfactory per inspection of the scatterplot of the means (see Appendix C, Figure C2). There were no outliers found in the data set based on the Mahalanobis distance critical value of 16.27 for Asian, Black, or Hispanic; however, there were mild outliers found in the White category (maximum value = 17.08). When those values were removed, the outcomes were not affected. The assumption of homogeneity of variance was tenable based on the results of all Box's M results being greater than .001. A Pearson's correlation analysis suggested that the assumption of multicollinearity was met for all groups with  $r$  values greater than .3 and less than .9. The Levene's Test of Equality of Error Variances was also non-significant for all groups, except for the White group ( $p < .001$ ); therefore the data or that group should be viewed with caution.

Finally, preliminary assumption testing was conducted with the data set for the economically disadvantaged population scores. The sample size was adequate with 526 districts and the smallest sample group consisted of 80 districts. Normality was assumed based on the Central Limit Theorem (Field, 2018). The assumption of linearity was satisfactory per inspection of the scatterplot of the means (see Appendix C, Figure C3). There were no outliers found in the data set based on the Mahalanobis distance critical value of 16.27. The assumption of homogeneity of variance was tenable based on the results of all Box's M results being greater than .001 ( $p = .005$ ). A Pearson's correlation analysis suggested that the assumption of

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multicollinearity was met with  $r$  values greater than .3 and less than .9. The Levene's Test of Equality of Error Variances was also non-significant for each year with  $p = .455$ ,  $p = .179$ , and  $p = .742$ , respectively.

### Hypothesis Testing

**Research Question 1: Is there a significant difference in ELA scores of third grade students who attended Ohio school districts that fully reopened to in-person learning in the fall of 2020 when compared to districts that remained hybrid or online?**

To address the first research question and investigate whether or not there is a difference between district instructional modality on overall district ELA test scores in each of the three years, a One-Way Multivariate Analysis of Variance (One-Way MANOVA) was conducted. Descriptive statistics were analyzed for the dependent variable, the overall district percentage of students scoring proficient or above on the Ohio State Test for ELA, disaggregated by the independent variable, instructional modality using IBM's SPSS Statistics Version 29.0.0.0 (241). The results are shown in Table 5.

**Table 5**

*Dependent Variable, % Proficient Overall District Score, Descriptive Statistics Disaggregated by Independent Variable, Instructional Modality (N = 604)*

Variable	5-Day In-Person (n = 350)		Hybrid (n = 167)		Fully Remote (n = 87)	
	M	SD	M	SD	M	SD
2018-2019 Overall District % Proficient	75.77	12.17	73.58	12.50	69.15	16.62
2020-2021 Overall District % Proficient	62.19	14.08	57.92	14.55	50.82	21.36
2021-2022 Overall District % Proficient	68.89	13.13	65.58	13.24	59.46	18.14

In total, data was analyzed for 604 districts ( $N = 604$ ). The groups had an unequal number of participants, with the largest number of districts utilizing 5-day in-person instruction ( $n = 350$ ) and the smallest group being districts that utilized fully remote instruction ( $n = 87$ ). The means of the overall score for districts in the 5-day in-person group were the highest in all three school years ( $M = 75.77$ ,  $SD = 12.17$ ); ( $M = 62.19$ ,  $SD = 14.08$ ); and ( $M = 68.89$ ,  $SD = 13.13$ ). The means for districts in the fully remote group were lowest for all three years ( $M = 69.15$ ,  $SD = 16.62$ ); ( $M = 50.82$ ,  $SD = 21.36$ ); and ( $M = 59.46$ ,  $SD = 18.14$ ). Districts in the hybrid instruction group ( $n = 167$ ) had means between the highest and lowest scores for each of the three years ( $M = 73.58$ ,  $SD = 12.50$ ); ( $M = 57.92$ ,  $SD = 14.55$ ); and ( $M = 65.58$ ,  $SD = 13.24$ ).

A one-way MANOVA was conducted. Pillai's Trace was used as it is the most robust multivariate test when assumptions may be violated (Field, 2018). The result of the Multivariate Test is shown in Table 6.

**Table 6**

*Multivariate Tests for Dependent Variable Overall District % Proficient*

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Observed Power
Pillai's Trace	0.067	6.88	6	1200	<.001	0.03	1.00

The analysis showed a statistically significant effect was obtained,  $F(6, 1200) = 6.88, p < .001$ , Pillai's Trace = .067, partial Eta squared = .03, observed power = 1.00. Based on these results we reject the null hypothesis and conclude that there was a statistically significant difference in overall district test scores based on instructional modality group. Partial eta squared measures the effect size in different variables. As a reference, .01 is considered a small effect size, .06 is a medium effect size and .14 and higher is a large effect size (SPSS Tutorials, 2023). In this test, the result of .03 indicated that approximately 3% of multivariate variance of the dependent variables was associated with the group factor and the effect size was small. The observed power result of 1.00 indicated that there was a 100% chance that results could have come out significant.

The test of between-subjects effects table illustrates how the dependent variables (Percentage of Overall District Population Proficient for each year) are different for the independent variable (Instructional Modality) by providing univariate ANOVA results. Table 7 includes the results of the between-subjects effects and the separate ANOVA results.

**Table 7**

*Tests of Between-Subjects Effects, Dependent Variables, % Overall District Proficient Scores, and Independent Variable, Instructional Modality*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Instructional Modality	2018-2019 % Overall Proficient - District	3147.92	2	1573.96	9.33	<.001	0.03
	2020-2021 % Overall Proficient - District	9503.38	2	4751.69	19.89	<.001	0.06
	2021-2022 % Overall Proficient - District	6429.53	2	3214.76	16.44	<.001	0.05

The results indicated that all three dependent variables were statistically significant for districts among the different instructional modality groups. The 2018-2019 school year indicated  $F(2, 601) = 9.33, p < .001$ , partial eta squared = .03. The 2020-2021 school year indicated  $F(2, 601) = 19.89, p < .001$ , partial eta squared = .06. The 2021-2022 school year indicated  $F(2, 601) = 16.44, p < .001$ , partial eta squared = .05. The effect size for the 2018 – 2019 school year was small with both the 2020-2021 and 2021-2022 school years having medium effect sizes. A post hoc was run to determine which pairs of means were different.

The Games-Howell post hoc comparison was selected to ensure accuracy when sample sizes are unequal, and homogeneity of variance violations may be present (Field, 2018). The post hoc was run to evaluate pairwise differences among group means. The results are shown in Table 8.

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**Table 8**

*Games-Howell Pairwise Comparisons for Overall District Data*

Dependent Variable	(I) Instructional Modality	(J) Instructional Modality	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
2018-2019 % Overall Proficient - District	5-Day In-Person	Hybrid	2.20	1.16	0.145	-0.55	4.94
		Fully Remote	6.62*	1.90	0.002	2.11	11.13
	Hybrid	5-Day In-Person	-2.20	1.16	0.145	-4.94	0.55
		Fully Remote	4.43	2.02	0.078	-0.38	9.23
	Fully Remote	5-Day In-Person	-6.62*	1.89	0.002	-11.13	-2.12
		Hybrid	-4.43	2.02	0.078	-9.23	0.38
2020-2021 % Overall Proficient - District	5-Day In-Person	Hybrid	4.28*	1.35	0.005	1.09	7.47
		Fully Remote	11.37*	2.41	<.001	5.64	17.11
	Hybrid	5-Day In-Person	-4.28*	1.35	0.005	-7.47	-1.09
		Fully Remote	7.10*	2.5	0.017	1.04	13.15
	Fully Remote	5-Day In-Person	-11.37*	2.4	<.001	-17.11	-5.64
		Hybrid	-7.10*	2.55	0.017	-13.15	-1.05
2021-2022 % Overall Proficient - District	5-Day In-Person	Hybrid	3.31*	1.24	0.022	0.38	6.23
		Fully Remote	9.42*	2.07	<.001	4.51	14.33
	Hybrid	5-Day In-Person	-3.31*	1.24	0.022	-6.23	-0.38
		Fully Remote	6.11*	2.20	0.017	0.90	11.32
	Fully Remote	5-Day In-Person	-9.42*	2.07	<.001	-14.33	-4.51
		Hybrid	-6.11*	2.20	0.017	-11.32	-0.90

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*Note.* Based on estimated marginal means.

\*The mean difference is significant at the .05 level.

Tests revealed significant pairwise differences on several dependent variables. For the 2018-2019 overall district percentage of students scoring proficient, there was a statistically significant difference in the pairwise comparison for 5-Day In-Person and Fully Remote ( $p = .002$ ). For the 2020-2021 overall district percentage of students scoring proficient, there was a statistically significant difference for 5-Day In-Person and Hybrid ( $p = .005$ ), 5-Day In-Person and Fully Remote ( $p < .001$ ), and Fully Remote and Hybrid ( $p < .017$ ). For the 2021-2022 overall district percentage of students scoring proficient, there was a statistically significant difference in the pairwise comparison for 5-Day In-Person and Hybrid ( $p = .022$ ), 5-Day In-Person and Fully Remote ( $p < .001$ ), and Fully Remote and Hybrid ( $p = .017$ ).

Upon examination of the mean scores, districts providing 5-Day In-Person learning had significantly higher scores than those that provided fully remote instruction for all three years with a mean difference of 6.62, 11.37, and 9.42 respectively. Districts that provided hybrid instruction had significantly lower scores than those engaging in 5-Day In-Person instruction in both the 2020-2021 and 2021-2022 school years with a mean difference of -4.28 and -3.31; however, Hybrid instruction had significantly higher tests scores than fully remote instruction in both years with mean differences of 6.11 in the 2020-2021 school year and 7.10 in the 2021-2022 school year.

**Research Question 2: Is there a significant difference in the ELA scores of third grade students based on district typology when comparing Ohio school districts that were in-person to districts that remained hybrid or online?**

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To address the second research question and investigate whether or not there is a difference between district instructional modality on overall district ELA test scores in each of the three years when controlled for district typology, a Two-Way Multivariate Analysis of Variance (Two-Way MANOVA) was conducted. The two-way MANOVA is a statistical test that allows the researcher to examine more than one independent variable on the dependent variable in multiple ways. Not only are the factors reported individually, but also collectively to examine the influence that each has together, also referred to as an interaction. “An interaction is the result of the two independent variables combining to produce a result that is different from a result that is produced by either variable alone” (Beyer, 2021)

Geography characteristics and poverty levels were combined to create a typology for each school district in Ohio (Ohio Department of Education, 2013). Geography characteristics included three categories: rural, suburban, and urban. Poverty level had five categories: very low, low, average, high, and very high. These variables, as well as student population, were combined into eight different categories and reported on the District Typology Report (Table 3).

The typology classifications were created by the Ohio Department of Education in 2013 using several data sources to classify similar districts based on shared demographic and geographic characteristics (Ohio Department of Education, 2013).

A crosstabulation was run to gain further insight into the proportion of cases in each subgroup and to examine the difference between observed participant counts to determine which variables may have an impact on the association. The results of the crosstabulation are displayed in Table 9.



**Table 9***Typology Code and Instructional Modality Crosstabulation (N = 604)*

Typology	Instructional Modality			Total (N = 604)
	5-Day In-Person (n = 350)	Hybrid (n = 167)	Fully Remote (n = 87)	
1 Rural High Pov Small Pop	88	29	5	123
2 Rural Avg Pov Very Small Pop	73	28	4	106
3 Sm Town Low Pov Small Pop	71	37	2	110
4 Sm Town High Pov Avg Pop	57	24	8	89
5 Suburban Low Pov Avg Pop	30	23	24	77
6 Suburban Very Low Pov Lg Pop	18	12	16	46
7 Urban High Pov Avg Pop	13	13	21	47
8 Urban Very High Pov Very Lg Pop	0	1	7	8

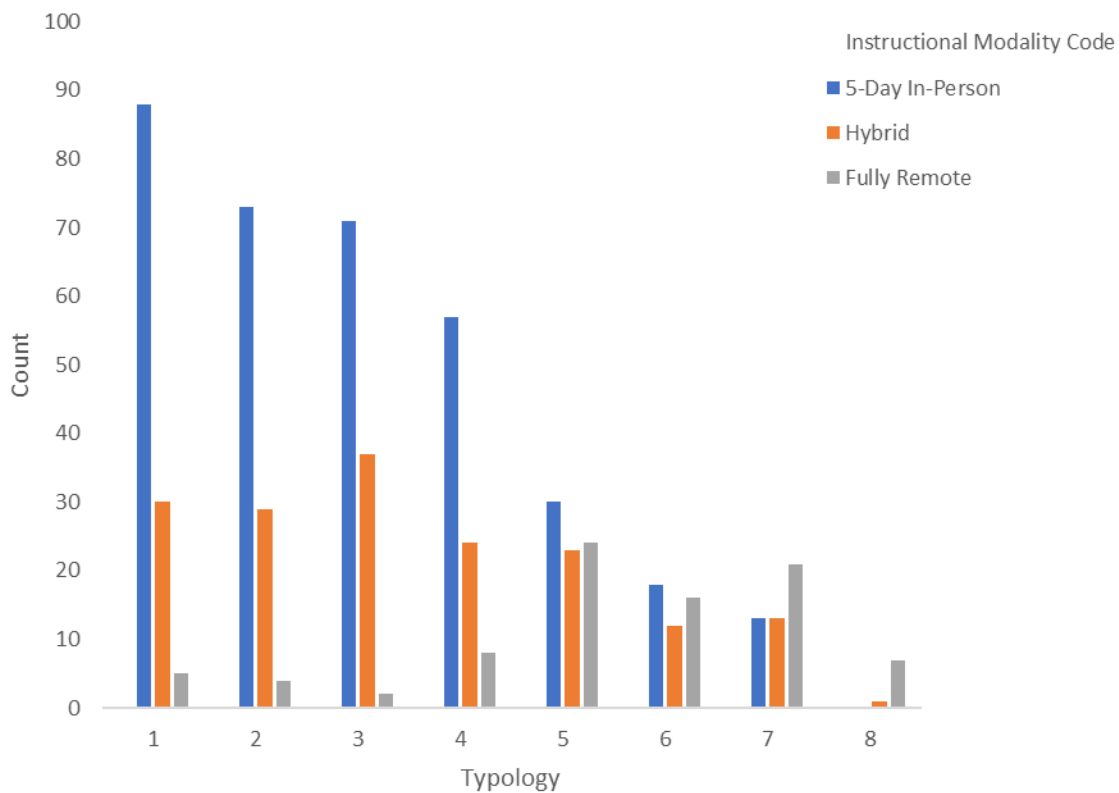
The crosstabulation indicated the largest group of districts were in Typology 1, rural districts with high poverty levels and small student populations ( $n = 123$ ). Typology 1 had the largest number of districts using 5-day in-person instruction with  $n = 88$  districts. This typology also had 29 districts utilizing hybrid instruction and five districts utilizing fully remote instruction. Typology 3, small town districts with low poverty levels and small populations, was the second largest group ( $n = 110$ ) and had the smallest number of fully remote districts ( $n = 2$ ).

