

IMPACT OF SCHOOL CLOSURES AND VIRTUAL INSTRUCTION ON SIXTH GRADE
READING AND MATH ACHIEVEMENT OF STUDENT SUBGROUPS

by

Crystal Michelle Pope

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

The purpose of this quantitative, causal-comparative design study was to determine whether differences existed between the reading and math achievement of sixth grade general education students and students with disabilities who have been identified with a specific learning disability or other health impairment. This study was important because achievement gaps exist between subgroups of students (Farkas et al., 2020). The sample included scores from 144 students in a school division in Southeastern Virginia. The instrument used was the Grade 6 Reading and Math Standards of Learning assessments administered in the spring of 2021. Two one-way ANOVAs were used to compare the differences between the math and reading achievement of the three identified groups. Data collected from the 144 participants were analyzed, and findings were summarized and reported. The independent variable in this study was the educational classification of the students. The dependent variable was the students' proficiency on the sixth grade math and reading Standards of Learning Assessments. The Statistical Package for the Social Sciences (SPSS) was used to run two one-way ANOVAs. The results revealed significant math and reading scores differences between general education students and the other groups: other health impairments and students with specific learning disabilities.

Keywords: student subgroups, student achievement, COVID-19, virtual instruction, students with disabilities, specific learning disabilities, other health impairments

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Dedication

This work is dedicated to the memory of my maternal grandmother Bertha Mae Stanton. “Bert Bert”, as she was affectionately known, always supported me through my educational career. She reviewed every report card and ensured that I made “high marks.” Her love for early literacy spurred my academic interest within me. I remember her telling me how she assisted each one of her five children with their educational goals. She supported her eldest daughter in her quest to become a nurse. Saundra went on to be recognized for her work with incubators for newborns in New York. For her twins that were born prematurely, she spent countless days, months, and years ensuring that they could read, write, and complete school when doctors advised that the pair would not. She explained to me how she would write words around the house to help them identify words and eventually read. Both daughters went on to graduate high school. One twin went into the military, while the other pursued food service as a career. Her next daughter was instilled with a passion for the performing arts. Bert Bert encouraged her to sing, play musical instruments, and participate in plays and productions. She was also encouraged to participate in other extracurricular activities and sports. For her only son, she worked hard to provide him with a private catholic school education. She supported him with his post-secondary educational goals, leading to his career in law enforcement. Although she passed away one year prior to the completion of this milestone, she is forever in my heart. She unknowingly served as an educational advisor in the areas of early childhood literacy and students with educational disabilities. Bert Bert, thank you!

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List of Abbreviations

Computer Adaptive Test (CAT)

Community of Inquiry (COI)

Computer Assisted Instruction (CAI)

Emergency Remote Education (ERE)

Every Student Succeeds Act (ESSA),

General Education (GE)

Individuals with Disabilities Education Act (IDEA)

Massive Open Online Courses (MOOCs)

National Assessment of Educational Progress (NAEP)

Other Health Impairment (OHI)

Social Equity Theory (SET)

Specific Learning Disability (SLD)

Standard Error of Measurement (SEM)

Standards of Learning (SOL)

Student Growth Percentile (SGP)

Student With a Disability (SWD)

Virginia Department of Education (VDOE)

Virginia Standards of Learning (VASOL)

CHAPTER ONE: INTRODUCTION

Overview

The purpose of this quantitative, causal-comparative study was to determine if a difference existed between the reading and math achievement scores among sixth grade general education students, students with specific learning disabilities, and students with other health impairments following school closures due to the COVID-19 pandemic and subsequent virtual instruction. Chapter one provides background information regarding virtual instruction, school closure data, and gaps in student achievement based on subgroups, specifically students with disabilities (SWD). Chapter one offers some historical data, social implications, and the theoretical framework for this research study. The problem statement addresses the current research on this topic and provides a discussion on the gaps in the research. Finally, the research questions are introduced.

Background

Achievement gaps for minority children are correlated with gaps in income, poverty rates, unemployment rates, and parents' education levels. Similarly, wealthier states have better assessment scores. Structural inequality was identified as a cause. According to the Department of Education, 45% of high-poverty schools receive less state and local funding than other schools within their division. The McKinsey study summarized that the achievement gap had cost the United States economy more than all recessions since 1970 combined (Amadeo, 2019). Education increases income which generates more significant economic growth. Over a lifetime, Americans with a college degree earned 84% more than those with just a high school diploma. Education can be used to improve economic mobility. The fact that the achievement gap remains hurts economic growth.

This research sought to determine the impact of the COVID-19 school closures and the subsequent need for virtual instruction on sixth-grade students' reading and math achievement. In November 2020, a study was published titled *Projecting the Potential Impact of Covid-19 School Closures on Academic Achievement* (Kuhfeld et al., 2020). This study sought to project the impact of school closures on academic achievement. The study used known factors such as absenteeism and seasonal school closures to project the effects of closures due to COVID-19. The research study did not address the impact of the achievement gaps between SWD and their non-disabled peers. In a 2016 study, achievement gaps for students with disabilities were examined. The study found that gaps in reading achievement between SWD and their general education peers were narrowing (Schulte et al., 2016). However, this study was completed before the COVID pandemic. An assumption can be made that school closures and virtual instruction may widen the prevalent achievement gaps. A widening achievement gap may hurt society.

During the fall of 2018, a study was conducted to compare the achievement of SWD and their general education peers when they spent 80% or more of their time in an inclusion classroom (Gilmour, 2018). This study found that although students who were in inclusion classrooms for a greater amount of time increased academically, there were some instances when a more restrictive environment was warranted. An example given was a student with a specific learning disability in reading. Because this student had difficulty in reading comprehension and sounding out words, this student would benefit from a self-contained classroom. This study is relevant to the research topic because it provides insight into the differences in educational needs based on the classification.

Historical Overview

Achievement gaps have existed for over 50 years as first pointed out in the Coleman report (1966). To search for the underlying causes of the reading achievement gap, a study was completed of 2,296 students in 184 schools from the Early Childhood Longitudinal Study (ECLS) kindergarten to 1st-grade cohort (Chatterji, 2006). Significant first grade reading differentials were present in African American children, which scored 0.51 *SD* units below Whites. Children in high poverty scored 0.61 *SD* units below well-to-do children. The study found that the size of the gaps increased from kindergarten to 1st grade.

Significant achievement gaps have existed between SWD and general education students; however, with increased federal accountability, curriculums have been adjusted to help students with disabilities access the general education curriculum. A meta-analysis of 23 studies found that SWD performed 1.7 standard deviations or more than three years below their typically developing peers in reading (Gilmour et al., 2019). In that study, access as outcomes was examined by estimating the size of the gap in reading achievement between students with and without disabilities. It was found that the reading gap varied by disability label and no other student characteristics.

The Rehabilitation Act of 1973 declared it discriminatory to exclude or segregate individuals with a disability. This law prohibited discrimination against individuals with disabilities from participating in programs or activities that receive federal funding (Murphy, 2020). Before the Rehabilitation Act, many students who had educational needs did not have access to educational opportunities. Some were excluded from public schools and the general population. Some students were removed from their homes and communities, being placed in residential treatment facilities. The landmark case *Brown v. Board of Education* benefited all

minority groups and challenged the notion of '*separate but equal*' for African American children. That important case led the way for the protection of SWD. The Americans with Disabilities Act (ADA) of 1990 was enacted to provide individuals with disabilities equal opportunities for participation in programs and activities, and to prohibit discrimination based on their disability in all areas of public life (Murphy, 2020).

There is now a current focus on the accountability of states and school divisions regarding the academic achievement of all students. With the onset of the No Child Left Behind (NCLB) Act and the Every Student Succeeds Act (ESSA), districts are trying to find ways to close the achievement gap between subgroups. These gaps often persist and expand as students move through their K-12 education, which impacts education systems, the workforce, and state economies, according to Ed.gov (*Every student succeeds act (ESSA)*, n.d). ESSA was signed by President Obama on December 10, 2015. It reauthorized the 50-year-old Elementary and Secondary Education Act (ESEA), the nation's national education law and longstanding commitment to equal opportunity for all students. Under ESSA, states are now held federally accountable for closing these achievement gaps.

Society-At-Large

The COVID-19 pandemic has impacted the educational outcomes of students across the nation (Van Lancker & Parolin, 2020). Research has been limited on the impact of school closures on the ever-widening achievement gaps before the pandemic. Data has been limited to the effects of school closures and the resulting impact of virtual learning. Most states have left the option of virtual versus in-person instruction to local divisions (Wedell, 2020). As of October 2020, data showed that most states had no order in effect, which means in-person instruction decisions were being made locally, with states providing only recommendations or guidelines.

Only a few states mandated a full closure, and some states required schools to be open to families wishing their children to come either full or part-time. (“Map: Where are schools closed, 2021”). Parental concerns have included anxiety about the risk of infections and the implications of social isolation (Wedell, 2020).

Special education students face difficulty accessing class assignments, materials, live chats, and discussion boards in the school’s online learning management systems (Burdette et al., 2013). Other technological barriers exist, such as a need for screen readers or more thoughtfully designed systems. Ensuring that services are being provided and that educational goals and objectives are met is also difficult in a virtual setting. Students with disabilities have Individualized Educational Plans (IEPs) that are developed to meet their educational needs, describing the specially designed instruction that will take place in the classroom. For some students, virtual learning is not conducive to their preferred learning styles or needs.

Although virtual learning may not be ideal for all or some students, research shows that educational technology may create equitable outcomes for underserved student populations (Kim, 2019). Education technology has been used to support diversity and equity in education. It has been focused on access to technology for marginalized populations, such as children of color, children in poverty, and children with disabilities.

Theoretical Background

In 2001, NCLB legislation required states to report student performance levels, including those of SWDs. It also provided for sanctions if these performance levels did not meet annual performance goals (Pak, 2020). In 2004, the Individuals with Disabilities Act (IDEA) was reauthorized. This established that the education of students with disabilities could be made more

effective by having high expectations and ensuring their access to the general education curriculum in the regular classroom to the maximum extent possible.

Although NCLB and IDEA targeted equity and inclusiveness, there have been racialized origins of disability classification in the United States (Annamma et al., 2016). Currently, some trends suggest the disproportionate classification of African American students as SWD and the segregation of students of color from general education classes more often than their white peers. In 2011, Artiles documented the practice of subjectively identifying students of color as having learning disabilities as the “racialization of ability” (Artiles, 2011, p. 431). Current federal legislation has mandated states and localities to reduce this disproportionate identification. However, injustices still exist.

George Fredrickson’s 1968 social equity theory (SET) provides the theoretical framework for this inquiry. SET proposes that racial-ethnic achievement gaps originate from two types of social processes, which include direct and signal influences (Mckown, 2013). Social processes are transactions between individuals, including verbal and non-verbal communication. In describing SET, direct influences can contribute to the racial-ethnic achievement gap when distributed differently to people with different ethnic backgrounds. Signal influences communicate negative expectations about a child’s racial-ethnic group.

SET applies to students with disabilities. When thinking of equity, one may consider “who gets what, when, and how” (Lasswell, 1970, p. 257). SET asserts that all students get equal treatment, regardless of race, religion, sex, or any other discriminating factor. For students with disabilities, special education services are the mechanism for the students to achieve access and benefit from the same curriculum as their non-disabled peers (Biddix et al., 1997).

The tracking of students was once widespread in education (Loveless, 1999). It has also been referred to as *phasing or streaming* and is a system where students are divided into classes based on their overall achievement. Some researchers have argued that tracking stands in the way of equal and equitable educational opportunities. With over 700 studies of tracking, results have shown that there is no special or adverse impact on the achievement of disadvantaged students.

Problem Statement

In November 2020, a study was published titled, *Projecting the Potential Impact of Covid-19 School Closures on Academic Achievement* (Kuhfeld et al., 2020). The researchers of this study suggested future research on how the pandemic impacted the most vulnerable populations. The study sought to project the impact of school closures, on academic achievement and used known factors, such as absenteeism and seasonal school closures, to make these projections. The study also addressed projected gaps related to socioeconomic status. However, the research did not address the impact of the achievement gaps and the specific performance of students with disabilities.

