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VIRTUAL AND BLENDED INSTRUCTION AND SCHOOL LUNCH ELIGIBILITY
ON STUDENT ACHIEVEMENT DURING THE CORONAVIRUS PANDEMIC

by

LeAnn Ferrell Helms

Dissertation

Submitted to the Faculty of

Harding University

Cannon-Clary College of Education

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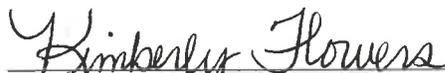
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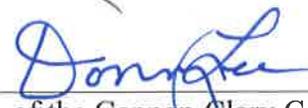
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ABSTRACT

by

LeAnn Ferrell Helms
Harding University
December 2021

Title: Virtual and Blended Instruction and School Lunch Eligibility on Student Achievement during the Coronavirus Pandemic (Under the direction of Dr. Kimberly Flowers)

The purpose of this dissertation was to determine the effects of virtual and blended instruction and school lunch eligibility on student achievement during the coronavirus (COVID-19) pandemic measured by the 2021 ACT Aspire Interim Assessment scores. Scores chosen were from seventh- and ninth-grade students in five schools giving the ACT Aspire Interim Assessment prior to Winter Break. The scores were used to provide academic performance data for the dependent variables used in each hypothesis. Bronfenbrenner developed the ecological systems theory in 1979 to identify environmental factors affecting a person's characteristics over a lifetime. COVID-19 affected education and instructional delivery during the pandemic. Of the four hypotheses, none displayed a significant interaction between instruction type and school lunch eligibility. This study's results indicated only one significant main effect for instructional type. Overall, these results revealed that instructional delivery type was not a significant factor for students' success.

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CHAPTER I

INTRODUCTION

Education during the coronavirus disease (COVID-19) pandemic looked differently than before the pandemic. One significant change was the advancement of virtual and blended teaching required to address students' academic needs. In March 2020, many United States students abruptly transitioned from traditional classrooms and in-person, teacher-led instructional delivery to full-time virtual instruction. Traditionally used by state consortiums, charter schools, and home schools, face-to-face public and private schools suddenly implemented virtual instruction daily (Harrington & Stebbins, 2020). Once exclusively done by face-to-face instructional delivery in traditional education settings, education shifted to streaming through Zoom, Google Meets, and other learning management systems. However, advancements in school technology during the 21st century and accessibility to devices and the Internet were still issues for many students and schools. Even with accessibility concerns, virtual and blended teaching (combining face-to-face and remote teaching) abruptly became norms for the instructional day during the COVID-19 pandemic.

Schools in Arkansas were required to develop readiness plans to address the instructional and technology concerns during the COVID-19 pandemic. These plans were known as the Ready for Learning Plans (Arkansas Division of Elementary and Secondary Education[DESE], 2020c). The Ready for Learning Plans allowed schools to customize

virtual and blended instructional delivery models. Selecting virtual or blended instruction allowed for flexibility and parent choices across the state during COVID-19. Schools in Arkansas prepared to offer virtual instruction or pivot between face-to-face instruction and remote instruction through Zoom, Google Meets, or other learning platforms when needed. Arkansas schools' virtual instructional delivery method allowed students to stay home and receive 100% instruction through a different learning platform. Students could choose to go to campus for face-to-face instruction, pivoting in a blended environment from time to time when COVID-19 numbers were high or when a student was isolated or in quarantine (Arkansas DESE, 2020c). Virtual and blended instruction were suggested to be part of schools' Ready for Learning Plans. Ready for Learning Plans allowed stakeholders' input and provided transparency to what schools in Arkansas were preparing to address instructional and technology challenges due to COVID-19.