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The smallest group of districts were in Typology 8, urban districts with very high poverty levels and very large student populations ( $n = 8$ ), which had zero districts engaging in 5-day in-person instruction, one district utilizing hybrid instruction, and seven districts utilizing fully remote instruction. A clustered bar chart is shown in Figure 3 to further illustrate the total number of districts in each subgroup.

**Figure 3**

*District Typology Code and Instructional Modality Clustered Bar Chart (N = 604)*



The bar chart further illustrates that as the Typology becomes more urban with higher poverty levels and higher populations, fewer districts provided in-person instruction. Rural and small-town districts utilized more in-person instruction overall than suburban and urban districts. There was also a higher total number of districts in those typology groups.

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Descriptive statistics for the Two-Way MANOVA with independent variables of instructional modality and typology were calculated using IBM's SPSS Statistics Version 29.0.0.0 (241) and are shown in Table 10.

**Table 10**

*Dependent Variable, Overall District % Proficient, Descriptive Statistics Disaggregated by Dependent Variables Instructional Modality and Typology (N = 604)*

	Instructional Modality	Typology	Mean	Std. Deviation	N
2018-2019 % Overall Proficient - District	5-Day In-Person	1 Rural High Pov Small Pop	72.36	11.33	88
		2 Rural Avg Pov Very Small Pop	78.62	10.96	73
		3 Sm Town Low Pov Small Pop	79.63	8.62	71
		4 Sm Town High Pov Avg Pop	70.40	10.74	57
		5 Suburban Low Pov Avg Pop	80.43	8.49	30
		6 Suburban Very Low Pov Lg Pop	89.08	4.78	18
		7 Urban High Pov Avg Pop	56.06	19.27	13
		Total	75.77	12.16	350
	Hybrid	1 Rural High Pov Small Pop	70.07	11.56	29

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Instructional Modality	Typology	Mean	Std. Deviation	N
	2 Rural Avg Pov Very Small Pop	78.56	9.54	28
	3 Sm Town Low Pov Small Pop	77.31	9.06	37
	4 Sm Town High Pov Avg Pop	63.68	8.40	24
	5 Suburban Low Pov Avg Pop	78.80	8.06	23
	6 Suburban Very Low Pov Lg Pop	87.40	7.65	12
	7 Urban High Pov Avg Pop	59.12	13.33	13
	8 Urban Very High Pov Very Lg Pop	36.50	.	1
	Total	73.57	12.49	167
Fully Remote	1 Rural High Pov Small Pop	64.90	10.37	5
	2 Rural Avg Pov Very Small Pop	80.45	10.28	4
	3 Sm Town Low Pov Small Pop	77.85	1.34	2
	4 Sm Town High Pov Avg Pop	62.90	20.41	8
	5 Suburban Low Pov Avg Pop	75.01	8.90	24
	6 Suburban Very Low Pov Lg Pop	87.67	6.53	16

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	Instructional Modality	Typology	Mean	Std. Deviation	N
		7 Urban High Pov Avg Pop	56.92	10.37	21
		8 Urban Very High Pov Very Lg Pop	44.64	11.13	7
		Total	69.15	16.61	87
2020-2021 % Overall Proficient - District	5-Day In- Person	1 Rural High Pov Small Pop	56.82	10.80	88
		2 Rural Avg Pov Very Small Pop	66.70	14.00	73
		3 Sm Town Low Pov Small Pop	66.79	10.16	71
		4 Sm Town High Pov Avg Pop	56.86	12.58	57
		5 Suburban Low Pov Avg Pop	65.51	11.46	30
		6 Suburban Very Low Pov Lg Pop	79.26	7.03	18
		7 Urban High Pov Avg Pop	40.10	20.62	13
		Total	62.19	14.08	350
	Hybrid	1 Rural High Pov Small Pop	54.58	11.45	29
		2 Rural Avg Pov Very Small Pop	61.32	12.90	28

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Instructional Modality	Typology	Mean	Std. Deviation	N
	3 Sm Town Low Pov Small Pop	63.12	12.50	37
	4 Sm Town High Pov Avg Pop	46.19	8.44	24
	5 Suburban Low Pov Avg Pop	62.44	11.91	23
	6 Suburban Very Low Pov Lg Pop	76.58	9.32	12
	7 Urban High Pov Avg Pop	42.23	11.78	13
	8 Urban Very High Pov Very Lg Pop	23.90	.	1
	Total	57.91	14.55	167
Fully Remote	1 Rural High Pov Small Pop	40.26	2.55	5
	2 Rural Avg Pov Very Small Pop	68.42	14.66	4
	3 Sm Town Low Pov Small Pop	66.70	1.69	2
	4 Sm Town High Pov Avg Pop	43.57	15.97	8
	5 Suburban Low Pov Avg Pop	57.86	13.84	24
	6 Suburban Very Low Pov Lg Pop	75.98	11.80	16
	7 Urban High Pov Avg Pop	33.48	14.26	21

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	Instructional Modality	Typology	Mean	Std. Deviation	N
		8 Urban Very High Pov Very Lg Pop	22.40	5.79	7
		Total	50.82	21.35	87
2021-2022 % Overall Proficient - District	5-Day In-Person	1 Rural High Pov Small Pop	64.74	9.96	88
		2 Rural Avg Pov Very Small Pop	72.33	13.47	73
		3 Sm Town Low Pov Small Pop	73.35	9.99	71
		4 Sm Town High Pov Avg Pop	62.51	10.72	57
		5 Suburban Low Pov Avg Pop	73.65	10.92	30
		6 Suburban Very Low Pov Lg Pop	83.98	5.52	18
		7 Urban High Pov Avg Pop	49.16	20.54	13
		Total	68.88	13.12	350
	Hybrid	1 Rural High Pov Small Pop	61.67	14.17	29
		2 Rural Avg Pov Very Small Pop	68.90	10.62	28
		3 Sm Town Low Pov Small Pop	70.00	10.92	37

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Instructional Modality	Typology	Mean	Std. Deviation	N
	4 Sm Town High Pov Avg Pop	55.88	7.67	24
	5 Suburban Low Pov Avg Pop	71.05	9.43	23
	6 Suburban Very Low Pov Lg Pop	81.15	6.73	12
	7 Urban High Pov Avg Pop	50.89	9.56	13
	8 Urban Very High Pov Very Lg Pop	32.80	.	1
	Total	65.57	13.23	167
Fully Remote	1 Rural High Pov Small Pop	51.70	15.86	5
	2 Rural Avg Pov Very Small Pop	68.27	4.44	4
	3 Sm Town Low Pov Small Pop	67.75	12.94	2
	4 Sm Town High Pov Avg Pop	52.26	16.33	8
	5 Suburban Low Pov Avg Pop	67.67	10.48	24
	6 Suburban Very Low Pov Lg Pop	80.10	6.99	16
	7 Urban High Pov Avg Pop	45.28	11.96	21
	8 Urban Very High Pov Very Lg Pop	33.07	8.09	7



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Instructional Modality	Typology	Mean	Std. Deviation	N
	Total	59.46	18.14	87

Data was analyzed for 604 districts ( $N = 604$ ). The groups had an unequal number of participants with no districts from Typology 8 included in the 5-Day In-Person instructional modality group. The highest means for all three years and in all instruction modality groups were recorded for Typology 6, which were suburban districts with very low poverty and large student populations. The lowest means were reported for Typology 8 in the hybrid and remote instructional modality groups.

The results of the Multivariate Tests are shown in Table 11.

**Table 11**

*Multivariate Tests for Dependent Variable Overall District % Proficient with Independent Variables of Instructional Modality and Typology<sup>a</sup>*

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Observed Power <sup>d</sup>
Instructional Modality	Pillai's Trace	0.03	3.2	6	1160	0.004	0.02	0.93
Typology	Pillai's Trace	0.42	13.31	21	1743	<.001	0.14	1.00
Instructional Modality * Typology	Pillai's Trace	0.05	0.7	39	1743	0.919	0.01	0.79

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*Note.* <sup>a</sup>Design: Intercept + Instructional Modality + Typology + Instructional Modality \* Typology

<sup>d</sup>Computed using alpha = .05

The analysis yielded a significant effect for instructional modality and typology separately, however, the interaction effect between instructional modality and typology was found to be a non-significant result. This indicated that there was no combined effect for instructional modality and typology on achievement. The interaction results for the Two-Way MANOVA are  $F(39, 1743) = 0.7, p = .919$ , Pillai's Trace = .05, partial Eta squared = .01, observed power = .79. The interaction effect was weaker than each variable individually as well with the partial Eta squared for the interaction being .01. The observed power of the interaction of .79 indicated a 79% chance of the results of the interaction coming out significant, whereas the results of the variables separately had higher observed powers. Based on these results there was not sufficient evidence to reject the null hypothesis, so the null hypothesis was accepted and concluded that Typology and Instructional Modality interaction did not have a significant effect on the dependent variable.

However, typology analyzed independently on the dependent variables had a significant effect ( $p < .001$ ) as well as an observed power of 1.00 and a large effect size with a partial Eta Squared of .14. These results may warrant further investigation in future studies.

**Research Question 3: Is there a significant difference in the ELA test scores of third grade students based on race/ethnicity when comparing Ohio school districts that were in-person to districts that remained hybrid or online?**

The third research question investigated whether or not there was a difference between district instructional modality on overall district ELA test scores in each of the three years when

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broken down by race/ethnicity. Race/ethnicity is separated into four different data sets (Asian, Black, Hispanic, and White). A one-way MANOVA was run for the data in each racial group.

### Asian Population

To analyze data for Asian students, district data on the percentage of Asian students scoring proficient or above for the 2018 – 2022 school years was utilized. Descriptive statistics for the dependent variable, the percentage of the Asian population in the district scoring proficient or above, disaggregated by the independent variable, instructional modality, are shown in Table 12.

**Table 12**

*Dependent Variable, % of Asian Population Scoring Proficient, Descriptive Statistics*

*Disaggregated by Independent Variable (N = 32)*

Variable	5-Day In-Person (n = 8)		Hybrid (n = 7)		Fully Remote (n = 17)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
2018-2019 % Proficient Asian Population	82.84	13.55	77.89	8.67	75.25	14.50
2020-2021 % Proficient Asian Population	72.13	11.88	65.01	14.12	57.13	20.15
2021-2022 % Proficient Asian Population	74.96	9.77	65.13	16.06	66.08	19.58

Not all school districts reported a score for Asian students for all three years. Districts that did not report scores for Asian students were excluded from this data set as part of the MANOVA procedures. The valid data set includes 32 districts ( $N = 32$ ), which is a relatively small sample size, but still large enough to run a MANOVA with three groups. The largest group being those with fully remote instruction ( $n = 17$ ) and the smallest group being those with 5-day

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in-person instruction ( $n = 8$ ). The means for districts that selected the 5-day in-person group were the highest in all three school years ( $M = 82.84, SD = 13.55$ ); ( $M = 72.13, SD = 11.88$ ); and ( $M = 74.96, SD = 9.77$ ). The means for districts in the fully remote group were lowest for all three years ( $M = 75.25, SD = 14.50$ ); ( $M = 57.13, SD = 20.15$ ); and ( $M = 66.08, SD = 19.58$ ).

The result of Multivariate Test is shown in Table 13.

**Table 13**

*Multivariate Tests for Dependent Variable % Asian Population Proficient*

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Observed Power
Pillai's Trace	0.33	1.82	6	56.0	.111	0.16	.63

The analysis showed a non-significant effect was obtained,  $F(6, 56) = 1.82, p < .111$ , Pillai's Trace = .33, partial Eta squared = .16, observed power = .63. Based on these results we accepted the null hypothesis and concluded that there was not a statistically significant difference in the district reported percentage of Asian students scoring proficient based on instructional modality group. Additionally, the tests of between-subjects effects indicated there was no significant effect of instructional modality on the 2018 – 2019 percentage of Asian students scoring proficient,  $F(2, 29) = .89, p = .421$ , partial eta squared = .06. There was no significant effect of instructional modality on the 2020 – 2021 percentage of Asian students scoring proficient,  $F(2, 29) = 2.13, p = .137$ , partial eta squared = .128. There was no significant effect of instructional modality on the 2021 – 2022 percentage of Asian students scoring proficient,  $F(2, 29) = .88, p = .424$ , partial eta squared = .06. Therefore, we failed to reject the null hypothesis and concluded that there was no difference between instructional modality on the district

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reported percentage of Asian students scoring proficient on the Ohio State ELA test for the reported years.

Despite the non-significant results, further inquiry into the between-subjects effects and univariate ANOVA results were conducted to better understand the results. The results of the between subjects-effects are displayed in Table 14.