In September 2020, a study examined the successes and difficulties of serving special education students during a pandemic (Tremmel et al., 2020). The study found that, with effective communication, professional development, and teacher tools, SWD were well supported. The researchers suggested future research on the impact of online instruction when implemented during a crisis, such as the COVID-19 pandemic, between rural SWD and students without disabilities. There are also existing studies on the effectiveness of virtual instruction strategies for SWD (Burdette et al., 2013; Cheng & Ye, 2010; Rana, 2016; Satsangi et al., 2016;). A 2022 study described the need to address a potential learning gap or decrease in

growth during the COVID-19 pandemic between students with and without disabilities. The study was drawn on a framework of social vulnerability and highlighted a lack of research on SWD (Bendeck, 2022). The problem is that the literature has not fully addressed the impact of the pandemic on the most vulnerable populations.

Purpose Statement

The purpose of this quantitative, causal-comparative design study was to determine whether differences existed between the reading and math achievement of sixth grade general education students and SWD that were identified with a specific learning disability or other health impairments. Sixth grade math and reading achievement were selected because this is a pivotal year of formal testing for public school students in Virginia. During the 2020-2021 testing cycle, students who were sixth graders had formally been tested before the COVID pandemic during the 2018-2019 school year (SY). For this study, the independent variable was the student's designation (general education, specific learning disabled, and other health impairment). The dependent variable was the academic performance on the sixth grade reading and math assessments.

Significance of the Study

This study was significant because of increased federal accountability for schools to close the gaps and ensure that all student subgroups are achieving at a high level and will give school divisions insight into the impact of virtual instruction on different subgroups of SWD. States must find ways to ensure the performance of all students. Achievement gaps for minority children are correlated with gaps in income, poverty rates, unemployment rates, and parents' education levels. Similarly, wealthier states have better assessment scores. Structural inequality was identified as a cause. According to the Department of Education, 45% of high-poverty

schools receive less state and local funding than other schools within their division (Amadeo, 2019). The McKinsey study summarized that the achievement gap had cost the United States economy more than all recessions since 1970 combined. Education increases income which generates more significant economic growth. Over a lifetime, Americans with a college degree earn 84% more than those with only a high school diploma. Education can be used to improve economic mobility. The fact that the achievement gap remains hurts economic growth.

Because of the COVID-19 pandemic, instructional outcomes have been stifled. Research on its impact has been limited. School divisions need to plan instruction to meet the needs of all students. However, students in identified subgroups are especially vulnerable. School divisions have not adequately prepared for the current school year, and if changes have not been made, the achievement gap will widen further. Some school divisions have not offered face-to-face instruction due to safety concerns and a lack of preparation for in-person instruction. This study will provide some insight into school divisions to use to increase the achievement of their subgroups.

Research Question(s)

RQ1: Is there a difference in reading achievement scores among sixth grade general education students, students with specific learning disabilities, and students with other health impairments?

RQ2: Is there a difference in math achievement scores among sixth grade general education students, students with specific learning disabilities and students with other health impairments?

Definitions

1. *Achievement* – measurement of the amount of academic content learned in a time frame (Merolla & Jackson, 2019).
2. *Achievement Gaps*- the disparity in academic performance between groups of students (Merolla & Jackson, 2019).
3. *Alternative instruction*- non-traditional instruction (Dibner et al., 2020).
4. *Blended learning*- instruction that combines classroom learning with online learning, in which students can, in part, control the time, pace, and place of their learning (Dibner et al., 2020).
5. *COVID-19*- an infectious disease caused by the coronavirus called SARS-CoV-2. With the disease, older adults and those with severe underlying medical conditions are at a higher risk of developing complications (Kuhfeld et al., 2020).
6. *Diversity*- differences in racial and ethnic, socioeconomic, geographic, and academic/professional backgrounds; people with different opinions, backgrounds (degrees and social experience), religious beliefs, political beliefs, sexual orientations, heritage, and life experiences (Artiles, 2011).
7. *Educational Disparity*- the unequal distribution of academic resources, including but not limited to,; school funding, qualified and experienced teachers, books, and technologies to socially excluded communities (Chatterji, 2006).
8. *Equity*- the state, quality, or ideal of being just, impartial and fair (Artiles, 2011).
9. *General Education Students*- typically developing students (Tremmel et al., 2020).
10. *Hemophilia* – a condition in which the blood’s ability to clot is severely reduced, causing the sufferer to bleed severely from even a slight injury (Kavale et al., 2009).

11. *Hybrid instruction*- similar to blended learning, combines in-class instruction with online activities (Dibner et al., 2020).
12. *IDEA-Individuals with Disabilities Education Act*- a law that makes free appropriate public education available to eligible children with disabilities (Gilmour, 2018).
13. *Individualized Education Plan*- a legal document that clearly defines how a school plans to meet a child's unique educational needs that result from a disability (Biddix et. al, 1997)
14. *Leukemia*- cancer of the body's blood-forming tissues, including the bone marrow and the lymphatic system (Kavale et al., 2009)
15. *Longitudinal Study*- A study in which researchers examine the same individuals repeatedly to detect any changes that may occur over a period of time (Chatterji, 2006).
16. *No Child Left Behind (NCLB)*-a federal law that provides money and extra educational assistance for disadvantaged children in return for academic progress improvements (Gilmour, 2018).
17. *Other Health Impairments*- covers a variety of conditions, diseases, disorders, and injuries that substantially affect a student's strength, vitality, or alertness (Tremmel, et.al., 2020).
18. *Pandemic*- an epidemic of an infectious disease that has been spread across a large region, which may have been spread across multiple continents or worldwide (Kuhfeld et al., 2020).
19. *Rehabilitation Act of 1973*- declared it discriminatory to exclude or segregate individuals that had a disability (Murphy, 2020)

20. *Risk Ratio*- relative risk compares the risk of a health event (disease, injury, risk factor, or death) among one group with the risk among another group (Farkas et al.,2020).
21. *Self-Contained Classroom*- refers to a classroom where a special education teacher is responsible for the instruction of all academic subjects (Tremmel, Myers, Brunow & Hott, 2020).
22. *Social Equity Theory*- a theory that proposes racial-ethnic achievement gaps originates from direct and signal influences (McKown, 2013).
23. *Social Justice*- justice in the distribution of wealth, opportunities, and privileges within a society (McKown, 2013).
24. *Specific Learning Disability*-a disorder in one or more of the psychological processes involved in using or understanding spoken or written language (Tremmel, et.al., 2020).
25. *Students with Disabilities*-Students who are diagnosed with one or more of thirteen disabilities covered by IDEA (Gilmour, 2018).
26. *Student Tracking*- also referred to as *phasing or streaming*, tracking is a system in which students are divided into classes based on their overall achievement (Loveless, 1999).
27. *Subgroups* – any group of students with similar characteristics such as gender, racial or ethnic identification, socioeconomic status, and physical or learning disabilities (Merolla & Jackson, 2019).
28. *Tourette Syndrome*- a disorder that involves repetitive movements or unwanted sounds (tics) that cannot be easily controlled (Kavale et al., 2009)
29. *Virtual Learning*-using computers or other electronic devices to deliver instruction (Burgess & Sievertsen, 2020).

CHAPTER TWO: LITERATURE REVIEW

Overview

The purpose of this literature review was to present findings regarding the impact of virtual learning and school closures on student achievement and the achievement gaps between student subgroups. The chapter opens with the theoretical framework. This study was grounded in Frederickson's Social Equity Theory (Mckown, 2013), which asserted that racial-ethnic achievement gaps form from two types of social processes, which include direct and signal influence. In addition, the theory of cognitive development and the theory of multiple intelligences is also foundational to this research study. A thorough review of pertinent literature regarding educational disparities, achievement gaps, and addressing the achievement gaps using technology, COVID-19, and school closure complete the chapter, and ending with a summary.

Introduction

The COVID-19 pandemic disrupted classrooms across the world. School closures were a common tool to battle against the spread (Engzell et al., 2021). Many students missed a substantial amount of direct classroom instruction (Viner et al., 2020). According to a report by Per Engzell, 95% of the world's student population was affected by the suspension of in-person classroom instruction. This was reported as the most significant disruption to education in history. School divisions were forced to provide alternative instruction, some with limited technological access. Many closures were also prevalent across the United States. The impact of these closures has not been widely studied. Some studies have predicted the effect; however, the actual result is yet to be seen. The impact of the closures on the most vulnerable populations also has not been studied. These vulnerable populations include students with disabilities (SWD) (Raskind et al., 2005). Research has shown that achievement gaps already exist between SWD

and their general education peers (Schulte & Stevens, 2015). In a 2020 report, author Elisabeth Grewenig argued that low-achieving students were particularly affected by the lack of educator support during school closures (Grewenig et al., 2020). This chapter will review the existing literature regarding these gaps and the impact of the COVID-19 school closures on the reading and math achievement of SWD.

Theoretical Framework

The theories that guided this research are the Social Equity Theory (SET) (Frederickson, 1990), the theory of cognitive development (Piaget, 1952), and the theory of multiple intelligences (Gardner, 1983). SET theory asserted that racial-ethnic achievement gaps originate from two types of social processes, which include direct and signal influences. The theory of cognitive development argued that people gradually construct their knowledge through experiences, sometimes in stages. (Orr, 1991). The theory of multiple intelligences suggested that people may be stronger in other areas or possess a range of abilities across multiple intelligences (Sanchez-Martin et al., 2017).

Social Equity Theory

Although SET was first credited to George Frederickson in 1968, its origins can be traced back to the works of Plato and Aristotle (Kamtekar, 2001). Plato addressed social justice in his book the *Republic*. According to Plato's principle of happiness, the city should aim for the happiness of all citizens. Plato called for functional reciprocity, stating that "each has a right to those and only those socially distributable benefits which will maximize his contribution regardless of the ratio which the value of services rendered bears to that of benefits" (p. 89).

George Fredrickson developed Social Equity Theory in 1968. Its original aim was to become the third pillar of the theory and practice of public administration. During that era,

inequality and injustice were prevalent, and a government built on a Constitution that claimed equal protection under the law had failed. Frederickson's theory emphasized equality in government services, and responsiveness to the needs of citizens and not public organizations (Frederickson, 1990). In recent literature, SET has been applied to civil service practices requiring agencies to support social equity principles and initiatives with dedicated resources that fit within constitutional foundations and legal responsibilities (Newbold & Holzer, 2020). SET applies to the comparison of SWD and their non-disabled peers because it asserts that all students get equal treatment, regardless of race, religion, sex, or any other discriminating factor. SWD should receive instruction that is comparable to their non-disabled peers. This theory may advance the resulting research because there may be some trends in closing the gaps for SWD.

Theory of Cognitive Development

Two other theories framed this research, the theory of cognitive development and the theory of multiple intelligences. Jean Piaget is the author of the theory of cognitive development. This theory asserted that people gradually construct their knowledge through experiences, sometimes in stages (Orr, 1991). Due to environmental factors that cannot be controlled, educational experiences among children are different. "Educators can't do much about an unsafe neighborhood, access to libraries, or the lack of jobs. All of these factors can adversely affect educational achievement" (Amadeo, 2019, p. 3) According to Piaget (1952), cognitive development can be described as a reorganization of mental processes that results from experiences and maturation. Four main stages characterize Piaget's theory. In the first stage, sensorimotor, children can differentiate themselves from objects and begin to act intentionally. Stage one occurs typically between birth and age two. During the next stage, preoperational, learners use language to represent objects. Some learners have difficulty understanding the

viewpoints of others. This stage happens between the ages of two and seven. In the third stage, concrete operational, seven to eleven-year old's, can think logically about events. During the last stage, formal operational, eleven-year old's and up, can think logically and question the future and ideology.

This theory can be applied when determining interventions to close the achievement gaps between subgroups of students. Focusing on environmental factors and individualizing learning experiences are two areas that will positively impact closing the achievement gap (Camera, 2016). When educators know how a child learns or thinks, instruction can be personalized. The learner-centric classroom is a product of Piaget's theory of cognitive development (Orr, 1991). One intervention to close the achievement gap is to personalize learning outcomes. Piaget's theory also focused on logical and critical thinking. There is abundant research on early childhood development and the impact of preschool education. In studying cognitive development, interventions can be explored to close the achievement gap.