With COVID-19, educational concerns were students' access to technology, Internet access for all despite school lunch eligibility, and virtual or blended instructional delivery methods. Arkansas Governor Asa Hutchinson postponed the Fall 2020 semester by two weeks to allow supplies and devices to arrive (Kruse, 2020). To help alleviate some issues, the federal government passed the Coronavirus Aid, Relief and Economic Security Act that funded the Education Stabilization Fund and budgeted \$13.5 billion to the Elementary and Secondary School Emergency Relief Fund during the pandemic (National Conference of State Legislatures, 2020). The federal government allotted these funds to provide needed resources during the pandemic. However, schools were at varying levels of preparedness to provide students with devices, provide Internet accessibility, and operate learning management systems. Schools purchased devices, Wi-

Fi hotspots, and learning management systems to educate students during the COVID-19 pandemic to address students' instructional support needs.

With the anticipated increases in COVID-19 cases, schools had to plan for instructional delivery shifts during the 2020-2021 school year. Virtual or blended instruction provided schools and parents options once all students had devices and accessibility (Arkansas DESE, 2020c). The superintendent of Harrisburg Public School was still waiting for student devices in November 2020, even though the devices were ordered in July (C. Ferrell, personal communication, November 4, 2020). Unfortunately, not all schools could receive the devices needed by the fall of 2020 opening date. Regardless, many schools attempted to offer virtual or blended instruction using the resources they had available.

In addition to instructional delivery changing, teachers' professional development shifted to virtual and blended training in the spring of 2020. Professional learning vendors across the United States offered free training to supplement teachers' professional development needs (Schaffhauser, 2020a). Because teachers were required to teach differently, professional development had to change. The additional professional development would help teachers prepare for the challenge of educating students during the pandemic.

Finally, family income level and required achievement measures provided unique challenges to meeting student needs during the pandemic. Carnegie Mellon University and the Massachusetts Institution of Technology disclosed that students from households receiving government assistance were 20% less likely to have Internet access (Schaffhauser, 2020a). Superintendent Joe Gothard from St. Paul, Michigan, stated,

“There is not a single student in this country who is to blame for COVID-19, yet we know the impact is harming students in disproportionate ways” (Sawchuk, 2020, para. 10). Achievement changes in reading and mathematics based on the instructional delivery, whether virtual or blended, may have occurred during the pandemic. Most research conducted focuses on only socioeconomic status, instructional delivery, and grade-level independently. Poverty and required achievement assessments could exacerbate achievement gaps during the pandemic.

Statement of the Problem

The purposes of this study were four-fold. First, the purpose was to determine the effects by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading achievement measured by the ACT Aspire Interim Assessment for Reading for seventh-grade students in five schools in Arkansas. Second, the purpose was to determine the effects by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading achievement measured by the ACT Aspire Interim Assessment for Reading for ninth-grade students in five schools in Arkansas. Third, the purpose was to determine the effects by school lunch eligibility between students participating in virtual instruction versus blended instruction on mathematics achievement measured by the ACT Aspire Interim Assessment for Mathematics for seventh-grade students in five schools in Arkansas. Fourth, the purpose was to determine the effects by school lunch eligibility between students participating in virtual instruction versus blended instruction on mathematics achievement measured by the ACT Aspire Interim Assessment for Mathematics for ninth-grade students in five schools in Arkansas.

Background

Theoretical Framework: Ecological Systems Theory

Many factors influence the thoughts and actions of individuals. Bronfenbrenner (2005) developed the ecological systems theory in 1979 to identify environmental factors affecting a person's characteristics over a lifetime. Bronfenbrenner organized the theory into five systems. These systems come together to influence the characteristics of the individual. The influences of these systems can be identified in the person's actions.

The factors that affect people include direct and indirect influences. The ecological systems theory is illustrated through concentric circles, containing five systems that directly or indirectly affect each person (Le Menestrel, 2016). The core of the system is the individual. The factors that influence the individual directly are sex, age, and health, as some examples (Bronfenbrenner, 2005). Around the core circle, the microsystem includes family, school, peers, health services, and religious institutions, directly affecting the person singly or in combination. This layer weaves in social and peer relationships. The next layer encircling the core and microsystem is the mesosystem, which connects the relationships between two or more microsystems. For example, if the parent disagrees with the decisions made at a school, the parent's opinion could directly or indirectly influence the student's attitude about the school and learning process. Further, the next circle is the ecosystem and involves the influences that affect the individual more indirectly. For example, if the city council votes on adding a new workforce training program and then parents enroll in classes, they receive a better job and provide more monetary sources in the home (Sincero, 2012). Higher incomes in the

homes would indirectly influence children and their education. These factors influence students directly and indirectly.