**Table 14**

*Tests of Between-Subjects Effects, Dependent Variables, % Asian-Pacific Islander Proficient Scores, and Independent Variable, Instructional Modality*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Instructional Modality	2018-2019 % Asian – Pacific Islander % Proficient	313.17	2	156.59	.89	.421	.06
	2020-2021 % Asian – Pacific Islander % Proficient	1275.37	2	637.69	2.13	.137	.13
	2021-2022 % Asian – Pacific Islander % Proficient	508.16	2	254.08	.88	.424	.06

The results indicated that all three dependent variables had a statistically non-significant association among the different instructional modality groups. The Games-Howell post hoc test was run to further analyze the pairwise differences among group means. The results are shown in Table 15.

**Table 15**

*Games-Howell Pairwise Comparisons for Percentage of Asian-Pacific Islander Population*

*Proficient*

Dependent Variable	(I) Instructional Modality	(J) Instructional Modality	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
<hr/>							
2018-2019 % Asian – Pacific Islander Proficient	5-Day In-Person	Hybrid	4.95	6.86	.476	-9.08	18.98
		Fully Remote	7.59	5.68	.192	-4.04	19.21
	Hybrid	5-Day In-Person	-4.95	6.86	.476	-18.98	9.08
		Fully Remote	2.63	5.95	.662	-9.54	14.81
	Fully Remote	5-Day In-Person	-7.59	5.68	.192	-19.21	4.041
		Hybrid	-2.63	5.95	.662	-14.81	9.54
<hr/>							
2020-2021 % Asian – Pacific Islander Proficient	5-Day In-Person	Hybrid	7.11	8.95	.434	-11.20	25.42
		Fully Remote	14.99	7.41	.053	-.17	30.16
	Hybrid	5-Day In-Person	-7.11	8.95	.434	-25.42	11.20
		Fully Remote	7.89	7.76	.319	-8.00	23.77
	Fully Remote	5-Day In-Person	-14.99	7.41	.053	-30.16	.17
		Hybrid	-7.89	7.76	.319	-23.77	8.00
<hr/>							

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Dependent Variable	(I) Instructional Modality	(J) Instructional Modality	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
2021-2022 % Asian – Pacific Islander Proficient	5-Day In-Person	Hybrid	9.83	8.78	.272	-8.12	27.79
		Fully Remote	8.89	7.27	.232	-5.99	23.76
	Hybrid	5-Day In-Person	-9.83	8.78	.272	-27.79	8.12
		Fully Remote	-.95	7.61	.902	-16.53	14.63
	Fully Remote	5-Day In-Person	-8.89	7.27	.232	-23.76	5.99
		Hybrid	.95	7.61	.902	-14.63	16.53

*Note.* Based on observed means. The error term is Mean Square (Error) = 170.803.

There were no significant effects found when comparing the mean scores for any groups.

### **Black Population**

To analyze data for Black students, district data on the percentage of Black students scoring proficient or above for the 2018 – 2022 school years was utilized. Descriptive statistics for the dependent variable, the percentage of the Black population in the district scoring proficient or above, disaggregated by the independent variable, instructional modality, are shown in Table 16.

**Table 16**

*Dependent Variable, % of Black Population Scoring Proficient, Descriptive Statistics*

*Disaggregated by Independent Variable (N = 114)*

Variable	5-Day In-Person (n = 28)		Hybrid (n = 32)		Fully Remote (n = 54)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
2018-2019 % Proficient Black Population	52.62	17.95	54.79	15.85	53.62	16.47
2020-2021 % Proficient Black Population	35.89	16.16	36.49	16.55	31.20	16.2
2021-2022 % Proficient Black Population	47.76	16.63	45.78	17.01	43.75	15.98

Not all school districts reported a score for Black students for all three years. Districts that did not report scores for Black students were excluded from this data set as part of the MANOVA procedures. The valid data set includes 114 districts ( $N = 114$ ). The largest group had fully remote instruction ( $n = 54$ ) and the smallest group had 5-day in-person instruction ( $n = 28$ ). For the 2018- 2019 and 2020-2021 school years, the means for districts that selected the hybrid instructional modality in the fall of 2020 were the highest with  $M = 54.79$ ,  $SD = 15.85$  and  $M = 36.49$ ,  $SD = 16.55$ , respectively. In the 2021-2022 school year, districts in the 5-day in-person group had the highest average means with  $M = 47.76$ ,  $SD = 16.63$ . Districts in the fully remote group had the lowest mean scores across all three school years.

The result of Multivariate Test is shown in Table 17.



**Table 17***Multivariate Tests for Dependent Variable % Black Population Proficient*

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Observed Power
Pillai's Trace	0.05	.86	6	220	.526	0.02	.34

The analysis showed a non-significant effect was obtained,  $F(6, 220) = .86, p < .526$ , Pillai's Trace = .05, partial Eta squared = .02, observed power = .34. The effect size is small and there is only a 34% chance results would come out significant. Based on these results we accepted the null hypothesis and concluded that there was not a statistically significant difference in the district reported percentage of Black students scoring proficient based on instructional modality group. The partial eta squared result indicated that only 2% of multivariate variance of the dependent variables was associated with the group factor. Additionally, the tests of between-subjects effects indicated that there was no significant effect of instructional modality on the 2018 – 2019 percentage of Black students scoring proficient,  $F(2, 111) = .13, p = .882$ , partial eta squared = .01. There was no significant effect of instructional modality on the 2020 – 2021 percentage of Black students scoring proficient,  $F(2, 111) = .95, p = .391$ , partial eta squared = .02. There is no significant effect of instructional modality on the 2021 – 2022 percentage of Black students scoring proficient,  $F(2, 111) = .60, p = .553$ , partial eta squared = .01. Therefore, we failed to reject the null hypothesis and concluded that there was no difference between instructional modality on the district reported percentage of Black students scoring proficient on the Ohio State ELA test for the reported years.

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Despite the non-significant results, further inquiry into the between-subjects effects and univariate ANOVA results were conducted to better understand the results. The results of the between-subjects effects are displayed in Table 18.

**Table 18**

*Tests of Between-Subjects Effects, Dependent Variables, % Black Proficient Scores, and Independent Variable, Instructional Modality*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Instructional Modality	2018-2019 Black % Proficient	69.50	2	34.75	.13	.882	.01
	2020-2021 Black % Proficient	509.25	2	254.62	.95	.391	.02
	2021-2022 Black % Proficient	306.28	2	153.14	.60	.553	.01

The results indicated that all three dependent variables have a statistically non-significant association among the different instructional modality groups. The Games-Howell post hoc was run to further analyze the pairwise differences among group means. The results are shown in Table 19.

**Table 19**

*Games-Howell Pairwise Comparisons for Percentage of Black Population Proficient*

Dependent Variable	(I) Instructional Modality	(J) Instructional Modality	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
2018-2019 % Black Proficient	5-Day In-Person	Hybrid	-2.14	4.40	.878	-12.75	8.46
		Fully Remote	-.97	4.05	.969	-10.76	8.82
	Hybrid	5-Day In-Person	2.14	4.40	.878	-8.46	12.75
		Fully Remote	1.17	3.57	.943	-7.40	9.74
	Fully Remote	5-Day In-Person	.97	4.05	.969	-8.82	10.76
		Hybrid	-1.17	3.57	.943	-9.74	7.40
2020-2021 % Black Proficient	5-Day In-Person	Hybrid	-.61	4.22	.989	-10.78	9.57
		Fully Remote	3.89	3.78	.564	-5.23	13.00
	Hybrid	5-Day In-Person	.61	4.22	.989	-9.57	10.78
		Fully Remote	4.49	3.68	.446	-4.34	13.33
	Fully Remote	5-Day In-Person	-3.89	3.78	.564	-13.00	5.23
		Hybrid	-4.49	3.68	.446	-13.33	4.34

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Dependent Variable	(I) Instructional Modality	(J) Instructional Modality	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
2021-2022 % Black Proficient	5-Day In-Person	Hybrid	1.98	4.34	.892	-8.48	12.45
		Fully Remote	4.01	3.75	.538	-5.06	13.08
	Hybrid	5-Day In-Person	-1.98	4.34	.892	-12.45	8.48
		Fully Remote	2.03	3.64	.844	-6.73	10.78
	Fully Remote	5-Day In-Person	-4.01	3.75	.538	-13.08	5.06
		Hybrid	-2.03	3.64	.844	-10.78	6.73

*Note.* Based on observed means. The error term is Mean Square(Error) = 257.123.

There were no significant effects found when comparing the means scores for any groups.

### Hispanic Population

To analyze data for Hispanic students, district data on the percentage of Hispanic students scoring proficient or above for the 2018 – 2022 school years was utilized. Descriptive statistics for the dependent variable, the percentage of the Hispanic population in the district scoring proficient or above, disaggregated by the independent variable, instructional modality, are shown in Table 20.

**Table 20**

*Dependent Variable, % of Hispanic Population Scoring Proficient, Descriptive Statistics*

*Disaggregated by Independent Variable (N = 104)*

Variable	5-Day In-Person (n = 36)		Hybrid (n = 28)		Fully Remote (n = 40)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
2018-2019 % Proficient Hispanic Population	65.18	16.82	63.67	16.80	60.35	17.70
2020-2021 % Proficient Hispanic Population	47.44	19.13	43.54	15.98	40.03	18.43
2021-2022 % Proficient Hispanic Population	54.61	18.39	55.85	17.55	46.83	17.56

Not all school districts reported a score for Hispanic students for all three years. Districts that did not report scores for Hispanic students were excluded from this data set as part of the MANOVA procedures. The valid data set includes 104 districts ( $N = 104$ ). The largest group had fully remote instruction ( $n = 40$ ) and the smallest group had hybrid instruction ( $n = 28$ ). For the 2018- 2019 and 2020-2021 school years, the means for districts that selected the 5-day in-person instructional modality in the fall of 2020 were the highest with  $M = 65.18$ ,  $SD = 16.82$  and  $M = 47.44$ ,  $SD = 19.13$ , respectively. In the 2021-2022 school year, districts in the hybrid group had the highest average means with  $M = 55.85$ ,  $SD = 17.55$ . Districts in the fully remote group had the lowest means scores across all three school years.

The result of Multivariate Test is shown in Table 21.

**Table 21***Multivariate Tests for Dependent Variable % Hispanic Population Proficient*

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Observed Power
Pillai's Trace	0.07	1.27	6	200	.275	0.04	.49

The analysis showed a non-significant effect was obtained,  $F(6, 200) = 1.27, p < .275$ , Pillai's Trace = .07, partial Eta squared = .04, observed power = .49. The effect size is small and there is a 49% chance results would come out significant. Based on these results we accepted the null hypothesis and concluded that there was not a statistically significant difference in the district reported percentage of Hispanic students scoring proficient based on the instructional modality group. Additionally, the tests of between-subjects effects indicated that there was no significant effect of instructional modality on the 2018 – 2019 percentage of Hispanic students scoring proficient,  $F(2,101) = .790, p = .457$ , partial eta squared = .015. There was no significant effect of instructional modality on the 2020 – 2021 percentage of Hispanic students scoring proficient,  $F(2,101) = 1.596, p = .208$ , partial eta squared = .031. There was no significant effect of instructional modality on the 2021 – 2022 percentage of Hispanic students scoring proficient,  $F(2,101) = 2.713, p = .071$ , partial eta squared = .051. Therefore, we failed to reject the null hypothesis and concluded that there was no difference between instructional modality on the district reported percentage of Hispanic students scoring proficient on the Ohio State ELA test for the reported years.

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Despite the non-significant results, further inquiry into the between-subjects effects and univariate ANOVA results were conducted to better understand the results. The results of the between-subjects effects are displayed in Table 22.

**Table 22**

*Tests of Between-Subjects Effects, Dependent Variables, % Hispanic Proficient Scores, and Independent Variable, Instructional Modality*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Instructional Modality	2018-2019 Hispanic % Proficient	465.44	2	232.72	.79	.457	.02
	2020-2021 Hispanic % Proficient	1041.53	2	520.76	1.59	.208	.03
	2021-2022 Hispanic % Proficient	1727.83	2	863.91	2.71	.071	.05

The results indicated that all three dependent variables have a statistically non-significant association among the different instructional modality groups. The Games-Howell post hoc was run to further analyze the pairwise differences among group means. The results are shown in Table 23.

**Table 23***Games-Howell Pairwise Comparisons for Percentage of Hispanic Population Proficient*

Dependent Variable	(I) Instructional Modality Code	(J) Instructional Modality Code	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
2018-2019 % Hispanic Proficient	5-Day In-Person	Hybrid	1.51	4.23	.932	-8.68	11.70
		Fully Remote	4.84	3.96	.445	-4.64	14.31
	Hybrid	5-Day In-Person	-1.51	4.23	.932	-11.70	8.68
		Fully Remote	3.33	4.23	.713	-6.85	13.50
	Fully Remote	5-Day In-Person	-4.84	3.96	.445	-14.31	4.64
		Hybrid	-3.33	4.23	.713	-13.50	6.85
2020-2021 % Hispanic Proficient	5-Day In-Person	Hybrid	3.90	4.39	.650	-6.65	14.44
		Fully Remote	7.41	4.32	.206	-2.92	17.75
	Hybrid	5-Day In-Person	-3.90	4.39	.650	-14.44	6.65
		Fully Remote	3.52	4.19	.681	-6.56	13.59
	Fully Remote	5-Day In-Person	-7.41	4.32	.206	-17.75	2.92
		Hybrid	-3.52	4.19	.681	-13.59	6.56
2021-2022 % Hispanic Proficient	5-Day In-Person	Hybrid	-1.24	4.51	.959	-12.10	9.61
		Fully Remote	7.78	4.13	.152	-2.12	17.67
	Hybrid	5-Day In-Person	1.24	4.51	.959	-9.61	12.10
		Fully Remote	9.02	4.32	.102	-1.38	19.42
	Fully Remote	5-Day In-Person	-7.78	4.13	.152	-17.67	2.12
		Hybrid	-9.02	4.32	.102	-19.42	1.38

*Note.* Based on observed means. The error term is Mean Square(Error) = 318.479.