Theory of Multiple Intelligences

The theory of multiple intelligences originated in 1983 when developmental psychologist Howard Gardner outlined nine types of intelligence in the book *Frame of Mind*. This book was influenced by the works of Alfred Binet and William Stern (Sanchez-Martin et al., 2017). This theory suggested that people have different types of intelligence which challenge the traditional view of intelligence. For example, people may be stronger in other areas or possess a range of abilities across multiple intelligences. Gardner proposed nine different bits of intelligence to capture the full range of talents and abilities people possess. These bits of intelligence include visual-spatial, linguistic-verbal, logical-mathematical, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic. Criticism of this theory includes psychologists who feel these bits

of intelligences are simply personality traits. Utilizing technology to address multiple intelligences and differentiated instruction may positively impact educational outcomes.

Behaviorism

Behaviorism is a learning theory based on the idea that all behaviors are acquired through conditioning (Cherry, 2019). It is sometimes called behavioral psychology. This conditioning occurs through interactions with the environment. Behaviorists believe that responses to environmental stimuli shape actions. Strict behaviorists believe that anyone can be trained to perform any task regardless of genetic background and personality traits.

Social-psychological interventions have reduced student achievement gaps in education. These exercises target students' thoughts, feelings, and beliefs and are often seen as "*magic*" because the effects of the interventions are long-lasting (Yeager & Walton, 2011). Psychological interventions seem small relative to traditional educational reform. Some people may assume that large problems require large solutions. Psychological interventions do not replace traditional educational reforms but operate within the context of existing structures, helping students take advantage of available learning opportunities. Yeager and Walton (2011) detailed several interventions. One intervention is increasing student motivation to learn by removing barriers to learning. Another intervention is to increase forces that promote behavior, for example, by giving incentives for better grades.

Related Literature

Historical Background of Disparities in Education

The United States has a long history of educational disparity. Native Americans faced oppression in the earliest days of our nation's history. Boarding schools for Native American children emerged in the 1800s. Unequal access to quality education was not isolated to Native

Americans. In California in the 1800s, school administrators routinely denied school admittance to Chinese American children (Turner & Parsons, 2014). In 1931, the first successful local school desegregation court decision prohibited the Lemon Grove School Board from turning away Mexican American students. It is well known that many disparities are patterned by space and the race and ethnicity of enrolled students. Native Americans have been routinely excluded from most studies in metropolitan areas due to their low numbers (Logan, & Burdick-Will, 2017). However, in rural America, the numbers are more prevalent. The poverty level is as high as in city schools, and achievement is unusually low. In a study by John Burdick and Julia Burdick-Will, it was found that disparities in reading and math were also associated with school segregation. Caucasian and Asian students attended schools with higher test scores, while Hispanic, Native American, and Black students attended the worst-performing schools.

The discriminatory treatment of African American students in our nation's educational system warrants more scrutiny due to disproportionality (Powers et al., 2016). Africans began their experiences in America as indentured servants or enslaved people. During the Civil War, laws were passed to prohibit Blacks from obtaining an education. In 1989, Samuel Myers (1989) asserted that public policy concerning African Americans in education had gone through at least four phases: the prohibition period (the banning of teaching Black children to read or write), the development period (creating educational opportunities for formerly enslaved people), the segregation period (separation of races) and the desegregation period (eradicating racial identity in education). Author Kevin Brown (2005) detailed a fifth phase described as the post-desegregation era and its impact on African American school children.

Disparities in School Readiness

Racial disparities exist in school readiness. Aspects of childhood experience, including health, stress, violence, parenting, and access to resources, contribute to these disparities. Some of the same experiences, including cognitive stimulation and chronic stress, affect brain development in humans and animals (Noble et al., 2005). There is a suggestion that socioeconomic differences underlie racial differences in academic performance, which is supported by the fact that minorities are at a much greater risk of growing up in poverty. Children from impoverished backgrounds are at heightened risk for poor academic readiness and achievement because of differences in their physical health, the quality of the cognitive and emotional stimulation they receive at home, their parenting, and their early childhood education (Noble et al., 2005). Although work on racial differences in cognitive development is minimal, researchers are beginning to examine the link between socioeconomic status (SES) and neurocognitive achievement.

Income is another factor in disparities in school readiness. Evidence shows that household income affects school readiness. Socioeconomic status affects capacity and achievement, including cognitive, social, emotional, and brain development. Maternal mental health has also been studied to determine its impact on school readiness. Maternal anxiety or depression has been shown to affect the developmental competencies of the offspring.

Causes of the Achievement Gaps between Student Subgroups

The article, *Structural racism as the fundamental cause of the academic achievement gap*, gave insight into factors contributing to the achievement gap. In researching the causes, ways can be found to remedy the problem. If the causes are not eliminated, offering solutions to correct the gap will be null and void (Merolla & Jackson, 2019). This article reviewed studies from the past ten years on the academic achievement gap. An argument was made that the

fundamental cause of the achievement gap includes structural racism. “A racialized social system does not only create barriers for students of color through structural forces that lead them to have fewer resources at home and attend lower quality schools” (pg. 7). Structural racism was defined as a system of social organization that provides advantages to Whites, and disadvantages to Blacks. Recent research has highlighted the critical roles played by socioeconomic status, school and residential segregation, and bias and discrimination within schools as factors that link race to educational outcomes.

Overall, our review of the recent literature on racial differences in academic achievement demonstrates that over six decades since the Supreme Court declared that all American children deserve equal opportunities, Black students continue to face a litany of barriers to catching up to their White counterparts (Merolla & Jackson, 2019, p. 8).

Another factor in disparities is government funding. Students from high-poverty schools do not receive an equal amount of government funding. A Department of Education study "Comparability of State and Local Expenditures Among Schools Within Districts: A Report from the Study of School-Level Expenditures," found that 45% of high-poverty schools received less state and local funding than other schools within their own districts (Heuer& Stullich, 2011). Environmental factors must be addressed to close the achievement gap.

Another cause was found to be low teacher expectations. Peterson et al., (2016) examined the effects of teachers' explicit ethnicity-based expectations for academic achievement and implicit prejudiced attitudes about academic achievement on students' actual academic success over time. Thirty-eight teachers were chosen to complete a traditional teacher expectation measure and a modified Implicit Association Task. This task assessed ethnic stereotypes associated with academic achievement and failure. The study was completed to address the issue

of the ethnic achievement gap. “In many countries, academic achievement levels of ethnic minority groups are lower than those of the ethnic majority” (Peterson et al., 2016, p.2). The authors examined the effect that teacher expectations had on academic achievement. Their research found that students in classrooms with teachers with high expectations performed better in reading at the end of the year. In contrast, it was found that mathematics scores were unrelated to teachers’ explicit expectations. Students also benefited most when their teachers’ implicit biases favored the ethnic group to which the student belonged.

If the achievement gap is not addressed, minority children will continue falling further behind. The school-to-prison pipeline is a current issue, and there are also disparities in how children are labeled as students with disabilities and even disciplined. Research shows that Black children, especially Black males, are disciplined at a higher rate than their counterparts. This leads to absenteeism, which also increases the achievement gap. Current research suggests that the achievement gap is still lingering. According to the 2019 Hechinger Report, on average, across the country, White students are scoring nearly two grade levels higher than Black students. In some districts, the Black-White gap was as small as one-third of the grade level (Barshay, 2019). This report suggested that the achievement gap is not driven by race but by poverty. The study found that racial segregation is a strong predictor of the gaps, however, it is poverty that accounts for these large gaps. When the difference in poverty rates between Black and White schools is smaller, the achievement gaps are smaller.

Achievement gaps for minority children are correlated with gaps in income, poverty rates, unemployment rates, and parents’ education levels. Similarly, wealthier states have better assessment scores. Structural inequality was identified as a cause. According to the Department of Education, 45% of high-poverty schools receive less state and local funding than other schools

within their division. The McKinsey study summarized that the achievement gap has cost the United States economy more than all recessions since 1970 combined (Amadeo, 2019). Education increases income, which generates greater economic growth. Over a lifetime, Americans with a college degree earn 84% more than those with just a high school diploma. Education can be used to improve economic mobility. The fact that the achievement gap remains hurts economic growth.

Special Education Disparities

Special Education was born from the Civil Rights movement (Skiba et al., 2008). Special education advocates were inspired by the struggles of the civil rights movement. Concerns regarding racial inequity led to the first special education legislation (IDEA) in 1975. The disproportionate representation of minority students is among the most critical and enduring problems in the field of special education.

Although African Americans are disproportionately identified as special education, some ethnicities are underreported. In 2019, a study was done involving the underrepresentation of Asian Americans and Pacific Islanders (AAPIs). Data for the study was collected over ten years and probed deeper into the underrepresentation by disaggregating participation trends for eleven different AAPI subgroups (Cooc, 2018). The findings of the report showed that most AAPI subgroups are underrepresented in special education and first receive service later than their White counterparts.

Another study addressed the disproportionate identification of minority students based on socio-demographics. The study explored gender, race, and socio-demographics, to determine if there was a correlation regarding identification as having a learning disability. The researchers used nationally representative data collected by the U. S Office for Civil Rights (Morgan &

Farkas, 2016). Results indicated a clear relationship between ethnicity and gender, determining identification as having a learning disability. A regression model also showed that sociodemographic factors were also strongly associated with the proportion of students identified as having a disability.

One key social determinant of health is education. The Individuals with Disabilities Education Act (IDEA) provides access and the right to free and appropriate education; however, some disparities still exist in the identification of students with special needs. Gaps and disparities were highlighted in an article written by Bonuck and Hill (2020). The article sought to link these disparities in special education services to poverty. The article also described years of medical-legal collaboration between the University Center of Excellence in Developmental Disabilities and Fordham University. According to the article, gaps were identified between the number of students potentially eligible and the number of students actually receiving services. Gaps were high, especially for students with specific learning disabilities, speech-language impairments, and developmental delays.

Gaps in education services are underlined by poverty. According to the article, IDEA'S funding share has never reached its legislative-authorized 40% (Bonuck & Hill, 2020). It now is averaging about 18%. State and local governments are left to contribute the remaining funds in public school settings. There are also concerns regarding the under and over-identification of minority children as having disabilities. An estimated 6 million children are not likely to receive the IDEA services for which they may be eligible. It was found through the study that wealthier parents can use private enforcement to obtain superior services. The study found that students with economic challenges were determined not to receive a free and appropriate education. One study found that almost one-third of students with a chronic illness did not ask for an IEP. The

study also found that the United States (US) Department of Education funds a network of parent information centers. However, they are not designed for readers with low literacy, are multilingual, and do not offer free or low-cost legal services.

Addressing Gaps Between Special Education and General Education Students

Federal legislation has mandated that the achievement gap must be closed between subgroups. This includes the gaps between special education and non-special education students. In 2016, a study was done to investigate how the achievement gap changed when different analytical techniques were used (Thurlow et al., 2016). The study also examined achievement trends that were influenced by three methods of reporting. The three different methods of reporting were cross-sectional, cohort-static, and cohort-dynamic. The different analytical techniques used in the study were proficiency levels, scale scores, and effect size. Lastly, the study examined the relationship between student achievement and the extent to which students' special education status changed over the years. The study found that the achievement gap increased as the student grade level increased.

A study in 2020 examined the special education risk ratios reported by school divisions in the United States to explain racial achievement gaps (Farkas et al., 2020). Results from a regression analysis indicated that Black, Hispanic, and White risk ratios were strongly related to Black, Hispanic, and White achievement gaps. The results found that non-White overrepresentation in special education was explained by achievement gaps. The research has been unable to address why disproportionality remains after 40 years (Kramarczuk Voulgarides et al., 2017). Some sociodemographic factors explain disproportionality, such as race, free/reduced-price lunch (FRPL), and family structure. With the onset of IDEA, a paradox has been seen. There has been a racialization of disabilities because the civil rights of one group

(students with disabilities) have become a source of inequity for another group (racial minority students).