The outer ring of the circle is the macrosystem. The macrosystem involves the ecosystem's components with social and cultural attitudes and ideologies (Bronfenbrenner, 2005). The macrosystem includes social class, educational background, world views, and ethnicity. Bronfenbrenner added a system after the model was first published called the chronosystem. This system allows for the passing through of the other systems. The existence of the chronosystem helps to explain how the events influence the characteristics of the individual. For example, a child with access to daily public transportation might have better access to a library than a student who does not have access to transportation. This theory allows for an understanding of the different factors that shape a person collectively. The ecological systems theory explains why students and adults respond differently to environmental situations (Bronfenbrenner, 2005). Bronfenbrenner's theory explains the human development of the child. This theory includes the factors influencing public school students, such as school lunch eligibility and instructional delivery methods. Bronfenbrenner's theory provides the framework to understand the many aspects involved in a student's learning.

Coronavirus Global Pandemic

In January of 2020, a global pandemic caused large-scale changes in the United States. In December 2019, the outbreak began in Wuhan, China, as clusters of citizens exhibited symptoms consistent with pneumonia (Zhu et al., 2020). According to the Centers for Disease Control and Prevention Control and Prevention (2021), COVID-19 quickly changed everyday life in the United States. By March 2020, the United States had

closed various manufacturing plants, retail businesses, restaurants, and amusement parks (Harrington & Stebbins, 2020). The restrictions left very few citizens unaffected by COVID-19. Through the Center for Disease Control and Prevention communication and government response, COVID-19 quickly changed everyday life in the United States.

COVID-19 created significant disruption in schools, beginning in the spring semester of 2020. Schools started closing in February, and eventually, closures affected 48 states, four United States territories, and the District of Columbia (Decker, Peele, & Riser-Kositsky, 2020). The closures were an attempt to stop the spread of COVID-19, which was unpredictable. In trying to stop the spread, at least 50.8 million public school students were affected (Decker et al., 2020). Following the arrival of COVID-19 in Arkansas, in a live press conference on March 15, 2020, Governor Asa Hutchinson announced that Arkansas schools would need to be closed by March 17, 2020, and remain closed 2 weeks. That 2-week closure extended for the remainder of the 2019-2020 school year (Howell, 2020a). This period was chaotic and unpredictable, and teachers were expected to continue teaching students through virtual means. COVID-19 quickly changed the education system on a vast scale with minimal warning.

Instructional Delivery

Different types of instructional delivery have long been the subject of debate in education. Different teaching models can be beneficial from the teachers' and learners' perspectives. Distance learning has dated back to 1728 when the *Boston Gazette* advertised a shorthand writing class (Bouchard, 2019); however, the idea of distance learning has shifted as communication and technology have developed. Most recently, distance education has adapted for virtual and blended instruction. Still, the idea has always been to offer access to students needing a source of education, whatever the circumstances.

Virtual instruction is the concept of computers being used to deliver 100% of the educational content through the Internet. Virtual learning has made communication much harder for school staff to connect with students who struggle educationally and emotionally due to the lack of personal contact (Chatterjee, 2021). The American Academy of Pediatrics has encouraged districts to put students back into classrooms. However, on August 26, 2020, the United States Census Bureau's Household Pulse survey noted that 93% of the United States households used some virtual learning (McElrath, 2020). Without virtual learning, the education process would have stopped when schools were closed in the spring of 2020 due to COVID-19. Virtual learning became an essential part of schooling in March 2020 during the rise of COVID-19.