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There were no significant effects found when comparing the mean scores for any groups.

### White Population

To analyze data for White students, district data on the percentage of White students scoring proficient or above for the 2018 – 2022 school years was utilized. Descriptive statistics for the dependent variable, the percentage of the White population in the district scoring proficient or above, disaggregated by the independent variable, instructional modality, are shown in Table 24.

**Table 24**

*Dependent Variable, % of White Population Scoring Proficient, Descriptive Statistics*

*Disaggregated by Independent Variable (N = 569)*

Variable	5-Day In-Person (n = 331)		Hybrid (n = 162)		Fully Remote (n = 76)	
	M	SD	M	SD	M	SD
2018-2019 % Proficient White Population	75.91	11.00	74.74	11.42	73.78	14.74
2020-2021 % Proficient White Population	65.52	12.83	59.22	13.56	57.41	17.88
2021-2022 % Proficient White Population	69.02	12.00	66.44	12.76	65.22	15.88

Not all school districts reported a score for White students for all three years. Districts that did not report scores for White students were excluded from this data set as part of the MANOVA procedures. The valid data set includes 569 districts (N = 569). The largest group had 5-day in-person instruction (n = 331) and the smallest group had fully remote instruction (n = 76). The means for districts that selected the 5-day in-person group were the highest in all three

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school years ( $M = 75.91, SD = 11.00$ ); ( $M = 65.52, SD = 12.83$ ); and ( $M = 69.02, SD = 12.00$ ).

The means for districts in the fully remote group were lowest for all three years ( $M = 73.78, SD = 14.74$ ); ( $M = 57.41, SD = 17.88$ ); and ( $M = 65.22, SD = 15.88$ ).

The result of Multivariate Test is shown in Table 25.

**Table 25**

*Multivariate Tests for Dependent Variable % White Population Proficient*

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Observed Power
Pillai's Trace	0.03	2.36	6	200	.029	0.01	.81

The analysis showed a statistically significant effect was obtained,  $F(6, 1130) = 2.36, p = .029$ , Pillai's Trace = .03, partial Eta squared = .01, observed power = .81. The effect size was small, but there was an 81% chance of a significant result. Based on these results we rejected the null hypothesis and concluded that there was a statistically significant difference in overall district test scores based on instructional modality group. The Levene's Test of Equality of Error Variances is significant for the 2018-2019 school year data,  $p = .002$ , the 2020 – 2021 school year data,  $p < .001$ , and the 2021-2022 school year data,  $p = .002$ ; therefore the data should be viewed with caution.

The test of between-subjects effects shown in Table 26 illustrates how the dependent variables (District reported percentage of White students scoring proficient for each year) differ from the independent variable (instructional modality) by providing univariate ANOVA results.

**Table 26**

*Tests of Between-Subjects Effects % White Population Proficient*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Instructional Modality	2018-2019 % White Proficient	348.83	2	174.41	1.28	.279	0.01
	2020-2021 % White Proficient	2243.71	2	1121.86	5.89	.003	0.02
	2021-2022 % White Proficient	1296.02	2	648.01	3.96	.060	0.10

The results indicated that the 2020-2021 percentage of White students scoring proficient dependent variable was statistically significant for districts among the different instructional modality groups with  $F(2, 566) = 5.89, p = .003$ , partial eta squared = .02. A post hoc was run to determine which pairs of means were different.

Although the assumption of homogeneity of variance was tenable, the sample sizes for this data set were unequal, therefore, the Games-Howell post hoc comparisons were again selected to ensure accuracy (Field, 2018). The post hoc was run to evaluate pairwise differences among group means. The results are shown in Table 27.

**Table 27***Games-Howell Pairwise Comparisons for Percentage of White Population Proficient*

Dependent Variable	(I) Instructional Modality Code	(J) Instructional Modality Code	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
2018-2019 % White Proficient	5-Day In-Person	Hybrid	1.17	1.08	0.526	-1.38	3.72
		Fully Remote	2.13	1.79	0.465	-2.15	6.4
	Hybrid	5-Day In-Person	-1.17	1.08	0.526	-3.72	1.38
		Fully Remote	0.96	1.91	0.871	-3.58	5.5
	Fully Remote	5-Day In-Person	-2.13	1.79	0.465	-6.4	2.15
		Hybrid	-0.96	1.91	0.871	-5.5	3.58
2020-2021 % White Proficient	5-Day In-Person	Hybrid	3.29*	1.27	0.028	0.28	6.3
		Fully Remote	5.1*	2.16	0.045	-0.06	10.27
	Hybrid	5-Day In-Person	-3.29*	1.27	0.028	-6.3	-0.28
		Fully Remote	1.81	2.31	0.714	-3.68	7.29
	Fully Remote	5-Day In-Person	-5.1*	2.16	0.045	-10.27	0.06
		Hybrid	-1.81	2.31	0.714	-7.29	3.68
2021-2022 % White Proficient	5-Day In-Person	Hybrid	2.58	1.20	0.082	-0.25	5.4
		Fully Remote	3.8	1.93	0.128	-0.81	8.41
	Hybrid	5-Day In-Person	-2.58	1.20	0.082	-5.4	0.25

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Dependent Variable	(I) Instructional Modality Code	(J) Instructional Modality Code	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
		Fully Remote	1.22	2.07	0.827	-3.71	6.15
	Fully Remote	5-Day In-Person	-3.8	1.93	0.128	-8.41	0.81
		Hybrid	-1.22	2.07	0.827	-6.15	3.71

*Note.* Based on observed means. The error term is Mean Square(Error) = 163.681.

\*The mean difference is significant at the .05 level.

For the 2018 - 2019 and the 2021- 2022 school years there were no significant effects between groups. For the 2020 - 2021 school year, there was a statistically significant pairwise difference for 5-Day In-Person and Hybrid ( $p = .028$ ) and 5-Day In-Person and Fully Remote ( $p = .045$ ). Upon examination of the mean scores, districts providing 5-Day In-Person learning had significantly higher scores than those that provided hybrid instruction and fully remote instruction in the 2020-2021 school year.

**Research Question 4: Is there a significant difference in the ELA test scores of third grade students who are economically disadvantaged when comparing Ohio districts that were in-person to districts that remained hybrid or online?**

To address the fourth research question and investigate whether or not there is a difference between district instructional modality on district ELA test scores for economically disadvantaged population, a one-way MANOVA was run. Descriptive statistics for the dependent variable, the percentage of economically disadvantaged population in the district scoring proficient or above, disaggregated by the independent variable, instructional modality, are shown in Table 28.

**Table 28**

*Dependent Variable % Economically Disadvantaged Population Scoring Proficient Descriptive Statistics Disaggregated by Independent Variable (N = 523)*

Variable	5-Day In-Person (n = 300)		Hybrid (n = 145)		Fully Remote (n = 78)	
	M	SD	M	SD	M	SD
2018-2019 Econ. Disadvantaged % Proficient	65.06	12.7	64.08	12.92	59.85	13.94
2020-2021 Econ. Disadvantaged % Proficient	48.96	13.31	46.07	12.88	38.98	16.2
2021-2022 Econ. Disadvantaged % Proficient	56.92	12.96	49.5	13.91	55.38	13.32

Not all school districts reported a score for an economically disadvantaged population for all four years. Therefore, districts that did not report scores for economically disadvantaged populations were excluded from this data set. The total valid number of districts included in this data set was 523 ( $N = 523$ ). The groups continued to have an unequal number of participants, with the largest number of districts utilizing 5-day in-person instruction ( $n = 300$ ) and the smallest group being districts that utilized fully remote instruction ( $n = 78$ ).

For the MANOVA, Pillai's Trace was used as it is the most robust multivariate test when there may be some assumption violations (Field, 2018). The result of Multivariate Test is shown in Table 29.

**Table 29***Multivariate Tests for Dependent Variable Overall District % Proficient*

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Observed Power
Pillai's Trace	0.07	5.94	6	1044	<.001	0.03	1.00

The analysis showed a statistically significant effect was obtained,  $F(6, 1044) = 5.94$ ,  $p < .001$ , Pillai's Trace = .07, partial Eta squared = .03, observed power = 1.00. Based on these results we rejected the null hypothesis and concluded that there was a statistically significant difference in district test scores for the economically disadvantaged population based on instructional modality group.

The test of between-subjects effects shown in Table 30 illustrates how the dependent variables (District reported percentage of economically disadvantaged scoring proficient for each year) differ from the independent variable (instructional modality) by providing univariate ANOVA results.

**Table 30***Tests of Between-Subjects Effects % Economically Disadvantaged Population Proficient*

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Instructional Modality	2018-2019 % Econ Disadv Proficient	1622.97	2	811.49	4.84	.008	0.02
	2020-2021 % Econ Disadv Proficient	6510.99	2	3255.50	17.51	<.001	0.06
	2021-2022 % Econ Disadv Proficient	3341.52	2	1670.76	9.78	<.001	0.04

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The results indicated that all three dependent variables were statistically significant for districts among the different instructional modality groups. The 2018-2019 school year indicated  $F(2, 523) = 4.84, p = .008$ , partial eta squared = .02. the 2020-2021 school year indicated  $F(2, 523) = 17.51, p < .001$ , partial eta squared = .06;  $F(2, 523) = 9.78, p < .001$ , partial eta squared = .04. A post hoc needed to be run to determine which pairs of means were different.

The Games-Howell post hoc comparison was selected to ensure accuracy when sample sizes are unequal and assumption violations may be present (Field, 2018). The post hoc was run to evaluate pairwise differences among group means. The results are shown in Table 31.

**Table 31**

*Games-Howell Pairwise Comparisons for Percentage of Economically Disadvantaged*

*Population Proficient*

Dependent Variable	(I) Instructional Modality	(J) Instructional Modality	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
2018-2019 % Econ Dis proficient	5-Day In-Person	Hybrid	1.10	1.30	0.673	-1.96	4.17
		Fully Remote	5.07*	1.71	0.01	1.01	9.13
	Hybrid	5-Day In-Person	-1.10	1.30	0.673	-4.17	1.96
		Fully Remote	3.96	1.88	0.091	-0.48	8.41
	Fully Remote	5-Day In-Person	-5.07*	1.71	0.01	-9.13	-1.01
		Hybrid	-3.96	1.88	0.091	-8.41	0.48
2020-2021 % Econ Dis proficient	5-Day In-Person	Hybrid	2.95	1.31	0.065	-0.14	6.04
		Fully Remote	10.10*	1.95	<.001	5.47	14.73



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Dependent Variable	(I) Instructional Modality	(J) Instructional Modality	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
	Hybrid	5-Day In-Person	-2.95	1.31	0.065	-6.04	0.14
		Fully Remote	7.15*	2.08	0.002	2.21	12.09
	Fully Remote	5-Day In-Person	-10.10*	1.95	<.001	-14.73	-5.47
		Hybrid	-7.15*	2.08	0.002	-12.09	-2.21
2021-2022 % Econ Dis proficient	5-Day In-Person	Hybrid	1.60	1.31	0.44	-1.48	4.67
		Fully Remote	7.27*	1.71	<.001	3.21	11.33
	Hybrid	5-Day In-Person	-1.60	1.31	0.44	-4.67	1.48
		Fully Remote	5.68	1.87	0.08	1.24	10.11
	Fully Remote	5-Day In-Person	-7.27*	1.71	<.001	-11.33	-3.21
		Hybrid	-5.68	1.87	0.08	-10.11	-1.24

*Note.* Based on observed means. The error term is Mean Square (Error) = 170.803.

\*The mean difference is significant at the .05 level.

Tests revealed significant pairwise differences on several dependent variables. For the 2018-2019 school year, there was a statistically significant difference in the pairwise comparison for 5-Day In-Person and Fully Remote ( $p = .001$ ). For the 2020-2021 school year, there was a statistically significant difference for 5-Day In-Person and Fully Remote ( $p = .001$ ), as well as Hybrid and Fully Remote ( $p = .002$ ). For the 2021-2022 school year, there was a statistically significant difference in the pairwise comparison for 5-Day In-Person and Fully Remote ( $p < .001$ ).

Upon examination of the mean scores, districts in the 5-Day In-Person group had significantly higher scores than those in the Fully Remote group for all three years. Districts in

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the Hybrid group had significantly higher test scores than those in the Fully Remote group for the 2020-2021 school year only. There was no significant difference between 5-Day In-Person and Hybrid groups in any years.

### Summary

Analysis conducted for this study suggested that districts utilizing 5-Day in-person learning during the initial return to school in the 2020-2021 school year had higher percentages of students scoring proficient or above on state standardized reading assessments. First, evidence from the analysis of overall district data indicated that districts providing 5-Day in-person instruction had significantly higher scores than those that provided fully remote instruction for all three years. There was no difference between 5-Day in-person and hybrid groups before the pandemic; however, during the 2020-2021 and 2021-2022 school years, districts that provided hybrid instruction had significantly lower scores than those who were in-person. However, during those years, hybrid districts outperformed fully remote districts in both years.

When overall district data was broken down into smaller groups, some results were significant while others were not. When examining overall district data with independent variables of typology and instructional modality, the analysis suggested that there was no significant interaction between the two variables. However, when examined independently, the variable of typology did show there was a significant difference in test scores over time. This is an area of suggested further research. When data was analyzed for several race/ethnicity categories, most groups indicated there was no significant effect on scores based on instructional modality. One exception was for the White population during the 2020-2021 school year only. When data for the 2020-2021 school year percentage of White student population was examined, there was a statistically significant pairwise difference for 5-Day in-person and hybrid groups.

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The results indicated that districts providing 5-Day in-person learning had significantly higher percentages of White students scoring proficient than those that provided hybrid instruction during that one school year.