Specific Learning Disabilities

A specific learning disability is the inability to acquire learning in one or more curriculum areas (McDowell, 2018). Students who have been identified with a specific learning disability have a disorder in one or more of the basic psychological processes involved in understanding or using language, spoken or written. This disorder may manifest itself in the inability to listen, think, speak, read, write, spell, or do mathematical calculations, including brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. Students identified as having a specific learning disability do not present learning problems primarily due to visual, hearing, motor disabilities, intellectual disabilities, emotional disabilities, or environmental, cultural, or economic disadvantages.

The impact of the school closures has yet to be seen. Students with a specific learning disability may have difficulty with written language and writing. Utilizing a mobile device for learning and demonstration may impede writing and mathematical calculation skills requiring paper and pencil (Terada, 2020). Also, barriers to spoken language may be difficult to overcome with virtual instruction. Other challenges include the inability of an educator to decipher if a student looks confused due to the material, issues with using the technology, and the distractibility of the home environment.

Between 1994 and 2017, research was conducted to compare studies of the education system of South Africa (Dreyer et al., 2020). A qualitative study was conducted to focus on implementing policy to address the needs of students with specific learning disabilities (SLDs) at the university level. A 2020 article summed up the results of the study. Inclusive education and

social inclusion have been promoted in South Africa since 1994. This transformation began with the dismantling of systematic apartheid in the region. Most support for underserved students at that time focused on students with disadvantaged or impoverished backgrounds. A subproject was created to focus on students with specific learning disabilities. According to the Learning Disability Association of America (LDA), many conditions are classified as SLD. They include but are not limited to, dyscalculia, dysgraphia, dyslexia, language-processing disorder, non-verbal learning disorder, visual perceptual or visual motor deficit, attention deficit hyperactivity disorder, dyspraxia, executive dysfunction, and memory disorder. The study found that three overarching themes existed. Many students with SLD did not disclose their disability due to a fear of being stigmatized and misunderstood. Negative self-perceptions were shared among participants. Inclusion policies were found to be in place. However, the general experience of students with an SLD was not generally positive. It was found that there was a lack of sufficient support provided. Students felt that staff members require more training in supporting diversity. Many barriers to academic success were reported. Those include a lack of access to the curriculum and a lack of preparation to meet the needs of diverse learners. Two final themes were that experiences vary across departments and that self-determination and family support are two vital factors in student-perceived success.

Instructional Interventions for Students with Specific Learning Disabilities

In 2015, before the COVID-19 pandemic, the effectiveness of iPad writing instruction was evaluated for a set of 4th-9th graders who had been diagnosed with having a specific learning disability that affects writing, such as dysgraphia (impaired handwriting), dyslexia (impaired spelling), and oral and written language learning disability (Berninger et al., 2015). During the study, the students participated in various activities aimed at improving handwriting,

spelling, and sentence composition. The researchers used normed measures to assess the effectiveness of the activities presented. The article noted that students with learning disabilities differed in acquired disorders that impair their writing abilities. Students with dysgraphia affect the learning of handwriting. Students with this disorder have difficulty forming legible letters. Working memory, spelling, and composing skills are hindered. Students with developmental dyslexia have considerable difficulty with learning how to pronounce and spell words. Results showed an improvement from the pretest to the posttest in handwriting, spelling, and written and oral sentence construction based on computer-aided instruction. The researchers suggested that technology and iPads be used for tier 3 instruction to improve the writing skills of students with a specific learning disability. Utilizing computer technology may allow students with difficulty with motor skill development to increase their academic abilities.

Computers have been used in instruction for many years; however, the effectiveness of computer-assisted instruction (CAI) has not been widely studied. In 2017, researchers sought to examine the current body of research focusing on the effectiveness of computer-aided math instruction on students with a specific learning disability (Stultz, 2017). According to the article, computers have been used in instruction since 1924; however, little research has been completed to test effectiveness for students with learning disabilities. Students with specific learning disabilities have unique educational needs. Common characteristics of students with a specific learning disability in mathematics include difficulties with math facts, counting, calculations, measurement, telling time, mental math, problem-solving strategies, and estimating number quantities. Basic math concepts are important, and individuals with disabilities without these skills have an increased risk of trouble with financial management or gainful employment.

Computer-aided instruction is currently used in classrooms. These programs offer students the opportunity to practice specific areas of weakness and come in a drill and practice or gaming format. The results of the study were mixed. The current body of research supports the use of CAI for teaching students with an SLD; however, the extent of its use is unclear. The author suggested future research on the efficacy of CAI for students to either supplement or supplant traditional classroom instruction (Stultz, 2017).

Other Health Impairments

The other health impairment disability (OHI) category is not used as frequently as specific learning disabilities, intellectual, or emotional disabilities. Students classified as having OHI are children that exert limited strength, vitality, and alertness due to a chronic or acute health problem (Wodrich & Spencer, 2007). Some conditions include attention deficit disorder, attention deficit hyperactivity disorder, diabetes, epilepsy, heart condition, hemophilia, lead poisoning, leukemia, nephritis, rheumatic fever, and sickle cell anemia. OHI has been used when health factors have contributed to a negative educational impact for identified students. The impact of virtual instruction and school closures on students with OHI has not been widely studied.

Students can receive special education services after being qualified under the (IDEA). The regulation of the act specifies that a child with a disability is defined as one with an impairment who needs specially designed instruction because of their disability. The (OHI) category is very broad and is often used to identify students who do not meet the qualifications of other classifications (Grice, 2002). Schools have been pressured to use this category to identify students who do not qualify under IDEA, allowing them to receive special education services.

Attention Deficit and Hyperactivity Disorder (ADHD) is one of the most common medical diagnoses that qualify students for special education services under the OHI category (Kim et al., 2019). According to an article on ADHD remission, there is a link between socioeconomic status and health outcomes. For many conditions, students with fewer economic resources are more likely to experience adverse health conditions at an early age. To assist students with ADHD in being academically successful, family, peer, and school-based interventions must be present. Family-based interventions should assist parents with understanding symptoms and treatments. Social skill training should assist with peer interactions. At the school level, teachers should implement behavioral modification intervention strategies to cater to the needs of students with ADHD. Some suggested strategies are additional instructional time, structured homework time, modified instructions, collaboration with parents, goal setting, peer tutoring, and computer-assisted instructions.

Using Human Performance and Educational Technology to address Achievement Gaps

Prior research has shown that technology can be an effective tool used to close gaps among diverse learners. The concepts of educational and human performance technology have been evolving. In today's conception, educational technology can be defined as an abstract concept or a field of practice (Januszewski & Molenda, 2008). It is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources. The research in the field has grown from investigations attempting to prove that media and technology are effective tools for instruction, to investigations formulated to examine the appropriate applications of processes and technologies to the improvement of learning. Important to the newest research in educational technology is the use of authentic environments and the voices of practitioners, users, and researchers. The

research seeks to resolve problems by investigating solutions that lead to new practices, new problems, and questions. The shift in views of learning and instruction reflected in cognitive and constructivist learning theories has created a rethinking of assumptions about the connection between instruction and learning. With the recent paradigm shift in learning theories, a greater recognition of the learner's role as a constructor as opposed to a recipient of knowledge has come. With this recognition of learner ownership; has come a role for educational technology that is more facilitative than controlling.

De Boer et al. (2016) used an experiment to look at; “the differences in performance and appreciation of the students working in a virtual learning environment with 2D or 3D vision were investigated” (p.145). Two-dimensional (2D) vision technology only uses one camera and can see the world in flat images. Three-dimensional vision technology allows for more depth perception. The researchers used tables to disaggregate the data and show their findings. The findings revealed that working with 3D vision was more beneficial than with 2D vision. According to de Boer et al., the performance of the students was enhanced by the use of 3D vision learning environments. Based on the questionnaire, the students preferred working in 3D vision. The authors concluded that 3D vision is a useful asset to a virtual learning environment. This study is relevant to the research study because the use of 3D vision may enhance the performance of students with disabilities. The study “Student Performance and Appreciation Using 3D vs. 2D Vision in a Virtual Learning Environment” highlighted how technological developments can also increase human performance in the learning environment and demonstrated that human performance factors can be altered based on the resources provided and environmental factors not just the humans' goal alignment with the organization (DeBoer et. al.,

2016). The article further supported the implementation of human performance technology in virtual learning, as well as traditional settings.

The research article “The Use of an Active Learning Approach in a SCALE-UP (Student-Centered Active Learning Environment with Upside-down Pedagogies) Learning Space” explored the use of alternate grouping models to promote student learning through collaboration. Hacısalihoglu, Stephens, Johnson, and Edington (2018) provided a few examples of flipped classroom models which is a type of educational technology. The study highlighted a project conducted at Florida A&M University that “implemented an active learning curriculum coupled with the flipped teaching methodology and an infusion of educational technology in a SCALE-UP environment” (p.2). The research article is significant because of the inclusion of human performance in the learning environment (Hacısalihoglu et. al., 2018). Here a traditional HPT model was not utilized, but the use of varying the environment demonstrated that human performance can be improved by strategies other than instructional strategies. The SCALE-UP learning environment that utilized a flipped classroom model improved student learning. The authors reported that this was one of the first studies of this kind. Ultimately, they felt as though they had created a learning model where the instruction of STEM (Science, Technology, Engineering, and Math) courses would provide learners with the support needed to be successful.

Some research explored the impact of technology on the achievement gap. According to the authors (Outhwaite et al., 2017) the use of handheld tablet technology with learner-centric the software will support children’s early math skills development. In the article “Closing the Gap: Efficacy of a Tablet Intervention to Support the Development of Early Mathematical Skills in UK Primary School Children”, it was found that, “Despite differences across studies in the methodologies used, overall, results showed large and significant learning gains in early math

skills following the tablet intervention” (p. 55). Other major findings of the study included significant gains in math skills following the applied intervention, learning gains were not influenced by SES status, the greatest improvement was shown in low-achieving students with poor memory skills, and handheld tablet technology that is equipped with learner-centered software is an effective means to supplement early instruction for children and should be made accessible to all learners.

In a study conducted to investigate whether students in a medical course would have better grades if they used the gaming software Kahoot, it was found that students viewed collaborative team and gamification-based learning positively (Felszeghy, 2019). The study lent support to the use of gamification in the teaching of histology and provided a foundation for designing a gamification-integrated curriculum across healthcare disciplines.

Technologies continue to emerge that can provide even more powerful learning experiences if properly integrated into curricula and used effectively by well-prepared educators. However, despite significant investments in research and the introduction of new technologies in schools, there is little evidence of substantial improvement in learning and instruction (Bull & Thompson, 2016). Multiple independent studies of how new and emerging technologies are currently being used by teachers and students are needed. These studies should contribute to the understanding of ways in which current instructional practices and learning experiences are or are not improving on account of powerful technologies. According to Bull and Thompson, there is a basic assumption that technology itself cannot improve learning and instruction. It is the use of technology that might impact education. Effective use requires prepared teachers, ongoing support, continuing professional development, and much more emphasis on a formative,

authentic, and ongoing assessment that is truly aligned with the effective forms of learning activities.

A different kind of educational technology use intended to support student achievement occurs in the connected classroom. Connected classroom technology refers to a networked system of personal computers or handheld devices specifically designed to be used in a classroom for interactive teaching and learning (Irving, 2006). These networked technologies include response systems and classroom communication systems. Connected classroom systems offer opportunities for improved formative assessment through questioning and immediate feedback, which has the potential for affording teachers the necessary information to tailor instruction to meet student needs. One mode of instruction in connected classrooms involves students beaming answers to a receiving station with an accompanying anonymous display of histograms of student answer choices. In the connected classroom, teacher adaptive expertise forms the critical foundation for formative assessment practices that provide needed information to monitor students' incremental progress, keeping them oriented on the path to deep conceptual understanding. The effectiveness of the connected classroom technology, as with all instructional tools, depends on the skill of the instructor, however, research has shown an increase in student performance when used effectively.