The blended instructional model did not present a perfect option for delivering education during the COVID-19 pandemic. If students or teachers were exposed to COVID-19, they would be required to quarantine at home for 14 days, and if students or teachers contracted COVID-19, they would be isolated at home (Arkansas Department of Health, 2020). If this exposure occurred, the instructional delivery method changed by moving the student or teacher from face-to-face instruction to a temporary Zoom, Google Meets, or other learning management system instructional platform. This system was not perfect, however. One parent insisted that her son should not be removed from face-to-face instruction because he had simply been at the lunch table with another student who received a false negative COVID-19 rapid test. However, the Arkansas Department of Health informed the parent that once students were identified as a close contact, students must quarantine for 14 days (F. Ashley, personal communication, September 15, 2020). When Arkansas teachers were surveyed in November 2020, they cited that one of their most complex challenges was quarantine absences (Howell, 2020b). The blended model is

for students to pivot, including entire schools or districts, and allows students to receive face-to-face instruction and temporarily move to 100% remote instruction when needed due to COVID-19 threats. Blended instruction contains the constant possibility of pivoting between face-to-face and remote learning due to COVID-19.

School Lunch Eligibility and Achievement

Physically and academically, feeding students has been a concern for public schools since compulsory education laws were passed. School lunch eligibility is identified by guidelines from the United States Department of Agriculture (2020). A student's family income level can qualify in the low socioeconomic status category based on these guidelines. The National Center for Education Statistics (2014) reported that 11.6% of students from low-income households between 16-24 years old were high school dropouts, compared to only 2.8% in homes with higher incomes (Kena et al., 2014). The United States Census Bureau (2014) reported that students in a high socioeconomic quartile were eight times more likely to earn a college degree than students in a low socioeconomic quartile. One factor in education attributed to poverty is children's access to community or public resources. Forty-nine percent of the nation's poverty is rural (Chau, Thampi, & Wight, 2009). Rural poverty is defined as areas with less than 50,000 people and nonmetropolitan areas (Joliffe, 2004). Joliffe (2004) focused on rural areas having a 5% higher poverty rate than urban areas and reported that students living in poverty have less access to books, influencing them to watch more television. In Arkansas, 44% of the population is classified as rural, with 67% of students qualifying for meeting the eligibility for free or reduced-price lunch, compared to 57% in urban areas (University of Arkansas Systems, 2013). Lack of resource accessibility in rural

areas can result in educational challenges for students living in poverty. School lunch eligibility has a direct relationship to the success of students.

Students' socioeconomic background and school lunch eligibility can positively or negatively affect their achievement in reading. Students from low-income households often enter high school 5 years behind in literacy skills than students from high-income households (Reardon, Valentino, Kalogrides, Shores, & Greenberg, 2013). Students' first reading competency, beginning at an early age, is related to the number of books in a home (Bergen, Zuijen, Bishop, & Jong, 2016). Homes with books and higher household incomes usually yield students with higher reading levels. Students raised in homes of poverty do not generally have access to the learning supplies, books, and experiences needed to advance in literacy development (Bradley, Corwyn, Mcadoo, & Coll, 2001). Also, students from households with low-income levels are less likely than other students to be exposed to fundamental reading skills (Buckingham, Wheldall, & Beaman-Wheldall, 2013). Students need access to learning resources and libraries to develop reading skills. In many ways, reading achievement can reflect the school lunch eligibility of the student.

Professional Development

Professional development, which licensed teachers use to continue growing in the classroom and instructional techniques, is required of Arkansas teachers. The Arkansas DESE (2016) revised the professional development rules in 2016, stating that districts must provide no less than 6 days within the teaching contract for professional development. Before 2016, Arkansas teachers were required to complete 60 hours of professional development every year (Arkansas DESE, 2014). As schools transitioned to increased required hours, Arkansas mandated specific professional development topics

such as child maltreatment, Arkansas history, parent involvement, and teen suicide. The purpose of the rules and regulations was to develop high-quality training in these concept areas for Arkansas teachers. Arkansas DESE identified the purpose of professional development as improving knowledge and skills to demonstrate proficiency on the state standards. As this shift occurred, teachers were no longer required to receive 6 hours in technology, as published in the rules and regulations in 2005. The change occurred once technology was embedded in other professional development. In many ways, professional development reflects what is needed by teachers at the time.