Analysis of the economically disadvantaged population revealed that there were no significant differences in scores between districts who were in-person and those that were hybrid during the initial return to school in the fall of 2020. However, the analysis suggested that the economically disadvantaged population that attended districts who utilized 5-Day in-person instruction had significantly higher scores than those who attended districts that were fully remote groups for all three years. Additionally, districts that utilized hybrid instruction during the initial return to school from the COVID-19 pandemic had significantly higher percentages of economically disadvantaged students scoring proficient in reading in the 2020-2021 and 2021-2022 school years than districts that remained fully remote. Chapter five includes the conclusion, a discussion of the findings related to the literature, and suggestions for future research.

## **CHAPTER V**

### **CONCLUSIONS, DISCUSSION, AND SUGGESTIONS FOR FUTURE RESEARCH**

#### **Introduction**

Literacy skills have long been considered an essential element for achievement in all content areas and a primary focus of educators at the elementary level. Several measures have been put in place to collect data in order to make informed decisions in regard to the progress of students (Cramer et al., 2018; Dickinson, 2016). Analyzing achievement data in the form of proficiency rates on the Ohio State Test is one way that school officials and communities can gauge if overall progress is being made. The pandemic-related disruptions to learning have undoubtedly impacted student learning and achievement. Concerns regarding remote and hybrid instruction and the impact on student achievement at the primary level led many lawmakers and communities to encourage schools to reopen with in-person learning as soon as possible (Holt & Kreamer, 2020; Ohio Education by the Numbers, 2022; Streich et al., 2021). In the fall of 2020, approximately 38% of schools reopened full time with students in physical classrooms five days a week (Ohio Department of Education, 2022b). This was a challenging task, with many obstacles, including staffing shortages, social distancing and sanitation requirements, and mental health challenges; however, many felt in-person instruction was the best decision for students (DeArmond et al., 2022; Goldhaber & Gratz, 2022; Maughan, 2022).

The purpose of this study was to better understand the impact that school closures and reopening plans had on elementary students' academic achievement in the area of reading. A quantitative approach and a quasi-experimental design was used to analyze district level achievement data for grade three, specifically the overall percentage of students scoring proficient or above on the Ohio State Test for English Language Arts. This sample was

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purposely selected due to the emphasis on Ohio's Third Grade Reading Guarantee, which indicates that achievement in grade three is predictive of future success. Additionally, Singh et al. (2022) suggest that students who reach the middle school years with lower reading abilities have an increased chance of dropping out of school, further emphasizing the importance of early literacy skills.

At the time of this study, research exploring the connections between the modality of instruction provided to students during the COVID-19 pandemic and student achievement was limited. This study hoped to contribute to the body of knowledge and uncover whether or not immediately reopening schools in the fall of 2020 to full time in-person learning made any significant difference on academic achievement. The research questions that guided this study were:

1. Is there a significant difference in ELA scores of third grade students who attended Ohio school districts that fully reopened to in-person learning in the fall of 2020 when compared to districts that remained hybrid or online?
2. Is there a significant difference in the ELA scores of third grade students based on district typology when comparing Ohio school districts that were in-person to districts that remained hybrid or online?
3. Is there a significant difference in the ELA test scores of third grade students based on race/ethnicity when comparing Ohio school districts that were in-person to districts that remained hybrid or online?
4. Is there a significant difference in the ELA test scores of third grade students who are economically disadvantaged when comparing Ohio districts that were in-person to districts that remained hybrid or online?

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This chapter is organized into five sections. The first is the summary of findings, which highlights critical information that will be discussed further in the chapter. Next, the conclusions section will explain what is known as a result of the research and will be organized by research question. The discussion section will thoroughly analyze significant findings, connect the findings to research in the literature review and create a better understanding of the meanings of the results. Lastly, the chapter will close with suggestions for future research and a comprehensive summary of the study, addressing final conclusions.

### **Summary of Findings**

To address the research question, district level proficiency rates on the Ohio State Test in English Language Arts were analyzed over a three-year time period, including pre and post pandemic years. Districts were placed in different groups based on the instructional modality that was chosen upon the return of school in the fall of 2020. Data was collected, with the first time period being the 2018–2019 school year (pre pandemic), the second time period being the 2020–2021 school year (during the pandemic), and the third time period being the 2021–2022 school year (post pandemic). District choice of instructional modality is the independent variable with three levels: in-person instruction five days per week, hybrid instruction, and fully remote instruction. Other categorical variables that were considered during testing are district typology, economically disadvantaged, and race/ethnicity groups.

The statistical test used to examine research questions one, three, and four was a one-way Multivariate Analysis of Variance (one-way MANOVA). Research question two was examined using a two-way MANOVA in order to compare interaction effects between two factors. The MANOVA test compared the mean score for each instructional modality group during the three separate years. Overall district proficiency rates were examined as well as proficiency rates

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broken down into different subgroups. Additional univariate ANOVAs were also run for some research questions to better understand the results. IBM's SPSS Statistics Version 29.0.0.0 (241) was used to analyze the data and run the statistical tests.

Results of the analysis were mixed, however, several findings emerged when analyzing the data. This section provides an overview of important findings starting with an analysis of descriptive data relating to the instructional modality choices of districts and community demographics followed by findings related to the overall population and subgroups of students.

### **Sample Sizes**

During the analysis phase, some subgroups resulted in sample sizes that were too small to run the statistical tests and receive reliable results. Field (2016) notes that sample size is linked with power, which is "the ability of a test to find an effect that genuinely exists" (p. 66). If the sample size is too small, results may be skewed and not generalizable to the larger population. To run the MANOVA, school districts must have reported data for all three years. If a district did not report data for one of those years, they were not included in the analysis. When examining the data, it was found that some districts reported data for some subgroups for one year or two years only. As a result, the subgroups for the American Indian or Alaskan Native and Multiracial population did not have an adequate number of participants in the sample to run these tests. Therefore, they were eliminated from the study for research question three, which examined results based on race/ethnicity. This will limit the ability to further discuss the impact that instructional modality may have had on reading achievement for these populations.

### **Likelihood of Receiving In-Person Instruction**

Overall, 604 districts were included in the study and each had one of three modalities indicated for instruction: fully in-person, hybrid, or fully remote. When overall data was

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analyzed with both instructional modality and typology as factors, results indicated a nonsignificant effect on scores based on the interaction; however, examination of descriptive statistics did result in a few important findings. Full time in-person learning was the most prevalent mode of instruction reported in September of 2020 across the state of Ohio. Of these 604 districts, 350 (58%) reported full time in-person instruction, 167 (28%) reported hybrid instruction, and 87 (14%) selected fully remote instruction. When data was broken down by district typology, the largest group of districts were in Typology 1, rural districts with high poverty levels and small student populations ( $n = 123$ ). This accounted for 20% of all Ohio school districts. Of this 20%, 72% attended districts providing full time in-person learning. Table 32 highlights the number of districts from each typology category who provided in-person, hybrid, and fully remote instruction.

**Table 32**

*Instructional Modality by District Typology (N = 604)*

District Typology	Instructional Modality			Total (N = 604)
	5-Day In-Person (n = 350)	Hybrid (n = 167)	Fully Remote (n = 87)	
1 rural, high poverty	88 (72%)	29 (24%)	5 (4%)	123
2 rural, average poverty	73 (69%)	28 (27%)	4 (4%)	106
3 small town, low poverty	71 (65%)	37 (33%)	2 (2%)	110
4 small town, high poverty	57 (64%)	24 (27%)	8 (9%)	89
5 suburban, low poverty	30 (40%)	23 (29%)	24 (31%)	77
6 suburban, very low poverty	18 (39%)	12 (26%)	16 (35%)	46
7 urban, high poverty	13 (28%)	13 (28%)	21 (44%)	47
8 urban, very high poverty	0 (0%)	1(12%)	7 (88%)	8



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When comparing rural high poverty districts and urban high poverty districts, the descriptive statistics show that rural high poverty districts were more likely to choose in-person instruction (72%) than urban, high poverty, high population districts (0%). Additionally, only 4% of rural high poverty districts were fully remote, while 88% of urban high poverty districts were fully remote. Previous research indicated that students from high poverty districts were more likely to be remote during the pandemic (Goldhaber et al., 2022). The finding that rural high poverty districts have the highest percentage of in-person learning is noteworthy because this suggested that population density and poverty level combined may be a better indicator of the availability of in-person learning, rather than just poverty level alone. This finding also acknowledged previous research which indicated that inadequate support systems were in place for rural and economically disadvantaged populations (Charland et al., 2021; Mueller et al., 2020). Rural regions tend to have high levels of poverty, limited employment opportunities, and less access to healthcare when compared to urban counterparts (Mueller et al., 2020). This increases this demographic's reliance on the education system to meet students' basic needs. Rural and high poverty locations are also more likely to experience the digital divide and lower students' accessibility to remote learning opportunities (Charland et al., 2021; Correia, 2020), possibly pressuring rural and high poverty district leaders to reopen to in-person learning as quickly as possible.

Further examination into descriptive statistics and typology revealed that districts with small and very small populations were more likely to provide in-person instruction than those with large and very large populations, which were typically located in an urban setting. Mann et al. (2021) noted that certain subgroups were considered vulnerable and more likely to have difficulties in the online learning environment. Those subgroups included the economically

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disadvantaged population, inner-city students, who were more likely to experience longer closures, and students in rural areas who were less likely to have access to resources nearby.

### **Pre Pandemic Differences Existed**

Some differences in academic achievement did exist between groups prior to the pandemic. When the aggregate 2018-2019 district proficiency scores for the overall population of students were analyzed, districts providing in-person instruction had significantly higher scores than those that provided fully remote instruction ( $p = .002$ ), with a mean difference of 6.62, before the pandemic. The economically disadvantaged population showed similar results, with a significant difference between the in-person group and the fully remote group ( $p = .01$ ), with a mean difference of 5.07, in the spring of 2019. Therefore, those districts that opted to provide full time in-person instruction were already outperforming those districts opting for fully remote instruction before the pandemic. Conversely, among the White population, there was no significant difference found between the groups prior to the pandemic ( $p = .279$ ). An examination of the descriptive statistics revealed very similar mean scores in the 2018-2019 school year with in-person at 75.91, hybrid at 74.74, and fully remote at 73.78 percent proficient. This finding contributes to the idea that differences in achievement may be linked to modifications to the learning environment, disruptions to traditional schooling, and unique hardships families faced during this time (Bronfenbrenner & Evans, 2000; Mann et al. 2022; Munastiwi & Puryono, 2021).

### **Reading Achievement Trends for the Overall Population**

The score reported on the Ohio State Test is the percentage of students scoring proficient or above in the area of English Language Arts and is reflective of achievement in Reading. The results of the MANOVA did indicate a significant association between groups,  $F(6, 1200) =$

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6.88,  $p < .001$ , Pillai's Trace = .067, partial Eta squared = .033, observed power = 1.00. When a post hoc was run, significant results were present in all three school years. As stated above, pre pandemic differences did exist between the districts who ultimately selected fully in-person instruction and districts providing fully remote instruction ( $p = .002$ ), with a mean difference of 6.62. However, in that year there was no significant difference between the in-person group and the hybrid group. In the spring of 2019, the mean scores of the in-person group, hybrid group, and fully remote group were  $M = 75.77$ ,  $M = 73.58$ , and  $M = 69.15$ , respectively.

State tests for the 2019-2020 school year were cancelled due to the COVID-19 pandemic and the closure of schools, so the next year of data collection was in the spring of 2021. At this point, schools were in the heart of the educational disruptions caused by the pandemic and there was a drop in mean scores for all groups. This finding supports theories recognizing that human development is influenced by shared interactions and social factors, and that the immediate environment affects education outcomes (Bronfenbrenner & Evans, 2000; Reynolds & Walberg, 1992). The in-person group mean dropped 13 points ( $M = 62.19$ ), the hybrid group dropped 16 points ( $M = 57.92$ ), and the fully remote group dropped 19 points ( $M = 50.82$ ). The achievement gap between the groups had also grown. For the 2020-2021 school year, the analysis found a significant association between instructional modality and test score for all three groups. There was a statistically significant difference for in-person and hybrid ( $p = .005$ , with a mean difference of 4.28) and the fully remote and hybrid groups ( $p < .017$ , with a mean difference of 7.10) that was not present before. The in-person and fully remote group continued to show a significant result, but the mean difference had increased ( $p < .001$ , with a mean difference of 11.37).

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For the 2021-2022 school year, the majority of schools statewide had returned to fully in-person learning. The Ohio Department of Education reported that, by March of 2022, 99% of public-school districts were open for full time in-person learning (Ohio Department of Education, 2022c). Scores showed an increase for all groups, with the largest gains (9 points) being for those students who were in the fully remote group in September of 2020 ( $M = 59.46$ ) and the smallest gains being for those who were in the in-person group in September of 2020 ( $M = 68.89$ ). Although the fully remote group saw large gains in the 2021-2022 school year, there was still a significant result found between groups when analyzing the data for all three groups. A statistically significant result was found for in-person and hybrid ( $p = .022$ , with a mean difference of 3.31), in-person and fully remote ( $p < .001$ , with a mean difference of 9.42), and fully remote and hybrid ( $p = .017$ , with a mean difference of 6.11). The finding supported previous research and educational theories which emphasized that a student's environment impacts learning (Bronfenbrenner & Evans, 2000; Reynolds & Walberg, 1992; Vygotsky, 1978). Examining the trend for all three years highlights that students who attended districts providing full time in-person learning consistently had the highest achievement. During the pandemic, the gap between achievement of the in-person group and the fully remote group doubled. Two years post pandemic, the gap in achievement has grown smaller, but is still not back to pre pandemic levels.