Impact of COVID-19 and School Closures

The full impact of the school closures has yet to be seen, however, some studies have provided insight into the possible impacts. Starpoint School located within Texas Christian University provides students with learning disabilities with specialized instruction (Chamberlain et al, 2020). The faculty is trained in dyslexia and reading-related disabilities. Due to COVID-19, the school transitioned to a virtual platform with a focus on literacy learning. Although most

teachers and staff did not prefer that learning method, they came together to support young learners and their families. Teachers and students responded well to new literacy experiences, however, children's enjoyment of writing was at its lowest level in a decade (Clark et al., 2020). In a study conducted by the National Literacy Trust, results showed that, although creativity and well-being were emphasized, student writing suffered (Picton & Clark, 2022).

During the COVID-19 pandemic, schools had to decide on providing hybrid or blended instructional options or 100% virtual offerings. Parents had to evaluate the unique needs of their children to determine the best option for them. Parents and schools had to take health and well-being into consideration. Future studies of the intersection of education and health outcomes can clarify the effect of health on education (Black et al., 2021). The National Academies of Sciences, Engineering, and Medicine convened an expert committee to provide guidance on the safe reopening of elementary and secondary schools for the 2020-2021 school year (Dibner et al., 2020). The committee emphasized providing in-person instruction for children in the younger grades, specifically K-3, and for students with disabilities.

It has been reported that school closures have affected the education of 80% of children worldwide (Van Lancker & Parolin, 2020). There has been a debate about the effect of school closures on the slowing of the spread of the disease. However, it has been shown that having schools closed for a long period of time could have detrimental social and health consequences for children living in poverty and will likely increase existing inequalities. School closures have exacerbated food insecurity. For students living in poverty, school is not only a place to learn but also, a place to get a meal. Another troubling factor is that research suggests that gaps in math and literacy skills between children from lower and higher socioeconomic backgrounds widen during holiday periods. The summer holiday in American schools contributes to an estimated one

month of educational loss for students with a low socioeconomic status. This is not seen in students with a higher socioeconomic status. It is expected that the school closures will widen this gap.

In a 2020 report by the National Council on Measurement in Education, the impact of COVID-19 on learning, classroom assessment, interpretation of growth, and teaching was explored (Middleton, 2020). Test pollution, the systematic increase or decrease in test scores unrelated to the content, has been dramatically present due to virtual instruction. The three main sources were identified as test preparation, situational factors such as stress and anxiety, and external factors such as socioeconomic status. Learning was impacted due to teachers not being fully prepared to teach in a one hundred percent virtual environment. Interpretation of growth will be difficult for school divisions due to the different time frames of analysis. Normally, growth is measured from year to year, however, in many states, a formal standardized assessment was not given over the course of 1.5 or 2 years, which makes interpretation difficult. Teaching was impacted due to deficiencies in technology, family issues, personal issues, and health issues. Some teachers taught virtually using video conferencing programs, while others used an asynchronous method, posting videos and assignments online without face-to-face instruction.

During school closures, many educators lacked the adequate resources or training necessary to deliver instruction remotely. A study in the *British Journal of Educational Technology* detailed the lessons learned from transitioning to remote learning in 2020 (Boltz et al., 2021). According to the article, teaching during COVID-19 should be more accurately described as “emergency remote teaching.” (p 14). Polls showed that by April 2020, 83% of families surveyed reported that their children were engaged in virtual learning. The shift came

with a huge learning curve for teachers who had traditionally taught in a face-to-face format. In a study from the University of Texas' Urban Education Institute, 95% of teachers surveyed reported that they had no previous experience with teaching online (Foy, 2020). Because of the lack of experience and the short time frame to prepare for instruction, educators were extremely challenged.

Massive Open Online Courses (MOOCs) are a quick way to build teacher capacity and provide access to professional learning (Boltz et al., 2021). The study addressed the influence of a MOOC on teachers' perceptions of their ability to effectively teach remotely and what major challenges were faced in the shift from in-person to remote teaching. The study found that MOOCs that align tightly with the needs of teachers can significantly impact the perceptions of educators' ability to teach remotely. The study also provided evidence that professional development can increase educator participation in the process of time.

The COVID-19 pandemic forced students to learn in an environment that was unfamiliar and sometimes not conducive to being successful. Students had to adjust to learning online, where technology was not always easily navigable and included choppy audio, frozen screens, and poor or no internet connection, which impacted facial expressions and eye contact (Almusharraf & Bailey, 2021). Because of this, student engagement became a critical part of virtual instruction. The effect of agentic engagement on collaborative language learning orientations was explored. According to the study, collaborative language learning is described as students actively working in pairs or groups to achieve learning goals and assist each other in learning. Learner collaboration has been shown to increase second language acquisition, among other positive benefits. Agentic engagement during video conferencing is critical for successful learning outcomes and is described as the learners' positive involvement in the teaching and

learning process. For this study, a total of 329 students were interviewed from four South Korean Universities. Results from the study confirmed positive perceptions held by students toward online collaboration. Students who participated in collaborative language activities felt they would perform better than students who had not participated in a collaborative activity.

Emergency remote education (ERE) was necessary to be implemented due to the COVID-19 pandemic. In emergencies, technology is often used as part of a crisis response, according to a study by Old Dominion University in Norfolk, VA (Crompton et al., 2021). This study, published in *the British Journal of Educational Technology* reviewed a decade's worth of strategies related to learning with technology during emergency situations. According to the study, prior ERE research was focused on geographic regions where the emergencies occurred. Usually this would go hand in hand with financial or economic hardships. ERE involves the use of technological resources, such as electronic platforms, group or individual online conferencing, and non-internet-based resources such as radio or television. Technology has proven to be the most cost-effective way to continue learning during an emergency. Because of the reliance on technology, broadband infrastructure, hardware, and software should be closely considered. The research involved reviewing a total of 60 studies, where 57 out of the 60 were related to the COVID-19 pandemic. Other emergencies cited were refugee emergencies in Syria, Lebanon, Jordan, and Palestine. Students in a mix of grade levels participated in the studies, with the majority of the students being in a secondary academic setting. Two main types of technology were explored, non-internet-based, and internet based. Although the majority of the studies included internet-based technology, it was noted that ERE could be delivered with the use of the internet. Research findings showed that various physical, cognitive, spatial, and infrastructure resources are needed by students and teachers when using ERE. Partnerships within companies,

organizations, and individuals should be explored to provide the necessary resources to teachers and students. Local groups should be more willing to support local schools within the community. The study also suggested that open lines of communication be maintained between students, parents, and the community. Another suggestion is that educators should be supported with strategies to maintain student engagement when teaching remotely.

A study on learning engagement and the Community of Inquiry model was conducted in 2021 as a result of the shift to full-time online education due to the COVID-19 pandemic (Li et al., 2021). The study explored how secondary students in China engaged with online education during this time and the factors that influenced sustained online engagement. The study explored the perspectives of twenty-four students and five teachers through observations of online classes and interviews. Early evaluations of instruction during this time showed that many difficulties occurred. These difficulties included low motivation, reduced focus, the limited ability to independent learning at home, and teachers' insufficient expertise in teaching online. This study was important because school-age children have been found to lack academic maturity (poor problem-solving skills and self-regulation abilities). Because of this, their ability to manage the cognitive processing of virtual learning resources may be impacted.

The article examined the Community of Inquiry (COL), which is a model that Garrison developed in the early 1990s (Li et al., 2021). It proposed that an engaging educational transaction in a text-based computer-mediated communication environment consists of social presence, teaching presence, and cognitive presence. The model suggests that when the efforts of the three processes are combined, meaningful learning experiences are created. Findings from this study showed that students' learning engagement involved three interrelated categories:

emotional, cognitive, and behavioral engagement. Other factors contributing to student success were teacher presence, parental involvement, and a supportive learning environment/community.

Since the onset of the COVID-19 pandemic, there have been many conversations regarding the impact of virtual learning, with most opinions stating that students are or will be “*behind*”. This has been purported in the mainstream media and is a nationwide concern. In this context, it is suggested that students are not making academic progress or developing socioemotionally (Mann et al., 2021). In the article “Our Children Are Not “Behind” Due to the COVID-19 Pandemic, but Our Institutional Response Might Be”, the authors suggested that the nation be careful regarding using the verbiage “*behind*”. The authors’ position is that putting demands on children to return to normal so rapidly may have an increased negative impact. The author cited previous research on labeling students as being behind as counterproductive. Students who have been labeled feel diminished self-worth, pressure to catch up, and struggle to remain motivated. The authors also think that the terms “*on time*” or “*behind*” are subjective.

One study determined the effectiveness of online education during a time when it was the only option due to the pandemic (Butnaru et al., 2021). In the article, several studies were reviewed and suggested that online learning can be as effective as traditional instruction; however, few studies focus on learner satisfaction. This particular study compared the perceptions of university and high school students regarding the effectiveness of online courses. To conduct the research, a survey was provided to students in Romania. The researcher hypothesized that the perception of the effectiveness of face-to-face courses will influence a student’s desire for physical class attendance and that the same perception will negatively influence the perception of the effectiveness of online courses. During the study, it was reported that a significant relationship existed between the comfort of using the internet and the general

feeling of satisfaction with an online course. The study found that students had clear perceptions of online education, and that educational level did not influence students' perceptions and attitudes regarding online learning. Adequate materials and resource availability had a positive effect.

In 2022, a study examined how K-12 instruction was presented to students with disabilities during the COVID-19 pandemic. The article addressed the disparities in education between special education students (Bendeck, 2022). During the pandemic, instruction had to be modified. These modifications frequently, did not accommodate learners with an educational disability. Some special education services were limited. The study included a variety of instructional delivery strategies used during the pandemic. They included asynchronous, synchronous, virtual, blended, in-person, and home-based. Data from the study concluded that students with disabilities experienced educational vulnerability due to the pandemic. Motivation fell and anxiety was heightened for these students. Some students were unable to understand lessons and keep up with their peers.

Professional development offerings should be adjusted to account for teacher needs, based on the COVID-19 pandemic according to a 2022 report (Haman, 2022). Ongoing changes, particularly ones related to online instruction and teaching with technology create the need for these adjustments. Teaching with technology has become a necessity versus a luxury. According to the report, teachers in higher education were more prepared to teach virtually than those in the K-12 sector.

Standardized Testing in the COVID-19 ERA

Educators and education leaders are debating the question of standardized testing during a pandemic. Advocates would like to have data but not the consequences tied to the data. Those

in favor would like division leaders to put resources where the “*Covid-slide*” has been the steepest (Field, 2021). Research by one of the nation’s major test makers, NWEA, suggests that the most vulnerable remote learners will skip the tests that will measure their academic growth. The Hechinger Report advised that the children most likely to have lost ground, low income, and students of color, are more likely to skip the tests, leaving schools with falsified data. The Education Department released guidance regarding spring standardized testing (Hoover, 2021). School officials in a few states are still challenging state testing requirements. Some school leaders call on parents to have their children opt out of state exams (Barnum, 2021).

It was found that during COVID-19, limited access to technology led to little or no standardized testing (Michel, 2020). The limited testing included remote testing. The rush to test did not allow institutions and school divisions to explore the possibility of issues that would arise; therefore, there were many challenges to remote assessments. The state of Virginia implemented a remote assessment; however, data from that assessment has not been considered fully valid. The Virginia Remote Student Progress Test (VRSPT) is an alternative assessment to the Standards of Learning (SOL) test, given in person to Virginia students. The VRSPT was made available to students in grades 3-8 who, due to the pandemic, received all instruction in a virtual environment and were not able to go to their school to take the SOL test.

In a 2020 report by the Center for Assessment, it was reported that changes to statewide assessments may impact the ability to measure student growth for the future and subsequent years (Betebenner & Iwaarden, 2020). Possible testing scenarios included no testing, full testing, partial testing, abbreviated testing, and delayed “*normal*” testing. The Center for Assessment has provided suggestions for calculating growth to states for over a decade. Due to the pandemic, many states did not formally test during the 2019-2020 school year. It was reported that 47 states

canceled their general summative assessments. Because of these cancellations, states cannot calculate growth between the 2018-2021 school years. The Center for Assessment recommended that using unusual test data for high-stakes decisions would not be appropriate.