Not only did the delivery method of professional development have to change, but the COVID-19 pandemic presented needs for specific topics that had received minimal attention in Arkansas in prior years. Arkansas school districts were required to submit Ready for Learning Plans to Arkansas DESE (2020c). These training and plan requirements changes explained how schools were planning to train and prepare teachers and students for the new school year with the pandemic. State conferences and professional development in Arkansas suddenly focused on training administrators and teachers to use learning management systems that would be used universally in Arkansas for Fall 2020. Teachers and administrators had been mandated in 2018 to complete the Reading Initiative for Students Excellence training by 2021 (Jones, 2020). In response to the pandemic, legislators revised these requirements so that districts could focus on training teachers on components of the individualized Ready for Learning Plans. Legislators adjusted required professional development, and administrators adapted to meeting teachers' needs as they trained for the 2020-2021 school year.

Hypotheses

The following hypotheses guided this work:

1. No significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading achievement as measured by the ACT Aspire Interim Assessment for Reading for seventh-grade students in five schools in Arkansas.
2. No significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading achievement as measured by the ACT Aspire Interim Assessment for Reading for ninth-grade students in five schools in Arkansas.
3. No significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on mathematics achievement as measured by the ACT Aspire Interim Assessment for Mathematics for seventh-grade students in five schools in Arkansas.
4. No significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on mathematics achievement as measured by the ACT Aspire Interim Assessment for Mathematics for ninth-grade students in five schools in Arkansas.

Description of Terms

ACT Aspire Interim Assessments. The ACT Aspire Interim Assessments feature four interim class tests that are given during the school year before the summative

assessment. The ACT Summative Assessment is a criterion-referenced exam administered in Arkansas that measures grade-level standards and skills for Grades 3-8 starting in the 2017-2018 school year. The ACT Aspire Interim Assessments measures grade-level standards in reading, mathematics, English, and science (Arkansas DESE, 2020b).

Blended instruction. Blended instruction or teaching was defined as delivering onsite face-to-face instruction and remote instruction using traditional, onsite teaching methods with technology platforms and blended learning resources while pivoting synchronously due to COVID-19 (Arkansas DESE, 2020a; Longo, 2016). For example, a student or teacher may have to pivot from traditional face-to-face instruction to temporary remote instruction after close contact with someone or contracting COVID-19. Arkansas DESE initially used the term *hybrid/blended* in coding to define this instruction as an option for the teaching and learning environments.

Coronavirus Disease (COVID-19). COVID-19 is a contagious respiratory illness that spreads more quickly than the flu and causes more severe illnesses in some people. The symptoms include fever, chills, cough, shortness of breath, difficulty breathing, fatigue, muscle or body aches, headaches, loss of taste or smell, sore throat, congestion, runny nose, nausea, vomiting, and diarrhea (Centers for Disease Control and Prevention, 2021).

School lunch eligibility. School lunch eligibility was defined by school lunch status per the guidelines set forth by the United States Department of Agriculture (2019). Students were identified as qualifying for the free or reduced-price school lunch program or not qualifying for the free and reduced-price lunch program. Families with a household

income meeting the free or reduced-price lunch guidelines were identified as falling in the low socioeconomic category, qualifying the student for free or reduced-price lunch.

Virtual instruction. Virtual instruction was defined as instruction for students who attended all classes online (Arkansas DESE, 2020c).

Significance

Research Gaps

Few studies address instructional delivery and school lunch eligibility during the COVID-19 pandemic on students' academic achievement. Although research has been conducted on instructional delivery, socioeconomic status, and achievement as separate or combined topics before COVID-19, little research has been available on achievement since the COVID-19 pandemic began. More research is needed on instructional delivery and school lunch eligibility on reading and mathematics achievement during a pandemic. Current studies have reviewed the effects of virtual instruction on student achievement, but the research that addresses the effects of virtual versus blended instruction is limited.