### **Reading Achievement Trends for Subgroups**

Mann et al. (2022) noted that certain subgroups of students were more likely to have difficulties in the online learning environment. Therefore, an investigation into subgroups was needed to better understand the effects of the pandemic on student learning. When results were disaggregated into selected subgroups based on race/ethnicity, only the White subgroup resulted

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in a significant effect. Asian-Pacific Islander, Black, and Hispanic populations showed non-significant associations between instructional modality and achievement based on the MANOVA results. However, further investigation into the scores, regardless of the non-significant result, uncovered interesting findings. All populations saw a decline in scores from the Spring 2019 results to the Spring 2021 results, regardless of instructional modality in the fall of 2020.

**Asian-Pacific Islander subgroup.** The Asian-Pacific Islander population had the smallest sample size of the study ( $N = 32$ ). Therefore, it is noted that results should be interpreted with caution. The analysis showed a non-significant effect was obtained,  $F(6, 56) = 1.82, p < .111$ , Pillai's Trace = .33, partial Eta squared = .16, observed power = .63. Pre pandemic, this subgroup had the highest means on the state test in all three groups. The in-person group mean was  $M = 82.84$ , followed by the hybrid group mean of  $M = 77.89$ , and the fully remote group mean of  $M = 75.25$ . This group also experienced an overall drop in scores between the spring of 2019 and the spring of 2021. In the 2021-2022 school year, the in-person and fully remote groups showed improvement, however, the hybrid group showed minimal growth between the Spring 2021 test and the Spring 2022 test ( $M = 65.01$  and  $M = 65.13$ ).

**Black subgroup.** The MANOVA results for the Black population subgroup showed a non-significant effect,  $F(6, 220) = .86, p < .526$ , Pillai's Trace = .05, partial Eta squared = .02, observed power = .34. Upon examination of mean scores, it was noted that this subgroup had the lowest pre pandemic achievement scores with the in-person group mean score of  $M = 52.62$ , the hybrid group mean score of  $M = 54.79$ , and the fully remote group mean score of  $M = 53.62$ . In the year following the pandemic, scores dropped 17 points for the in-person group, 18 points for the hybrid group, and 22 points for the fully remote group with  $M = 35.89$ ,  $M = 36.49$ , and  $M = 39.20$ , respectively. The 22-point drop for the Black population attending fully remote districts

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was the largest drop observed in the study; however, when analyzing the difference in the means between groups for the 2020-2021 school year, the result was still non-significant ( $p = .391$ ). The results from the Spring 2022 test showed an increase in mean scores for all instructional modalities between 9 and 12 points. Mean scores for the 2021-2022 school year were  $M = 47.76$  for the in-person group,  $M = 45.78$  for the hybrid group, and  $M = 43.75$  for the fully remote group. Although these were large gains, the between-subjects effects showed no significant effect of instructional modality on the 2021-2022 percentage of Black students scoring proficient,  $F(2,111) = .60, p = .553, \text{partial eta squared} = .01$ .

**Hispanic subgroup.** The MANOVA results for the Hispanic population subgroup showed a non-significant effect,  $F(6, 200) = 1.27, p < .275, \text{Pillai's Trace} = .07, \text{partial Eta squared} = .04, \text{observed power} = .49$ . Mean scores prior to the pandemic, 2018-2019 school year, were similar with the in-person score of  $M = 65.18$ , hybrid group mean score of  $M = 63.67$ , and the fully remote group mean score of  $M = 60.35$ . The tests of between-subjects effects indicated that there was no significant effect,  $F(2,101) = .790, p = .457, \text{partial eta squared} = .015$ . This subgroup saw scores decline between 18 and 20 points in the 2020-2021 school year. In the spring of 2021, the mean score for districts providing in-person instruction was  $M = 47.44$ , hybrid instruction mean score was  $M = 43.54$ , and fully remote instruction mean score was  $M = 40.03$ . Despite the drops, there was no significant effect found between subjects,  $F(2,101) = 1.596, p = .208, \text{partial eta squared} = .031$ . The 2021-2022 school year resulted in gains between 6 and 12 points, however, no significant effect was found between instructional modality groups,  $F(2,101) = 2.713, p = .071, \text{partial eta squared} = .051$ . This finding contradicted recent publications claiming that minority populations in remote learning settings had significantly worse test scores than in-person groups nationwide (Jack et al., 2023; Kuhfeld et al., 2023).

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However, the reported mean scores did support claims that remote learners in minority populations, specifically Black and Hispanic populations, did have the lowest test scores overall (Kuhfeld et al., 2023), despite the non-significant association between instructional modality groups in this study.

**White subgroup.** The White population showed a significant association between instructional modality groups in the 2020-2021 school year. An important finding for this subgroup was that there was no pre-existing significant difference in the 2018-2019 school year among any groups. This means that pre pandemic scores were similar among all groups and after the pandemic there were significant differences, supporting the concept that there was a relationship between instructional modality and achievement. The MANOVA results showed a statistically significant effect was obtained,  $F(6, 1130) = 2.36, p = .029$ , Pillai's Trace = .03, partial Eta squared = .01, observed power = .81. Univariate ANOVA results indicated that significant differences were only present in the 2020-2021 results ( $p = .003$ ). When individual means were further investigated for the 2020-2021 school year, there was a statistically significant pairwise difference for in-person districts and hybrid districts ( $p = .028$ , with a mean difference of 3.29) and in-person districts and fully remote districts ( $p = .045$ , with a mean difference of 5.1), which was not present before.

When examining data from the spring of 2019 to the spring of 2021, all groups experienced a decline in scores, but the achievement gap between groups had grown from a two-percentage point difference between highest and lowest means scores, to an eight-percentage point difference. The in-person group mean dropped 10 points ( $M = 65.52$ ), the hybrid group dropped 15 points ( $M = 59.22$ ), and the fully remote group dropped 16 points ( $M = 57.41$ ).

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For the 2021-2022 school year, the association between the instructional modality group and test score for the White population was non-significant ( $p = .060$ ). During this school year, all groups showed an increase in mean score, with the largest gains (9 points) being for those districts who were in the fully remote group in September of 2020 ( $M = 65.22$ ) and the smallest gains being for those who were in the in-person group in September of 2020 ( $M = 69.02$ ).

Although the differences in achievement between groups grew smaller, proficiency rates for third grade students were still not back to pre pandemic levels.

### **Economically Disadvantaged Population Showed Large Drops and Large Gains**

Charland et al. (2021) noted that significant inequalities exist in the social system setting, adversely affecting achievement for economically disadvantaged students. Throughout the pandemic, families from higher socio-economic backgrounds and low-poverty areas were more likely to be able to accommodate extra tutoring, learning assistance applications, and ensure an adult was at home to assist with learning. The economically disadvantaged population was also disproportionately affected by the digital divide with reports indicating that 50% of low-income families lacked the devices and internet capabilities needed to learn from home (Correia, 2020; Kuhfeld et al., 2020).

Upon analysis of the economically disadvantaged data, the findings supported previous research which indicated that economically disadvantaged populations are at higher risk of learning loss due to school closures and wide-spread remote instruction (Charland et al., 2021; Correia, 2020; Mann et al., 2021). The results of the MANOVA showed a statistically significant effect was obtained,  $F(6, 1044) = 5.94, p < .001$ , Pillai's Trace = .07, partial Eta squared = .03, observed power = 1.00. When examining ANOVA results, significant differences were present in all three school years, similar to the results of the overall population discussed previously.



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Because a significant result was evident in the 2018-2019 school year ( $p = .008$ ), evidence suggested that pre pandemic differences did exist. Post hoc results showed significant differences in mean scores between in-person districts and fully remote districts ( $p = .01$ , with a mean difference of 5.07). However, in that year there was no significant difference between the in-person group and the hybrid group.

For the 2020-2021 school year, mean scores dropped for all groups. The mean score for districts providing fully remote instruction dropped roughly 21 points, which is the second largest drop found in the data set. Statistically significant differences were found between the in-person and fully remote groups ( $p = .001$ , with a mean difference of 10.10), as well as hybrid and fully remote groups ( $p = .002$ , with a mean difference of 7.15). For the 2021-2022 school year, growth in achievement was shown for all groups. The largest gains were seen in the mean score for the fully remote group, increasing roughly 17 points. When examining pairwise comparisons, statistically significant results were identified for in-person and fully remote groups ( $p < .001$ , with a mean difference of 7.27). These findings suggest that districts in the in-person group outperformed those in the fully remote group for all three years. Additionally, districts in the hybrid group had significantly higher test scores than those in the fully remote group for the 2020-2021 school year only. There was no significant difference between in-person and hybrid groups in any year for the economically disadvantaged population.

Overall, the important findings in this study further supported the statement that the educational impact of the pandemic was not consistent across all groups and that inequalities within the system may exist (Betebenner & Wenning, 2021; Charland et al., 2021). These included the finding that school district typology limited in-person learning opportunities for students who lived in urban settings. Results of examining mean scores also indicated that

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districts that utilized in-person instruction had higher proficiency rates for subgroups than those who utilized fully remote instruction. These outcomes were found to be significant in the overall district data, the White population, and the economically disadvantaged population. The largest gains in achievement were seen when the economically disadvantaged population receiving remote instruction returned for the 2021-2022 school year. Lastly, the findings highlighted that preexisting inequalities were augmented by the pandemic.

### **Conclusions**

The conclusions drawn here further illustrated how decisions on the modality of instruction provided to students impacted student achievement. This study hoped to identify if there were differences in educational outcomes based on the mode of instruction that districts provided to students. Ultimately this information can assist in identifying the most highly impacted populations and monitor their progress in years post pandemic. Betebenner and Wenning (2021) emphasize that the educational impact of the pandemic was not even across all populations and further study into the long-term effects is needed to help determine which students are recovering and which students need further interventions.

**Research Question #1: Is there a significant difference in ELA scores of third grade students who attended Ohio school districts that fully reopened to in-person learning in the fall of 2020 when compared to districts that remained hybrid or online?**

When examining overall district proficiency data on the third grade ELA Ohio State Test, there were significant differences between groups in all three school years. In the spring of 2021 and 2022, districts that provided in-person learning had a higher percentage of students scoring proficient than districts that were hybrid and fully remote. However, when scores were examined for the 2018 school year, which was pre pandemic, there was a significant difference between

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districts that were in the in-person group and the fully remote group. Therefore, one can conclude that since this relationship existed pre pandemic, the significant results between those two groups in the 2021 and 2022 school years may not actually have been associated with instructional modality, but with other outside factors. In-person and hybrid districts performed significantly better than students who were fully remote when examining overall data.

**Research Question #2: Is there a significant difference in the ELA scores of third grade students based on district typology when comparing Ohio school districts that were in-person to districts that remained hybrid or online?**

When examining the relationship between instructional modality and typology, there was not a significant interaction between the factors. This means that instructional modality and typology, when interacting together did not significantly impact achievement scores. However, upon examination of the descriptive statistics, one can conclude that typology may determine the likelihood of students attending a district providing in-person instruction. For example, students who attended districts with a rural typology code were more likely to attend districts who returned to in-person instruction. Students who attended districts with urban typology codes were far less likely to attend districts offering in-person instruction and much more likely to attend fully remote districts. Overall, in-person instruction was less prevalent in urban settings when compared to rural settings, regardless of poverty level. School size may also be a factor as small districts were more likely to provide in-person instruction than large districts.

**Research Question #3: Is there a significant difference in the ELA test scores of third grade students based on race/ethnicity when comparing Ohio school districts that were in-person to districts that remained hybrid or online?**

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While one would assume that there would be significant differences between the in-person and fully remote groups for all race/ethnicity groups examined, this was not the case for this study. Only one subgroup resulted in a significant finding and that was for the White population in the 2020-2021 school year. An important finding for this subgroup was that there was no pre-existing significant difference in the 2018-2019 school year among any groups. This means that pre pandemic scores were similar among all groups and after the pandemic there were significant differences, supporting the concept that there is a relationship between instructional modality and achievement. When individual means were further investigated for the 2020-2021 school year, results found that 5-Day in-person districts outperformed hybrid districts ( $p = .028$ , with a mean difference of 3.29) and 5-Day in-person districts also outperformed fully remote districts ( $p = .045$ , with a mean difference of 5.1). This supported the conclusion that the difference in achievement is associated with instructional modality and that students who received hybrid and fully remote instruction were more negatively impacted than those receiving in-person instruction.

There was no significant difference in scores based on instructional modality for other race/ethnicity groups included in the study. District data did show that test scores dropped in the 2021 and 2022 school years; however, the difference between instructional modality groups was not enough to be significant. With this information, one can conclude that all students in these populations, regardless of the mode of instruction they received in the fall of 2020, were negatively impacted based on the resulting trends found in the Ohio State Test data.

**Research Question #4: Is there a significant difference in the ELA test scores of third grade students who are economically disadvantaged when comparing Ohio districts that were in-person to districts that remained hybrid or online?**

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When examining the ELA test scores of the economically disadvantaged population, the results were similar to the overall population results. Districts providing in-person instruction in the fall of 2020 had significantly higher scores than those in the fully remote group for all three years. Since there was already an established significant difference in 2018, one can assume there would continue to be a difference. Districts in the hybrid group had significantly higher test scores than those in the fully remote group in the spring of 2021 and 2022. This association was not evident in 2018, before the pandemic, therefore one can conclude that instructional modality did influence learning and student achievement in the economically disadvantaged population.

Upon further investigation into mean scores and yearly growth, it is noted that the mean scores of students in the fully remote group dropped drastically from the spring of 2019 to the spring of 2021. By the spring of 2022, the majority of districts were back to in-person learning. When examining mean scores for those that were fully remote, the mean scores grew dramatically in this school year. This finding, along with the higher scores reported in the in-person learning group, could support a conclusion that economically disadvantaged students performed better when they were in-person rather than remote.