Betebenner & Van Iwaarden (2020) made some suggestions for data analysis. States and localities should compare two-year results for student groups between 2017 and 2019 with those from 2019-2021. Comparing cohorts will allow states to compare growth rates and identify the impact of the COVID-19 pandemic by calculating the mean Student Growth Percentile (SGP). Another suggestion mentioned in the study is to review Fall 2020 data if available. This data should be used to determine whether school disruption and learning loss are more extreme based on subgroups.

Summary

Based upon a review of the literature, the causes of the achievement gaps are revealed, including a historical and theoretical framework of the disparities in American education, including special education. Noted is that some instructional interventions have been successful in addressing these gaps. Also, it has been demonstrated that technology has been used to increase the performance of both general education students and SWD. Educational technology, coupled with appropriate teacher development has been shown to improve student performance and close achievement gaps. Based on this review, the current literature highlighted the achievement gaps between students. There is also current literature on the predicted impacts of the COVID-19 pandemic. There is a gap in the research regarding the specific implications for sixth grade math and reading achievement, and if there is a difference between the achievement of special education and general education students following the school closures of the 2019-2020 school year. Because states are mandated to take a standardized test, data should be

available to determine how the achievement gaps are impacted by the COVID-19 pandemic and subsequent school closures.

CHAPTER THREE: METHODS

Overview

The purpose of this quantitative causal-comparative study was to determine whether differences existed between the reading and math achievement of sixth grade general education students and students with disabilities that were identified with a specific learning disability or other health impairments. One hundred and forty-four research participants were selected from elementary schools in the southeastern region of Virginia. Convenience sampling was used to select the participants. Math and reading achievement of sixth graders on the Virginia Standards of Learning Assessment for the 2020-2021 school year was compared between general education students, students with a specific learning disability, and students with other health impairments. The reading assessment was comprised of 28 operational items, and the math assessment was comprised of 40 operational items on the traditional assessment and 28 operational items on the computer adaptive (CAT) version. This study included the CAT version of the math assessment. Chapter three began by introducing the design of the study, including full definitions of each variable. The research questions and null hypotheses followed. The participants, setting, instrumentation, procedures, and data analysis plans were also presented.

Design

A quantitative causal-comparative design was used for this research study. This research design was used because it sought to find the relationship between independent and dependent variables after an action or event has already occurred (Salkind, 2010). This design type was most appropriate for this study because it compared quantitative means for a given dependent variable among groups based on the independent variable (Gall et al., 2007). The causal-comparative research design process, as explained by Gall et al., is closely related to a cause-

and-effect relationship where the investigation sought to find relationships between independent and dependent variables after an event has occurred. It determines if there was a pattern in how the independent variable affects the dependent variable and is a design process in which the person performing the research relies on personal observations or interactions to reach a research conclusion. The Individuals with Disabilities Education Act (IDEA) specifies thirteen disability categories (Lee, 2020). These categories include specific learning disabilities, other health impairments, autism spectrum disorders, emotional disturbance, speech or language impairment, visual impairment, deafness, hearing impairment, deaf-blindness, orthopedic impairment, intellectual disability, traumatic brain injury, and multiple disabilities.

For this study, the independent variable was the student's designation (general education, specific learning disability, and other health impairment). The dependent variable was the academic performance on the sixth grade reading and math assessments. The goal of this research was to determine whether the student's educational designation affects the outcome, which was reading and math achievement scores. General education students were defined as typically developing students who have not been identified as having a disability (Venkatesan, 2017). Students with a specific learning disability have a disorder where one or more of the basic psychological processes in understanding may be impacted (Hienonen et al., 2018). This may include the ability to read, listen, speak, spell, write, or perform mathematical computations. Students described as having other health impairments have limits in strength, vitality, or alertness due to a chronic or acute health problem (Pullen et al., 2017). Common health problems are asthma, attention deficit disorder, or attention deficit hyperactivity disorder, diabetes, epilepsy, heart condition, hemophilia, leukemia, kidney disease, sickle cell anemia, or Tourette syndrome.

Research Question(s)

RQ1: Is there a difference in reading achievement scores among sixth grade general education students, students with specific learning disabilities, and students with other health impairments?

RQ2: Is there a difference in math achievement scores among sixth grade general education students, students with specific learning disabilities, and students with other health impairments?

Hypothesis(es)

The null hypotheses for this study were:

H₀₁: There is no statistically significant difference between the *reading achievement* scores of sixth grade general education students as compared to students with specific learning disabilities and students with other health impairments.

H₀₂: There is no statistically significant difference between the *math achievement* scores of sixth grade general education students as compared to students with specific learning disabilities and students with other health impairments.

Participants and Setting

Population

The school division was described as urban with an approximate enrollment of 13,395 students (VDOE, 2021). Demographics for the school division based on 2020 enrollment included 72.7% African American students, 17.5% Caucasian, 4.2% multiple races, 4.2% Hispanic, 0.7% Asian, 0.4% American Indian, and 0.4% Native Hawaiian. Twelve point two percent of the school division's students were identified as students with disabilities. Sixty-three percent of students were identified as economically disadvantaged, and 1.1% of students were

described as English learners. The city had a population of 95, 311 with a 17.2% poverty rate. The median household income is \$50,224, with a median property value of \$171, 800. The sample population included forty-eight general education students, 48 students that had a specific learning disability, and 48 students that had other health impairments. General education students are defined as those who are typically developing (Tremmel et al., 2020). Students with a specific learning disability were described as having a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, write, spell, or do mathematical calculations (Kavale et al., 2009). Students described as having other health impairments may have a variety of conditions, diseases, disorders, and injuries that substantially affect a student's strength, vitality, or alertness. The sampling procedure used was a convenience sampling of third-grade students enrolled in an urban school district. Participants were selected based on their school and classroom type, specifically a general education inclusion classroom. This classroom type was chosen because the students received the same instruction from the same teachers.

In the state of Virginia, there is an intent to include all students with disabilities in the assessment portion of the accountability system (Tuerk, 2005). Federal regulations under Section 504 of the *Rehabilitation Act of 1973*, as amended, and Regulations Governing Special Education Programs for Children with Disabilities in Virginia at 8 VAC20-81-20.4, require that individuals with disabilities be given equal opportunity to participate in and benefit from the policies and procedures customarily granted to all individuals (Ruff, 2019).

All students were sixth graders during the 2020-2021 school year. The students with specific learning disabilities and other health impairments received accommodation and services

through the Office of Special Education. General education students did not receive any accommodations or services to access the curriculum. Testing accommodations fell into four categories, timing/scheduling accommodations, setting accommodations, presentation accommodations, and response accommodations. Timing/scheduling accommodations included multiple test sessions, time of day, order of tests, and planned breaks during testing. Setting accommodations normally are making adjustments to the place where testing normally occurs. These accommodations included test location, adaptive or special furniture, and lighting. Presentation accommodations adjust the presentation of text or materials. A few presentation accommodations included written directions and accompanying oral directions, verbal prompts, visual aids, read-aloud tests, audio tests, and large-print tests (Belfi et al., 2012). Response accommodations adjust the manner in which students answer test items. Some response accommodations included an enlarged copy of the answer document, word prediction software, spelling aids, and the English dictionary (Defur, 2002).

Participants and Setting

The participants for the study were drawn from a convenience sample of elementary school students located in southeastern Virginia during the spring semester of the 2020-2021 school year. For this study, the number of students being sampled was 144 which assumed a medium effect size of .7 statistical power and alpha set at .05 (Gall et al., 2007). The sample came from elementary schools in the local school division. Within each school, the students were sampled from general education inclusion classrooms. The classes included both general education and special education students. The classes were taught by general education and special education teachers who used the co-teaching model. The classes included the general education curriculum which covered basic math and reading components. The sample included

72 male and 72 female students. There were 100 African American students, 32 Caucasian students, 6 Hispanic students, and 6 students identified as mixed race. Forty-eight students were general education students. This was defined as the control group. Forty-eight students were classified as having a specific learning disability, and 48 students were classified as having other health impairments as defined by IDEA and were considered the treatment group. The students came from different ethnic and socioeconomic backgrounds. Both treatment and control groups were assessed during the spring assessment administration. All students were provided appropriate accommodations as defined by federal regulations.

Instrumentation

Types of data collection for causal-comparative research include questionnaires, pre and post-tests, various assessments, and behavior observation. Post-tests were used in this research study. The instrument that was used in this study was archival data retrieved from the Virginia Standards of Learning Assessment for math and reading. It is a standardized test in which reading and math scores of sixth grade general education and special education students were collected.

In the state of Virginia, the Standards of Learning (SOL) serve as the curriculum guideline for K-12 education. The SOL provide a foundation to increase student achievement. The program has been utilized since the mid-1990s when the reading scores of Virginia's fourth graders took a dramatic decline on the National Assessment of Educational Progress (NAEP). Because of this and declining SAT scores, there was a need identified for a more rigorous curriculum (VDOE, 2021). The standards were revised in 1995 at the recommendation of the Board of Education. Reform came by way of a commission formed by then -Governor George Allen. The commission recommended that an accountability program be created to assess the

new standards. SOL testing began in 1998. Students in grades 3, 5, 8, and high school took assessments in reading, writing, mathematics, history, and science (Parish, 2002).

The SOL is a valid and reliable instrument. Reliability is a way to quantify the level of stability in test scores (Gall et al., 2007). High reliability would indicate that there is high stability in the observed score representing the student's true proficiency. The SOL use internal consistency to estimate their reliability. Cronbach's coefficient alpha statistic is used to estimate internal consistency reliability (Cronbach, 1951). The Cronbach alpha score for the sixth grade reading test is 0.86, and 0.91 for the sixth grade math assessment (VDOE, 2021). For assessments that combine a multiple choice and short answer section, a stratified alpha statistic is used (Cronbach et al., 1965). The Standard Error of Measurement (SEM) is also used to indicate the stability of test scores. VASOL uses the following formula to calculate the SEM:

$$SEM = \sigma_X \sqrt{1 - \rho_{XX'}}$$

where σ_X is the population standard deviation of observed scores, and $\rho_{XX'}$ is the population reliability coefficient.

Validity is the degree to which an instrument measures what it is intended to measure (Gall et al., 2007). Validity in the sense of the SOL test refers to how theory supports the interpretations of test scores for the proposed use of the test. To ensure test validity, the Virginia Department of Education looked at four sources of valid evidence (VDOE, 2021). These sources included evidence based on test content, response processes, internal structure, and relationships to other variables. To ensure content alignment, each assessment is built to a specified blueprint. Teacher input is also used to develop item content. Alignment studies were done in conjunction with state universities to conduct external reviews.

The Virginia SOL assessment was used in a study conducted in 2007 titled “What is the Relationship Between Teacher Quality and Student Achievement? An Exploratory Study” (Stronge et al., 2007). The study examined the relationship between teacher effectiveness and student achievement. Achievement of 1,936 third graders in 85 classrooms on the Virginia SOL Assessments in English, mathematics, social studies, and science was compared to an expected indicator of teacher effectiveness.

The sixth grade math assessment has two different formats, a traditional format, and a computer adaptive test (CAT) format. On the traditional assessment, 50 operational items are present. There are nine items in number and number sense, 12 items in computation and estimation, 11 items in measurement and geometry, and 18 items in probability, statistics, patterns, functions, and algebra. On the CAT formatted assessment, there are a total of 50 items, however, only 42 items are operational. The CAT version of the assessment includes 8 field-tested items that are not used to compute student scores. There are eight items that are in the reporting category of number and number sense, 10 computation and estimation items, nine measurement and geometry items, and 15 probability, statistics, patterns, functions, and algebra items. The CAT format was used for this study.

The sixth grade reading SOL is only available in the CAT format. The test is comprised of a total of 37 items, however, only 31 items are operational. There are six field-tested items that will not be computed into the student’s score. There are 14 questions dedicated to the comprehension of fictional texts and word analysis strategies, and 17 questions dedicated to the comprehension of nonfiction texts and the use of word analysis strategies. For all SOL tests, the scale scores range from 0-600, with a minimum passing score of 400. These scores are both

applicable to the math and reading assessment. A score of 500 and above is considered passed advanced.