Possible Implications for Practice

Twenty years ago, the struggle for schools was having enough computers for students. According to Brecker (2000), only 22% of families making less than \$20,000 per year had access to a home computer compared to 91% from families making \$75,000 per year. In 2017, students had access to computers and devices due to schools implementing one-to-one computing programs; however, sustainable Wi-Fi was an issue. Although 94% of families had an Internet connection, 53% of those families fell below the median income level and had mobile-only access (Bentley, 2017). Through government funds and school budgeting, devices and Wi-Fi are more accessible to

students. Specific data identifying differences in school lunch eligibility between virtual instruction and blended instruction in reading and mathematics achievement could help school leaders decide on expansion or changes to virtual instruction and blended instruction after the pandemic and future technology budgets.

Administrators, school boards, and teachers need specific achievement data on virtual instruction and blended instruction to determine future academic planning needs such as the remediation of lost instruction due to COVID-19, reading and mathematics achievement, the need for continued alternative methods of instruction, or AMI days, and the development of the school instructional calendar to exclude inclement weather days. If virtual instruction and blended instruction continue, research on the effects of student achievement will be necessary. Also, school budgets may be adjusted to allow for additional devices, Wi-Fi hotspots, and learning management platforms to deliver instruction. Teachers will need professional development that focuses on pivoting in a blended instruction environment and developing additional teaching strategies. This study's results could provide evidence to help administrators decide if they will apply for future virtual learning waivers.

Process to Accomplish

Design

A quantitative, causal-comparative strategy was used to examine the hypotheses with four 2 x 2 factorial ANOVAs. The four hypotheses' independent variables were students' school lunch eligibility (participating in free and reduced-price versus no free and reduced-price) and the instructional delivery method (virtual versus blended). The dependent variables for Hypotheses 1-2 included student achievement from the ACT

Aspire Interim scores in reading for seventh- and ninth-grade students in five Arkansas schools. The dependent variables for Hypotheses 3-4 included student achievement from the ACT Aspire Interim scores in mathematics for seventh- and ninth-grade students in five Arkansas schools.

Sample

The sample was the 2020-2021 ACT Aspire Interim Assessment scores for reading and mathematics for seventh- and ninth-grade students in five Arkansas schools with Arkansas Activities Association classifications ranging from 2A to 5A. The five schools were located in Northeast Arkansas, Central Arkansas, and Southeast Arkansas. The five schools administered the Interim reading and mathematics assessments before the 2020 winter break in December. The five schools had mixed demographics, and all students, including those receiving special services, were included in the data. The five schools offered virtual and blended instruction during the 2020-2021 school year. The accessible population consisted of 120 students for seventh grade for Interim reading and mathematics scores stratified by gender and school lunch eligibility and 120 students for ninth grade for Interim reading and mathematics scores stratified by gender and school lunch eligibility.

Instrumentation

The ACT Aspire Interim Assessments were mandated in Arkansas during the 2015-2016 school year when the Arkansas DESE (2020b) adopted the ACT Aspire as the state's summative assessment for Grades 3-10. Students in 7th through 10th grade receive a predictor score for the ACT Test. The ACT Aspire Interim Assessments measure student progress up to four times before the ACT Aspire Summative Assessments. The

ACT Aspire Interim Assessments measures reading, English, mathematics, and science (Arkansas DESE, 2020b).