### **Discussion**

This study set out to investigate whether or not the modality of instruction during the COVID-19 pandemic had an impact on the reading achievement of third grade students. The study found that districts who utilized in-person instruction had the highest mean proficiency scores for all subgroups in all years. The most significant differences in achievement were found between the in-person and fully remote groups in the economically disadvantaged population. This may be due to the digital divide, limited resources to engage in online learning, food insecurities or a lack of stability in the home environment (Charland et al., 2021). Additionally,

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large declines in achievement were noted for both the economically disadvantaged population and the Black population who were fully remote in the 2020-2021 school year. Finally, the likelihood of receiving in-person instruction diminished as districts became more urban with higher poverty levels, potentially widening the achievement gap for vulnerable populations.

### **Disparities in Achievement Based on Learning Environment**

Many variables associated with the student learning environment were significantly affected during the COVID-19 pandemic (Huck & Zhang, 2021; Kuhfeld et al., 2020; Shaw et al., 2021). The most impactful may have been the rapid large-scale shift to learning from home. While online learning can be a useful tool to provide students with opportunities traditional schooling lacks (Ahn, 2016), researchers note that certain elements must be in place to provide a beneficial learning system. Most notably, the online program must be well-planned, teachers should be fully trained and comfortable with online tools, frequent communication with families and timely feedback to students must be made available, and there should be high levels of engagement from students (Burdina et al., 2019; Munastiwi & Puryono, 2021). Due to the swift closure of schools in March of 2020, most districts did not have a comprehensive remote learning plan in place, nor were teachers fully trained on the skills necessary to facilitate effective remote instruction (Huck & Zhag, 2021). Hodges et al. (2020) notes that the plans that most districts utilized were meant to be temporary adjustments to instruction due to an emergency, not intended for long-term implementation.

The results of this study supported the conclusion that remote learning was not as effective as in-person instruction for the majority of students, leading to lower academic achievement when compared to in-person peers (Goldhaber et al., 2022). This aligned with my anticipated outcomes and supported the theoretical framework citing that students' learning

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environment affects development and achievement (Bronfenbrenner & Evans, 2000; Reynolds & Walberg, 1992). An examination of mean scores revealed that, in the spring of 2021, the difference between the overall percentage of students scoring proficient on the third grade ELA Ohio State Test widened when compared to pre pandemic rates. In-person districts had a mean of approximately 62% of students scoring proficient while fully remote districts had a mean of approximately 50% of students scoring proficient in 2021. Additionally, the percentage of students in the fully remote group who scored proficient dropped roughly 19 points during the pandemic, from 69% proficient in 2019 to 50% proficient in 2021.

The White population was the largest subgroup sample included in the study and resulted in significant differences between instructional modality groups in the 2020-2021 school year only. During this school year, districts providing in-person instruction had a significantly higher percentage of students scoring proficient in reading than both the fully remote and hybrid groups. This result was particularly interesting because pre pandemic differences were not evident between any groups in the spring of 2019, nor were differences found to be significant in the 2021-2022 school year. While evidence is growing that remote instruction highly impacted students in a negative way, this result suggests that hybrid instruction also had a significantly negative effect on achievement for this subgroup.

### **Impact on Vulnerable Populations**

Findings from this study supported claims from other researchers that vulnerable populations were highly affected by remote instruction (Goldhaber et al., 2022; Kuhfeld et al., 2022; Mann et al., 2022). Goldhaber et al. (2022) conducted a nationwide study of NWEA results in both reading and math, concluding that the mode of instruction was a primary factor for widening the achievement gap between high poverty and low poverty schools. “Within

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school districts that were remote for most of 2020-21, high-poverty schools experienced 50 percent more achievement loss than low-poverty schools” (Goldhaber et al., 2022, p. 6).

Additionally, Goldhaber et al. (2022) notes that Black and Hispanic students were more likely to attend fully remote districts than other populations, implying they would be more negatively affected. While large drops in academic achievement were noted for these groups in this study, tests resulted in non-significant associations between instructional modality groups for both the Black and Hispanic groups, which is contradictory to previous research and what I anticipated.

When examining the trend over all three time periods, there were large drops in proficiency rates for all subgroups in the spring of 2021. The largest drops in reading achievement were in the fully remote group for the economically disadvantaged population and the Black population. However, when running the MANOVA test, the Black population subgroup did not result in a statistically significant association as one would expect. Further examination of the 2021 scores revealed that this population had the smallest spread between the highest and lowest scores. Districts providing in-person instruction resulted in approximately 35% of students scoring proficient, hybrid instruction resulted in 36% of students scoring proficient, and remote instruction resulted in 31% scoring proficient. The drops in proficiency rates from pre pandemic levels were notable (about 17%, 18%, 22% respectively). Although the MANOVA produced a non-significant association when comparing group means. This could be associated to limited opportunities for in-person learning and other challenges that in-person districts were facing, reducing effectiveness. Regardless of a non-significant result, it was clear that this population was still highly affected by the pandemic and should be targeted for strategic intervention during recovery planning.



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The largest gains in achievement were found in the fully remote groups for the economically disadvantaged population and the Black population in the 2021–2022 school year. For the economically disadvantaged population, districts who were fully remote in 2020 saw a 17% increase in proficiency in 2022. For the Black population, districts in the fully remote group saw a 12% increase in proficiency in 2022. This correlates with a return to full time in-person learning for the vast majority of students in Ohio (Ohio Department of Education, 2022c), including the districts in this study that are labeled as fully remote. It is important to remember that the label category each district was placed in was determined by the modality of instruction in fall of 2020 and did not account for subsequent changes. While this study was designed to identify if significant differences existed between instructional modality groups in each specific year, examining the means for these individual groups over time supported the theoretical framework citing that students' learning environment affects development and achievement (Bronfenbrenner & Evans, 2000; Reynolds & Walberg, 1992).

### **Disparities in Access to In-Person Instruction**

Additional evidence supported the claim that inequalities existed in regard to instructional modality options provided to students depending on their demographic. Students who attended schools in rural settings had a high probability of being provided with an in-person learning option, even in rural high poverty districts. This may be due to the fact that rural areas faced particular challenges relating to internet connectivity and other resources needed for remote learning. They also may have faced fewer challenges associated with overcrowding and been able to accommodate social distancing requirements more easily than urban districts with high student populations. As districts become more urban, the likelihood of students being offered in-person instruction diminished. There were eight districts included in this study with a

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typology code of eight, which is an urban setting with high student population and very high poverty levels. None of these districts provided an in-person option and only one district provided a hybrid option. The remaining seven districts provided no other option for students other than fully remote instruction in the fall of 2020.

This illustrated inequalities in regard to educational opportunity, resources, and access to learning. Additionally, it further emphasized the impact that changing societal factors have on student development (Bronfenbrenner & Evans, 2000). Jack et al. (2023), comments that districts who only offered fully remote instruction may be reflecting a greater societal challenge of the community experiencing higher rates of COVID-19 illness. It is worth noting that the health impacts on families, as well as the economic impacts resulting from the closures of businesses and loss of employment, may be directly influencing student achievement in these districts. Educational theories imply that the quality of instruction and social interactions provided to students has a significant influence on achievement (Reynolds & Walberg, 1992; Bowers & Schwarz, 2018). Previous research has noted that instructional quality for remote learners varied widely due to a variety of factors, such as teacher preparedness, available resources, and caregiver engagement (Holt & Kreamer, 2020; Huck & Zhang, 2021).

The fact that the nation's most vulnerable populations lacked choice regarding instructional modality and were more likely to be restricted to fully remote options is a significant factor in widening the achievement gap between socio-economic status and racial groups. Kuhfeld et al. (2023) notes that "gaps between students in low- and high-poverty schools disproportionately widened in the elementary school grades relative to middle school grades" (p.257). The results from this study supported an increasing body of research providing evidence that remote learning resulted in substantially reduced reading achievement for students (Kuhfeld

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et al., 2023; Relyea et al., 2023). This was especially true for students from high-poverty backgrounds that were likely to spend extended periods of time learning from home with limited opportunities to return to the classroom.

### **Implications for Leaders**

District leaders were tasked with making difficult decisions about return to school plans prior to the 2020-2021 school year. Unique needs of local communities, such as population density, available resources, and uncertainty about public health risks, were the driving force behind decisions on whether to provide in-person, hybrid, or remote instruction for students (Goldhaber et al., 2022). The intent of this study was not to place blame on decision makers, or imply which decisions were right or wrong, but rather to analyze data to increase knowledge of student outcomes and create a better understanding of how district decisions affected achievement. Uncovering the differences in achievement between those who were in-person, hybrid, and those who were remote is imperative for school districts to further understand how their students were affected and where to focus long term recovery efforts.

Many school leaders are enforcing strategic progress monitoring and intervention periods for students in hopes of rebounding from drops in achievement during the pandemic. Care should be taken to ensure interventions and resources provided align with the needs of the most significantly impacted populations. Leaders should recognize that an indicator of this need may be the instructional modality group they participated in during the pandemic. Allocating staff and resources to critical areas for the most affected populations is necessary to avoid permanent implications to students' future education, employability, and success with their post-secondary pathways (Goldhaber et al., 2022).

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Districts who were fully remote for the 2020-2021 school year need to understand that they most likely have more ground to make up than other districts. Therefore, an explicit plan to recover from delayed learning, which includes progress monitoring of students, and providing evidence-based intervention in critical areas is needed. Establishing an effective multi-tiered system of support (MTSS) with a plan for academic screening of all students, identification of skill deficiencies, and guidance for teachers on selecting evidence-based interventions is an essential element for making progress. When developing this system, it is also important for districts to consider other environmental factors that may be affecting achievement, such as attendance, discipline, social-emotional well-being, and home stability. By identifying gaps in learning and other areas of need early, districts and schools can provide intervention and develop plans to better support student development.

### **Implications for Policy**

For those who have the power to impact educational policy, continuing to study the long-term implications of the pandemic, including emergency school closures and the effectiveness of different instructional modalities, is necessary to ensure sound decision making and create a better understanding of the impact that the pandemic had on each child's future. The goal of educational policy in this area should be to minimize disruptions to learning in emergency situations, provide support to students and families, increase engagement and attendance, and enhance strategic interventions and monitoring systems to assist in recovery efforts moving forward. Policymakers should also note that some students were successful while remote learning and those families may want to pursue full time online learning options. Recognizing that some positive elements did come out of the pandemic, leading to new innovations in

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education, can help districts explore an expansion of online learning opportunities for those who possess the characteristics and support to be successful.

The results found in this study support the need to have alternative learning plans in place for possible unforeseen disruptions and emergencies. There is mounting evidence that most remote learners fell behind their in-person peers (Goldhaber et al., 2022, Jack et al., 2023), all efforts should be made to avoid any future school closures. Unfortunately, the pandemic has proven that situations may arise where remote learning is the only option. To prepare for an event where remaining in-person would be impossible or place students in harm's way, educational policy should ensure that a comprehensive alternative learning plan is in place for each district. This plan should outline efforts to build teacher capacity in remote learning strategies and tools to provide effective online instruction, as well as increase student familiarity with platforms that would be used. Clear guidance on what good instruction looks like should be provided to educators. Attendance was identified as a significant risk factor during the pandemic (McDonald et al., 2023). Plans should outline attendance expectations during periods of remote learning, as well as family and community support to remove barriers for students and ensure basic needs are met during disruptions. Progress monitoring, with support and an explicit system for educators, should be included in order to guide interventions to address skill deficits at all levels. The pandemic must no longer be an excuse for poor performance. Remediation practices, such as high dosage tutoring and increased instructional time are showing promising results at addressing learning loss (Pinto, 2023). Plans should be in place to identify students at risk and address student needs with evidence-based interventions and support. Lastly, a process should be in place to identify and eliminate barriers to providing equitable learning opportunities for all.

### **Other Factors**

It should be noted that student achievement can be affected by multiple factors, especially when utilizing data that was collected during the pandemic. It has been previously mentioned that instructional modality includes an understanding that the student's learning environment may be drastically different whether they were in-person, hybrid, or online. These changing environmental and social differences contribute to student learning (Bronfenbrenner & Evans, 2000; Reynolds & Walberg, 1992) and ultimately to performance on achievement tests.

The measure used for this study was performance on Ohio State Tests for English Language Arts. Testing administration was affected by the pandemic. Prior to the pandemic, efforts were made to ensure all students took the tests under similar circumstances. Some accommodations were made for those with requirements for small group or one-on-one testing; however, the majority of the student body took their tests in a classroom with their teacher or other test administrator. After the pandemic, students were learning in different settings, yet all were required to report for testing. District plans to accommodate this were done at the local level, therefore, they most likely tested under different circumstances. For example, some may have completed testing during the school day, while others attended at night. Learners may have taken the tests in large group settings, such as in a cafeteria or gymnasium with a limited number of proctors in order to ensure social distancing. The distraction of masking may have been a performance inhibitor. Some students may not have reported for testing at all, affecting the district's overall performance scores.

Other factors, such as social-emotional well-being, mental health, exposure to trauma, parental support, job loss, and food insecurity may have contributed to each student's ability to learn and perform at their best. In-person districts may have been struggling with quarantines,

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periodic closures, chronic absenteeism for staff and students, staffing shortages, and increases in disruptive behaviors. Discussing all counterarguments to the results provided in this study and identifying all factors that could influence achievement pre and post pandemic would prove to be a monumental task. Thankfully, there is a growing body of research in this area as researchers attempt to study the many factors that influenced student outcomes during the pandemic to create a more complete picture.

### **Limitations**

The findings discussed in this study should consider several limitations, including sample selection, information collections dates, and a limited ability to make any causal claims. A non-equivalent groups quasi-experimental design was used, meaning there was a lack of random assignment of participants (Trochim et al., 2016) and findings should be interpreted with caution. This is typical of education research where the assignment of students to particular school districts by location are not able to be randomly assigned. This also means that assignment to instructional modality groups was not able to be randomized. This limits the study's ability to prove causality, however, it can show a relationship between instructional modality and a change in student achievement levels.