Procedures

Institutional Review Board (IRB) approval was received prior to conducting this study. Archival data were used for this study. Data were collected from 144 students from the spring 2021 test administration. The data included 48 scores per school. The scores of 16 students with a specific learning disability and 16 students with an other health impairment were randomly selected from each elementary school. Sixteen general education students were matched based on gender, socioeconomic status, and ethnicity from each school, as well. Data obtained for this study was collected and stored in a locked container and secure electronic drive accessible by the researcher. Data will be destroyed after a seven-year period.

Data Analysis

A One-Way Analysis of Variance, also called ANOVA was most appropriate for this research study because it is used when the researcher is interested in investigating the differences between groups, the independent variable is categorical and consists of three or more groups, and the dependent variable is measured on a continuous scale. In this study, the researcher examined if there was a statistical difference between the reading and math achievement scores of general education students compared to students that have a specific learning disability or other health impairment, therefore two one-way ANOVAs were run.

During the initial data screening, student submissions were reviewed for missing responses. The assessment was given electronically, therefore missing responses were identified immediately by the Pearson software. Non-participant responses were removed from the data set.

The use of Analysis of Variance to respond to the research questions assumed a normal distribution of the dependent variable for each subgroup, and homogeneity of variance among the groups. The dependent variable must also be a continuous interval level of measurement. The independent variable must be categorical. A Box and Whisker plot for each group of the independent variable was used to check for extreme outliers. Kolmogorov-Smirnov was used to test the assumption of normality and Levene's test of equality of error variance was used to test the assumption of equal variance. The null hypothesis was rejected at the 95% confidence level. The effect size was reported using partial eta squared.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this causal-comparative, quantitative study was to determine whether differences existed between the reading and math achievement of sixth grade general education students and students with disabilities that have been identified with a specific learning disability or other health impairments. Sixth grade math and reading achievement were selected because, in the state of Virginia, this is a pivotal year of formal testing for public school students. Students who were sixth graders during the 2020-2021 testing cycle, had formally been tested prior to the COVID-19 pandemic during the 2018-2019 school year. For this study, the independent variable was the student's designation (general education, specific learning disability, and other health impairment). The dependent variables were academic performance on the sixth grade reading and math assessments.

Research Question(s)

RQ1: Is there a difference in reading achievement scores among sixth grade general education students, students with a specific learning disability, and students with other health impairments?

RQ2: Is there a difference in math achievement scores among sixth grade general education students, students with a specific learning disability, and students with other health impairments?

Null Hypothesis

H₀₁: There is no statistically significant difference in *reading achievement* scores among sixth-grade general education students, students with specific learning disabilities, and students

with other health impairments as measured by the 2020-2021 Virginia Standards of Learning Assessment.

H₀₂: There is no statistically significant difference in *math achievement* scores among sixth grade general education students, students with specific learning disabilities, and students with other health impairments as measured by the 2020-2021 Virginia Standards of Learning Assessment.

Descriptive Statistics

For each group, descriptive statistics were obtained on the dependent variable (scores on the sixth grade reading and math SOL). Descriptive statistics can be found in Table 1 and Table 2.

Table 1

Descriptive Statistics Reading

Dependent Variable: scores

Group	<i>n</i>	<i>M</i>	<i>SD</i>
1 – General Ed	48	404.27	58.347
2 - SLD	48	375.29	56.036
3 - OHI	48	368.87	44.009

Table 2*Descriptive Statistics Math*

Dependent Variable: scores

Group	<i>n</i>	<i>M</i>	<i>SD</i>
1 – General Ed	48	386.54	55.026
2 - SLD	48	353.77	44.311
3 - OHI	48	350.94	37.763

Results

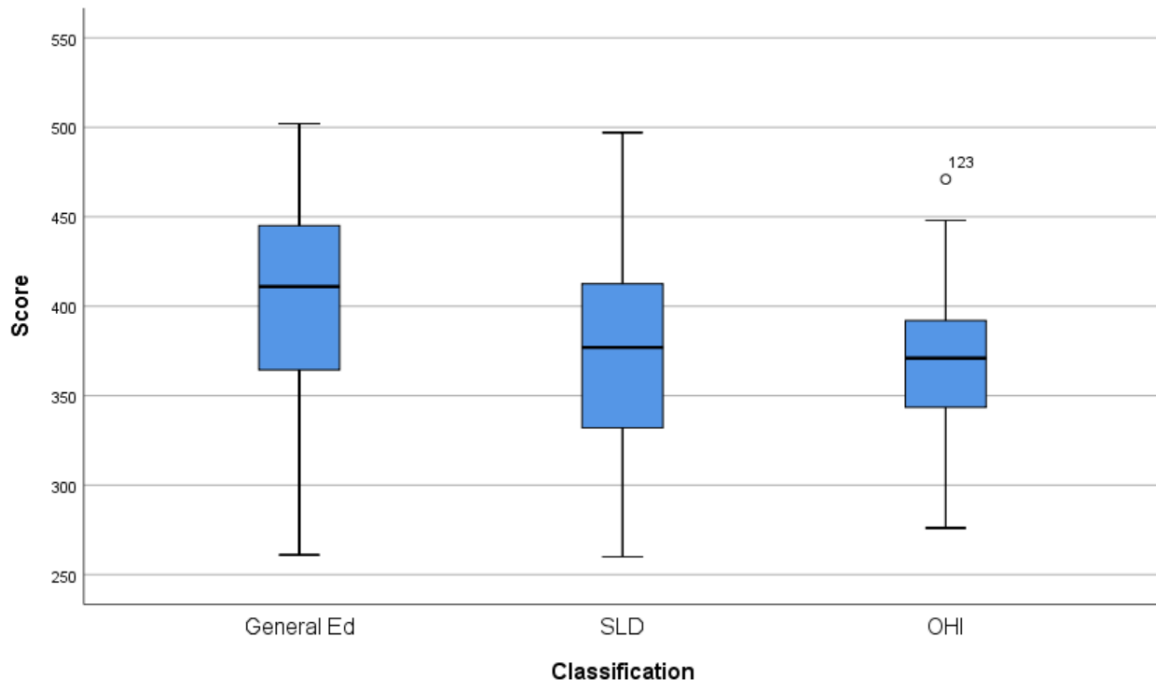
H₀₁: There is no statistically significant difference in *reading achievement* scores among sixth grade general education students, students with specific learning disabilities, and students with other health impairments as measured by the 2020-2021 Virginia Standards of Learning Assessment.

Data screening

Data screening was conducted on each group of the dependent variable. No data errors or inconsistencies were identified. Box and whiskers plots were used to detect outliers in the groups of the dependent variable. No extreme outliers were identified, so all data were retained. See Figure 1 for box and whisker plots.

Figure 1

Box and whisker plot (sixth-grade reading).

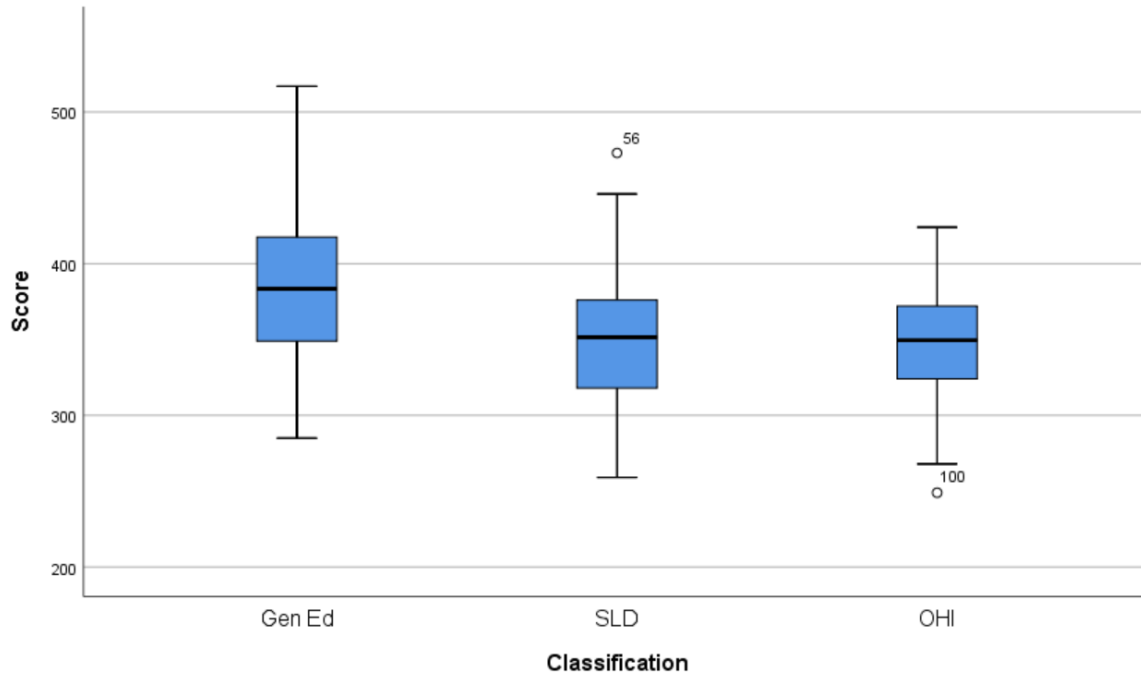


H₀2: There is no statistically significant difference in *math achievement* scores among sixth grade general education students, students with specific learning disabilities, and students with other health impairments as measured by the 2020-2021 Virginia Standards of Learning Assessment.

Data screening was conducted on each group's dependent variable. The researchers scanned for data entry errors and inconsistencies. No data errors or inconsistencies were identified. Box and whiskers plots were used to detect extreme outliers in the dependent variable. No extreme outliers were identified, so all data were retained. See Figure 2 for box and whisker plots.

Figure 2

Box and whisker plot (sixth grade math)



Assumptions

An Analysis of Variance (ANOVA) was used to test the null hypothesis. The ANOVA required that the assumptions of normality and the homogeneity of variance are met. Normality was examined using Kolmogorov-Smirnov because the sample size was more than 50 participants. No violations of normality were found. See Tables 3 and 4 for Tests of Normality.

Table 3*Tests of Normality (Reading)*

Kolmogorov-Smirnov				
Groups		Statistic	<i>df</i>	Sig.
Scores	1 – General Ed	.124	48	.063
	2 - SLD	.105	48	.200
	3 - OHI	.087	48	.200

Table 4*Tests of Normality (Math)*

Kolmogorov-Smirnov				
Groups		Statistic	<i>df</i>	Sig.
Scores	1 – General Ed	.090	48	.200
	2 - SLD	.090	48	.200
	3 - OHI	.075	48	.200

Assumption of Homogeneity of Variance

The ANOVA requires the assumption of homogeneity of variance to be met. The assumption of homogeneity of variance was examined using Levene's Test. Levene's test used an *F* test to test the null hypothesis that the variance is equal across the three groups. Levene's test revealed that the assumption of equal variance was met ($p > .05$) signifying no difference between the variance of the three student groups, general education, SLD, and OHI for the sixth grade reading assessment where ($p=0.097$). However, the assumption of homogeneity of

variance was not met for the math assessment where ($p=0.039$). ANOVA is robust to slight violations of the assumption of equality of variance when the sample size is large, as is the case in the study. The sample size of the study was sufficiently large ($N=144$) making the one-way ANOVA the appropriate choice.

Results for Null Hypothesis

Two one-way ANOVAs were run to determine if there was a significant difference in the achievement of general education students, students with a specific learning disability, and students with an other health impairment on the 2020-2021 sixth grade math and reading Virginia Standards of Learning Assessment. The independent variable was the student's classification of general education, SLD, or OHI. The dependent variable for null hypothesis one is the achievement of the sixth grade reading SOLs and null hypothesis two is sixth grade math SOL scores. The researcher rejected the null hypothesis (**H₀₁**) at the 95% confidence level where $F(2, 141) = 6.038, p = 0.003$ for reading achievement. Partial eta squared equaled ($\eta^2_p = 0.079$) which represents a medium effect size. The researcher rejected the null hypothesis (**H₀₂**) at the 95% confidence level where $F(2, 141) = 8.787, p = 0.000$ for math achievement. Partial eta squared equaled ($\eta^2_{par} = 0.111$). The effect size was also medium.