The study only included the 604 Ohio public school districts that reported instructional modality for the 2020-2021 school year. According to the Ohio Department of Education website, there are 611 traditional public-school districts in Ohio as of 2023, indicating that some districts were either not in existence during this time or did not report instructional modality to the state by September 10, 2020 to be included in the study. Additionally, any changes in instructional modality that occurred throughout the school year were not included. This is a significant limitation because many districts opened and closed based on the rate of illness

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throughout the school year and recommendations from local health departments. This has the potential to influence student achievement scores and the generalizability of the results.

Sample sizes for some subgroups may also be a limitation of the study. To run the MANOVA, data must have been reported for each subgroup for all three years. If a district did not report data for one of those years, they were not included in the analysis. As a result, the subgroups for the American Indian or Alaskan Native and Multiracial population did not have an adequate number of participants in the sample to run these tests. Therefore, they were eliminated from the analysis for research question three, which examined results based on race/ethnicity. The inclusion of these groups in the overall data set may have influenced results and limited generalizability.

Finally, the typology information was limited to data from 2013 as that is the most recent date the data was collected. At the point of this study, these typologies were assigned ten years ago. I acknowledge that some demographics may have changed; however, the state of Ohio has not updated school district typologies at this time.

### **Suggestions for Future Research**

The purpose of this study was to explore the effects that instructional modality had on student achievement during the COVID-19 pandemic. When districts were separated into fully remote, hybrid, and fully in-person groups, the statistical tests documented that there were significant differences between the overall population and some subgroup populations. The tests also revealed that differences arose post pandemic that were not present in the pre pandemic data. Considering the review of the literature in chapter two, new literature that has emerged, and the data analyses from this study, recommendations for future research are as follows:



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1. First, involving a larger sample size and increasing the number of participants may reveal new findings and deepen the understanding of the topic. The study was limited to an examination of third grade reading scores over a four-year period in the state of Ohio, with three data points. A broader study could be conducted to examine scores over multiple grade levels and multiple states with a nationwide common assessment.
2. Secondly, a longitudinal study of reading scores for a single cohort could be conducted. This study did not follow any singular cohort of students, but rather examined progress for the same grade level year after year. Additional research could be conducted to examine the growth of a cohort of students in an effort to gauge recovery efforts over time. According to Lewis and Kuhfeld (2023), current reading recovery shows evidence of stalling in 2023 with limited growth among the economically disadvantaged population. Recovery in achievement among Hispanic and Black populations was previously noted as being the fastest growing population; however, data from 2023 shows a slowdown in that progress (Lewis & Kuhfeld, 2023). Future research suggestions include an investigation into whether or not all student subgroups are rebounding over the long term and if an educational achievement gap based on race/ethnicity groups or socio-economic status is still present.
3. Next, the method of research could be adapted to include qualitative research into the quality of instruction and home stability for all instructional modality groups. In this study, some populations saw higher achievement levels with in-person learning while other populations revealed no significant effect on achievement based on instructional modality. This leads one to wonder about the quality of instruction students received

while attending districts that were in-person and the challenges those districts faced, as well as the quality of remote instruction. Using a mixed methods approach could provide important information related to differences in achievement and how challenges were handled in different educational settings in the years following.

Research notes that disruptions to education continued to be felt throughout the 2020-2021 and 2021-2022 school years as districts attempted to cope with a variety of aftereffects of the COVID-19 pandemic, including staffing shortages, quarantines, forced closures, and interrupted schedules and routines (DeArmond et al., 2022; Goldhaber & Gratz, 2022; Maughan, 2022). Including more qualitative information could contribute to a deeper and more holistic understanding of the findings and differences in achievement between instructional modality groups.

4. Lastly, the scope of the study could be broadened to include achievement in mathematics. Adverse impacts on math were well documented throughout the pandemic and the real possibility of long-term implications on achievement are beginning to emerge (Goldhaber et al., 2022, Jack et al., 2023; Lewis & Kuhfeld, 2023). Future studies can examine the overall impact on math achievement and why greater effects on achievement were documented in this area. Furthermore, research regarding recovery efforts should be closely examined. Upon returning to school, districts took different approaches to academic recovery. Some districts focused on remediation, trying to fill in skill gaps and content that was missed during closure, while others took an acceleration approach. Research as to which districts are showing the biggest gains and which strategies were used for recovery should be conducted. This information can be used for decision making purposes when

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recovering from any future disruptions to learning and also help educational leaders determine which intervention strategies have the most impact on student outcomes in general.

### **Summary**

The impact of the COVID-19 disruptions to education continues to have adverse effects on student achievement throughout the state of Ohio and nationwide. “Although they were back in school this year, the kids are still not alright” (Center for Reinventing Public Education, 2022 p. 7). The widespread closure of schools during the pandemic enhanced inequalities and revealed new challenges for schools, which continues to contribute to the achievement gap that has been present for decades. Researchers note that as students returned to in-person instruction, some gains were made, but many students are still far below grade level expectations (Center for Reinventing Public Education, 2022). Three years post pandemic, researchers are still uncovering the long-term implications of pandemic policies and decisions on students’ future.

The purpose of this study was to better understand the impact that different learning modalities had on student achievement. The overarching research question being investigated was whether or not the modality of instruction during the 2020-2021 school year made a difference in reading achievement based on overall district proficiency rates on the third grade Ohio State Test for ELA. Pre and post pandemic data was collected from publicly available achievement reports from the Ohio Department of Education to compare the percentage of students reaching proficient levels. The sample included 604 districts in the state of Ohio. A MANOVA test was run to address each research question. The initial hypothesis predicted that statistically significant results would be present in all subgroups, especially minority populations.

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The main findings of this study highlighted that not all students were affected equally by the pandemic. Significant associations were only found in the White and economically disadvantaged populations. Even though subgroup findings were limited, the overall district data analysis did indicate that those who were in-person had higher percentages of students scoring proficient in reading than those who were fully remote.

While the study did not reveal significant results among minority populations, the results did suggest that the pandemic augmented inequalities in the system and differences in achievement for vulnerable populations. A significant factor in the study was socio-economic status. Results indicated a significant result among the economically disadvantaged population. Additional inquiry found that students from urban, high poverty districts were provided with very limited opportunities to receive in-person instruction. This finding, in addition to adverse non-academic factors associated with the pandemic, contributed to an educational opportunity gap that may prove to be difficult to recover from.

Education has been referenced by Horace Mann as being the great equalizer in society (1848, as cited by Growe & Montgomery, 2003). Some question whether this will continue to be the case. Literacy skills are a critical element to future success in and out of the classroom. It remains essential to continue to monitor reading achievement and pandemic recovery efforts in order to match academic intervention to areas of need. This data suggested that resources should be devoted to districts who utilized remote learning for long periods of time, as well as high poverty districts serving economically disadvantaged populations to ensure foundational skills are developed and learning gaps are addressed. In addition, educational programs and policies should not only account for disruptions to educational achievement, but also take steps to mitigate barriers associated with socio-economic status and home-life instability that impact

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student learning over the long term. This study explored one way to identify groups of students who may be at risk. The results concluded that those engaged in remote instruction for long periods of time experienced the largest declines in achievement, especially among the economically disadvantaged population.

Educators, leaders, and policymakers must understand that simply returning to pre pandemic practices will not be enough to help students recover from learning losses during the pandemic (Pinto, 2023). The main findings of this study highlighted that students were affected differently, and individualized efforts are needed to meet student needs. Developing a comprehensive and purposeful plan to address learning gaps and resolve issues uncovered during the pandemic will enhance emergency preparedness, remove barriers, minimize disruptions, and hopefully mitigate negative effects on student learning. The pandemic provided many lessons for school leaders and policymakers. Most notably it became clear that schools are an important system of support for families and society as a whole. Removing that support resulted in dire consequences for many. There is still much to uncover about the long-term impact of the pandemic on students as they progress through their education and begin their careers. It is essential that districts learn from these studies and “adjust course” (Center for Reinventing Public Education, 2023, p. 10) to provide the best possible education for students in all settings. A sense of urgency must be created to embrace emerging evidence on what works and abandon past practices that have been proven ineffective in order to catch students up before they run out of time.

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APPENDIX A: IRB APPROVAL

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Apr 24, 2023 3:18:35 PM EDT

Jane Beese  
Teacher Ed and Leadership St

Re: Exempt - Initial - 2023-277 The Rush to Reopen: Examining Reading Achievement Pre and Post Pandemic by Modality of Instruction

Dear Dr. Jane Beese:

Youngstown State University Human Subjects Review Board has rendered the decision below for The Rush to Reopen: Examining Reading Achievement Pre and Post Pandemic by Modality of Instruction

Decision: Exempt

Selected Category: Category 1. Research, conducted in established or commonly accepted educational settings, that specifically involves normal educational practices that are not likely to adversely impact students' opportunity to learn required educational content or the assessment of educators who provide instruction. This includes most research on regular and special education instructional strategies, and research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

Any changes in your research activity should be promptly reported to the Institutional Review Board and may not be initiated without IRB approval except where necessary to eliminate hazard to human subjects. Any unanticipated problems involving risks to subjects should also be promptly reported to the IRB.

The IRB would like to extend its best wishes to you in the conduct of this study.

Sincerely,  
Youngstown State University Human Subjects Review Board

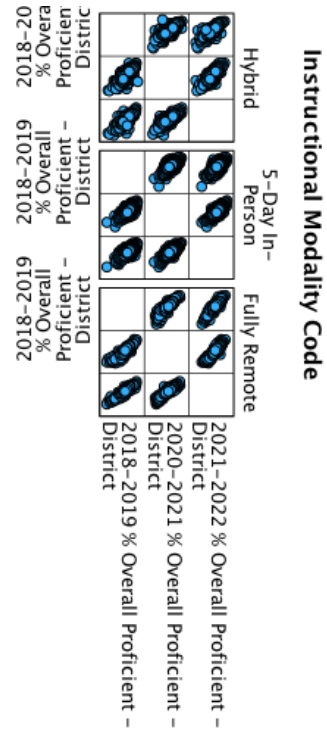
**APPENDIX B: CITI TRAINING CERTIFICATE**



APPENDIX C: SCATTERPLOTS

Figure C1

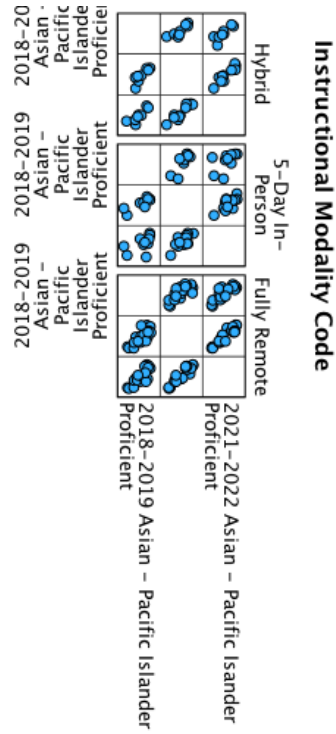
Scatterplots for Overall District Data



**Figure C2**

*Scatterplots for Each Race/Ethnicity Group's Data*

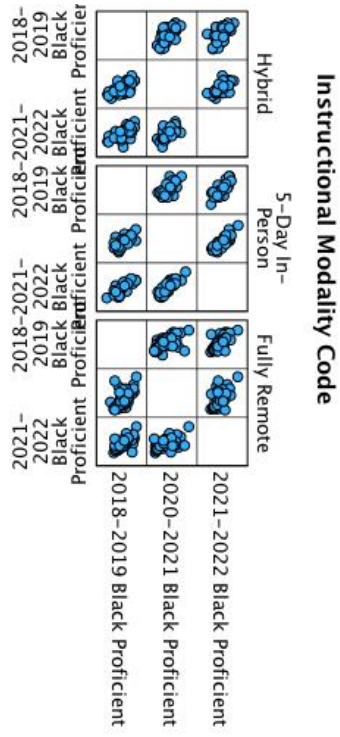
*Scatterplots for % Asian Proficient*





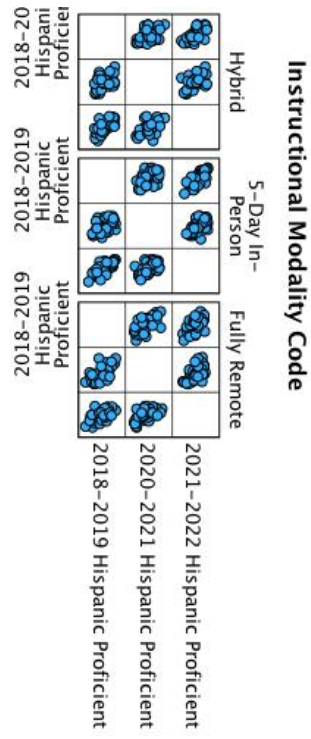
# The Rush to Reopen

## Scatterplots for % Black Proficient



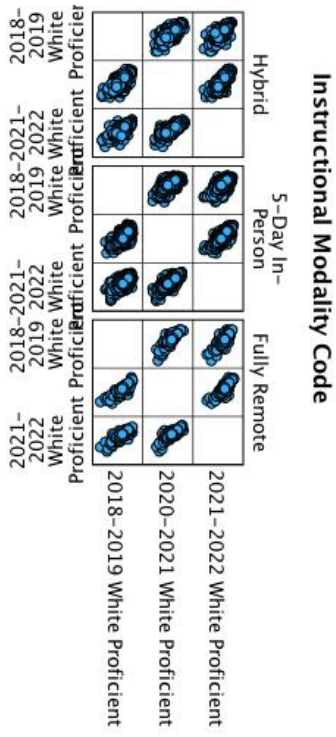
# The Rush to Reopen

## Scatterplots for % Hispanic Proficient



# The Rush to Reopen

## Scatterplots for % White Proficient



**Figure 5 C3**

*Scatterplots for Economically Disadvantaged Population*