Because the null hypothesis was rejected, post hoc analysis was required. A Tukey test was performed to compare all possible pairs of group means among the three categories. Based on this test, it was found that there was a significant mean difference among general education students and students with an OHI on the math assessment where $p = .001$. There was also a significant mean difference among general education students and SLD students on the math assessment where $p = .002$. There was not a significant mean difference between SLD and OHI students on the math assessment where $p = .952$. Similar results were found on the reading

assessment. A significant mean difference was found among general education students and OHI students where $p = .004$, and between general education students and SLD students where $p = .023$. However, no significant mean difference was found between OHI and SLD students on the reading assessment where $p = .825$. See Tables 5 and 6 below for Multiple Comparisons of Groups.

Table 5

Multiple Comparisons of Groups (Reading)

Pairwise Comparisons

Dependent Variable: scores

(I) group	(J) group	Mean Difference (I-J)	SE	Sig. ^b	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
1 (GE)	2	28.98*	10.853	.023	3.27	54.69
	3	35.40*	10.853	.004	9.69	61.10
2 (SLD)	1	-28.98*	10.853	.023	-54.69	-3.27
	3	6.42	10.853	.825	-19.29	32.13
3 (OHI)	1	-35.40*	10.853	.004	-61.10	-9.69
	2	-6.42	10.853	.825	-32.13	19.29

Based on estimated marginal means

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

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Table 6*Multiple Comparisons of Groups (Math)*

Pairwise Comparisons

Dependent Variable: scores

(I) group	(J) group	Mean Difference (I-J)	SE	Sig. ^b	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
1 (GE)	2	32.77*	9.441	.002	10.41	55.13
	3	35.60	9.441	.001	13.24	57.97
2 (SLD)	1	-32.77*	9.441	.002	-55.13	-10.41
	3	2.83	9.441	.952	-19.53	25.20
3 (OHI)	1	-35.60*	9.441	.001	-57.97	-13.24
	2	-2.83	9.441	.952	-25.20	19.53

Based on estimated marginal means

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

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

CHAPTER FIVE: CONCLUSIONS

Overview

This chapter provides a summary of the research completed within this study. The chapter begins with a discussion, review of findings, and how the findings compare to previous studies on the topic. It also includes a discussion on the implications of the study and research. The discussion addresses each research question and relevant findings. It concludes with limitations and suggestions for further research.

Discussion

The purpose of this causal-comparative, quantitative study was to determine whether differences existed between the reading and math achievement of sixth grade general education students and students with disabilities that have been identified with a specific learning disability or other health impairments. In March 2020, the Covid-19 pandemic shut down the world, leading to mandatory school closures. The findings of this study are significant because they addressed the impact of school closures, specifically on the performance of students with an educational disability. States are held accountable by the federal government to ensure the success of all students through public educational programs. With the disparities in the performance of students with disabilities, a fresh look at instructional programs for student subgroups should be a priority. The study addressed the following research questions and hypothesis:

RQ1: Is there a difference in reading achievement scores among sixth grade general education students, students with specific learning disabilities, and students with other health impairments?

H₀₁: There is no statistically significant difference in *reading achievement* scores among sixth grade general education students, students with specific learning disabilities, and students with other health impairments as measured by the 2020-2021 Virginia Standards of Learning Assessment.

The null hypothesis was rejected as the data demonstrated that a significant difference exists between the reading achievement scores of general education students and students with a specific learning disability or an other health impairment, however, there was not a significant difference between the reading performance of students with a specific learning disability or an other health impairment. This finding is in alignment with previous studies that showed an achievement gap between students with disabilities and general education students. The study confirmed the finding of a 2022 study that examined how K-12 instruction was presented to students with disabilities during the COVID-19 pandemic. The study found that during the pandemic special education services, accommodations, and modifications were limited (Bendeck, 2022). It was also found that the modifications that were attempted did not accommodate students with an educational disability. The study also addressed the following research questions and hypothesis:

RQ2: Is there a difference in math achievement scores among sixth grade general education students, students with specific learning disabilities, and students with other health impairments?

H₀₂: There is no statistically significant difference in *math achievement* scores between sixth grade general education students, students with specific learning disabilities, and students with other health impairments as measured by the 2020-2021 Virginia Standards of Learning Assessment.

The null hypothesis was rejected as the data demonstrated that a significant difference exists between the math achievement scores of general education students and students with a specific learning disability or an other health impairment, however, there was not a significant difference between the math performance of students with a specific learning disability or an other health impairment. Data from a study conducted in 2022 concluded that students with disabilities experienced educational vulnerability due to the pandemic (Bendeck, 2022). Motivation fell and anxiety was heightened for these students. Some students were unable to understand lessons and keep up with their peers. The current study supports those findings.

This study was important because it addressed the persistent achievement gap between general education students and students receiving special education services. Multiple studies have shown that this gap is widening, and the 2020 school closures did not help with this phenomenon (Gilmour et al., 2019, Amadeo, 2019 and Voulgarides et al., 2017). A study in 2021 examined the challenges faced by students with autism during the COVID-19 pandemic (Hurwitz, et al., 2021). The study detailed how teachers modified their instructional practices to provide parents with support and monitor progress in the home setting. It was found that the participants of the study demonstrated resiliency and innovation, however, no formal assessments were mentioned. Another study in 2021 detailed the challenges of providing distance learning for students with disabilities during the COVID-19 pandemic (Supratiwi, et al., 2021). The results of the study showed that most special education teachers faced barriers that included technology, lack of communication with parents, student boredom, difficulties adapting instructional material to online learning, difficulty monitoring student progress, blackouts, and insufficient internet signal.

With increased federal accountability, state departments of education should determine ways to provide more financial support for educational programs aimed at addressing this gap. Even the federal government's funding share has never reached its legislative authorized 40% (Bonuck & Hill, 2020). It now is averaging about 18%. State and local governments are left to contribute the remaining funds in public school settings.

Another area of concern is a lack of teacher preparation. To address the achievement gap between student subgroups, school divisions should ensure that teachers are properly trained to provide specially designed instruction for students with an educational disability. Teachers should also receive training on delivering instruction utilizing educational technology. In 2015, a study found that improvement was shown in students with disabilities through the use of technology and iPads (Berninger et al., 2015). In that study, it was recommended that technology and iPads be used for tier 3 instruction to improve the writing skills of students with a specific learning disability. A 2017 study also had positive results when computer-assisted instruction was used to supplement mathematics instruction (Stultz, 2017).

Because students with an educational disability are a vulnerable group, teachers need specialized training to support their diverse learning needs. Specially designed instruction is historically reserved for special education teachers. However, based on the results of this study, general education teachers should attend training to learn how to provide this specialized teaching to students with an educational disability. Specially designed instruction (SDI) is the instruction that is tailored to a particular student and often addresses an IEP goal. SDI provides modifications and adaptations to content, allowing a student with an educational disability access to the general education curriculum. Focusing on specially designed instruction will assist students with disabilities in increasing their academic achievement.

This study highlighted a trend in downward math and reading achievement since the COVID-19 pandemic. During the 2017-2018 school year, in the state of Virginia, 85.16% of sixth grade general education students passed the reading SOL, and 82.63% of sixth grade general education students passed the math SOL according to the VDOE website. That same year, 42 % of sixth grade students with a classification of OHI passed math and reading SOL. Students identified with a specific learning disability achieved a 39.76% pass rate on the sixth grade reading SOL and a 45.96% pass rate on the sixth grade math SOL. Scores decreased slightly during the 2018-2019 school year, which was the last year of formal testing in Virginia pre-pandemic. General education students scored 82.73% and 81.25% on the sixth grade reading and math SOLs respectively. Students with an other health impairment scored 38.51% and 38.96% on the sixth grade reading and math SOLs. Students with a specific learning disability achieved pass rates of 37% and 43.88% on the sixth grade reading and math assessments. Pass rates decreased significantly during the 2020-2021 SOL test administration which was after the COVID-19 school closures. General education students obtained a 73.85% reading pass rate and a 44.22% math pass rate. Students with other health impairments achieved a 31.96% reading and 13.95% math pass rate. Students with a specific learning disability achieved a 28.21% reading pass rate and a 14.3% math pass rate. During the last SOL test administration school year 2021-2022, scores rebounded slightly in the state of Virginia. Math pass rates for general education sixth grade students were 58.96% while reading pass rates for sixth grade general education students were 75.28%. sixth grade students with other health impairments achieved a 32.4% reading pass rate and a 24% pass rate in math. Students with a specific learning disability achieved a 33.46% pass rate on the sixth grade reading SOL and a 27.13% pass rate in math.

Implications

Not addressing the achievement gap between subgroups of students will continue to have a negative impact on the society at large. A 2020 study addressed the equity gaps for students with disabilities (Pak, 2020). The study found that students of color represent the majority of SWD's in the United States and their underperformance is linked to biases, as many are low-income students in urban classrooms. Education increases income that generates greater economic growth. Over a lifetime, Americans with a college degree earn 84% more than those with only a high school diploma. Education can be used to improve economic mobility. The fact that the achievement gap between students with disabilities and their non-disabled peers remains damages economic growth (Amadeo, 2019). In a 2022 report by the National Center for Education Statistics, it was found that fourth grade reading and math scores dropped by the largest margin in over 30 years (Ceron, 2022). This represented the first decline in math and the largest decline in reading. All ethnicities lost ground; however, Black and Hispanic students declined the most.

Another implication is the debated national teacher shortage. In parts of the country, many schools are struggling to hire staff (Thompson, 2022). Due to stressors caused by the pandemic, the entire profession is at a tipping point according to a 2022 article by *The Economist*. Some divisions are offering bonuses and four-day work weeks to combat the crisis. States that have historically invested in public education are facing fewer challenges, whereas states that did not invest as much are seeing large vacancies. According to a government survey in June, 47% of schools need to fill a vacancy in special education, compared to only 11% in physical education. The teacher shortage is most prevalent in the most underfunded schools serving the most disadvantaged students.

Limitations

Limitations of a research study can threaten or harm both internal and external validity. The study used a causal comparative research design where there was a lack of researcher control. This type of research design requires measures to yield definitive results (Gall et al., 2007). This study reviewed data from the 2020-2021 school year. The state of Virginia allowed parents to maintain virtual instruction for their students. Because of this, testing was very limited. Many parents of virtual students did not bring their children to school to take the SOL assessment, as it was only offered in person. The previous standardized testing year in Virginia was the 2018-2019 administration. During that year, 98,823 students took the sixth grade reading SOL test. In the 2020-2021 administration, only 68,560 students tested. Another limitation is the lack of research comparing students with a specific learning disability and students with other health impairments.

Recommendations for Future Research

Future research should include other disability classifications, such as emotional disabilities or autism. Data may also be disaggregated to take into consideration ethnicity and sociodemographic information. Teacher preparedness should also be explored with respect to providing specially designed instruction and the use of educational technology with students with disabilities. Future research should include a look at the impact of the growth model that the Virginia Department of Education uses to calculate pass rates.

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APPENDIX A

[External] IRB-FY21-22-1112 - Initial: Initial - Exempt

do-not-reply@cayuse.com <do-not-reply@cayuse.com>

Thu 9/29/2022 5:32 PM

To: Pope, Crystal Michelle <cmpope@liberty.edu>; [REDACTED]
[REDACTED]@liberty.edu>

[EXTERNAL EMAIL: Do not click any links or open attachments unless you know the sender and trust the content.]

LIBERTY UNIVERSITY

INSTITUTIONAL REVIEW BOARD

September 29, 2022

Crystal Pope
[REDACTED]

Re: IRB Exemption - IRB-FY21-22-1112 Impact of School Closures and Virtual Instruction on Sixth Grade Reading and Math Achievement of Student Subgroups

Dear Crystal Pope, [REDACTED]

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:104(d):

(4) Secondary research for which consent is not required: Secondary research uses of identifiable private information or identifiable biospecimens, if at least one of the following criteria is met:
(ii) Information, which may include information about biospecimens, is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained directly or through identifiers linked to the subjects, the investigator does not contact the subjects, and the investigator will not re-identify subjects;

Please note that this exemption only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,
[REDACTED]