Data Analysis

A 2 x 2 factorial between-groups analysis of variance (ANOVA) was conducted to address each of the four hypotheses. Hypothesis 1 was analyzed using a 2 x 2 factorial between-groups ANOVA with the instructional method (virtual versus blended) and school lunch eligibility (free and reduced-price versus no free and reduced-price) as the independent variables and student achievement in reading for seventh grade on the ACT Aspire Interim Assessment as the dependent variable. Hypothesis 2 was analyzed using a 2 x 2 factorial between-groups ANOVA with the instruction method (virtual versus blended) and school lunch eligibility (free and reduced-price versus no free and reduced-price) as the independent variables and student achievement in reading for ninth grade on the ACT Aspire Interim Assessment as the dependent variable. Hypothesis 3 was analyzed using a 2 x 2 factorial between-groups ANOVA with the instruction method (virtual versus blended) and school lunch eligibility (free and reduced-price versus no free and reduced-price) as the independent variables and student achievement in mathematics for seventh grade on the ACT Aspire Interim Assessment as the dependent variable. Hypothesis 4 was analyzed using a 2 x 2 factorial between-groups ANOVA with the instruction method (virtual versus blended) and school lunch eligibility (free and reduced-price versus no free and reduced-price) as the independent variables and student achievement in mathematics for ninth grade on the ACT Aspire Interim Assessment as the dependent variable. A two-tailed test with a .05 level of significance was used to test the null hypotheses.

Summary

Education has changed because of the COVID-19 pandemic. As educational professionals have worked through this pandemic, the details of virtual and blended instructional models have influenced numerous changes at the local, state, and federal levels. For years, educational leaders will likely continue studying, collecting, and researching virtual and blended instruction effects during the COVID-19 pandemic. In Chapter II, a literature review of virtual instruction, blended instruction, and the effects of school lunch eligibility on reading and mathematics achievement was conducted through Bronfenbrenner's ecological systems theory.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

In March 2020, United States teachers and students were forced to transition from traditional, in-person, teacher-led instructional delivery to full-time online instruction through Zoom, Google Meets, or other learning systems. By the fall of 2020, Arkansas schools provided two instructional options: virtual instructional delivery, allowing students to receive 100% instruction through a virtual learning provider, or face-to-face instructional delivery, and when necessary, pivoting to blended instruction when COVID-19 numbers were elevated or when a student or teacher was isolated or in quarantine (Arkansas DESE, 2020c). Before the pandemic, Molnar et al. (2019) reported that 268 public schools in the United States offered only virtual instruction, and 233 charter schools had virtual instruction options. Few studies exist on COVID-19's long-term effects (Centers for Disease Control and Prevention, 2021) and even fewer on the effects on student achievement with the two instructional delivery methods used since the fall of 2020. While educating students during the pandemic, instructional delivery had to transition rapidly from traditional to online and offer instructional delivery choices.

Despite the changes the COVID-19 pandemic had on instruction, teachers continued to teach students, but some students had limited access to technology and other supporting resources. Forty-four percent of Arkansas' population is rural, and 67% of students are eligible for free or reduced-price lunch (University of Arkansas Systems,

2013). The lack of resource accessibility in Arkansas' rural areas and lack of technology for students living in low-income homes could hinder instructional delivery and academic learning; therefore, the purpose of this study was to determine if participating in virtual instruction or blended instruction affected student achievement by student lunch eligibility.

This literature review was organized into five sections. First, the theoretical framework, the ecological systems theory, established the foundation for the review that included the four embedded environmental systems of the theory. The literature review includes sections on instructional delivery, school lunch eligibility and achievement, and professional development. Additionally, COVID-19 is briefly discussed, relating how the pandemic affected large-scale educational changes in Arkansas from the spring of 2020 to the time of this review, Summer 2021.

Theoretical Framework: Ecological Systems Theory

Ecological systems theory, also known as the human ecology system, has been used to identify environmental factors influencing human thoughts and actions. Bronfenbrenner (1979), the theory's creator, described ecological factors affecting individuals over a lifetime. These environmental systems influence personal decisions, activities, and current events. The theory has demonstrated that people are affected differently by their diverse environments, settings, and interactions (Sincero, 2012). The ecological systems theory acknowledged why people behave differently in different environmental settings. The ecological systems theory's visual representation is embedded circles organized into systems (see Figure 1).

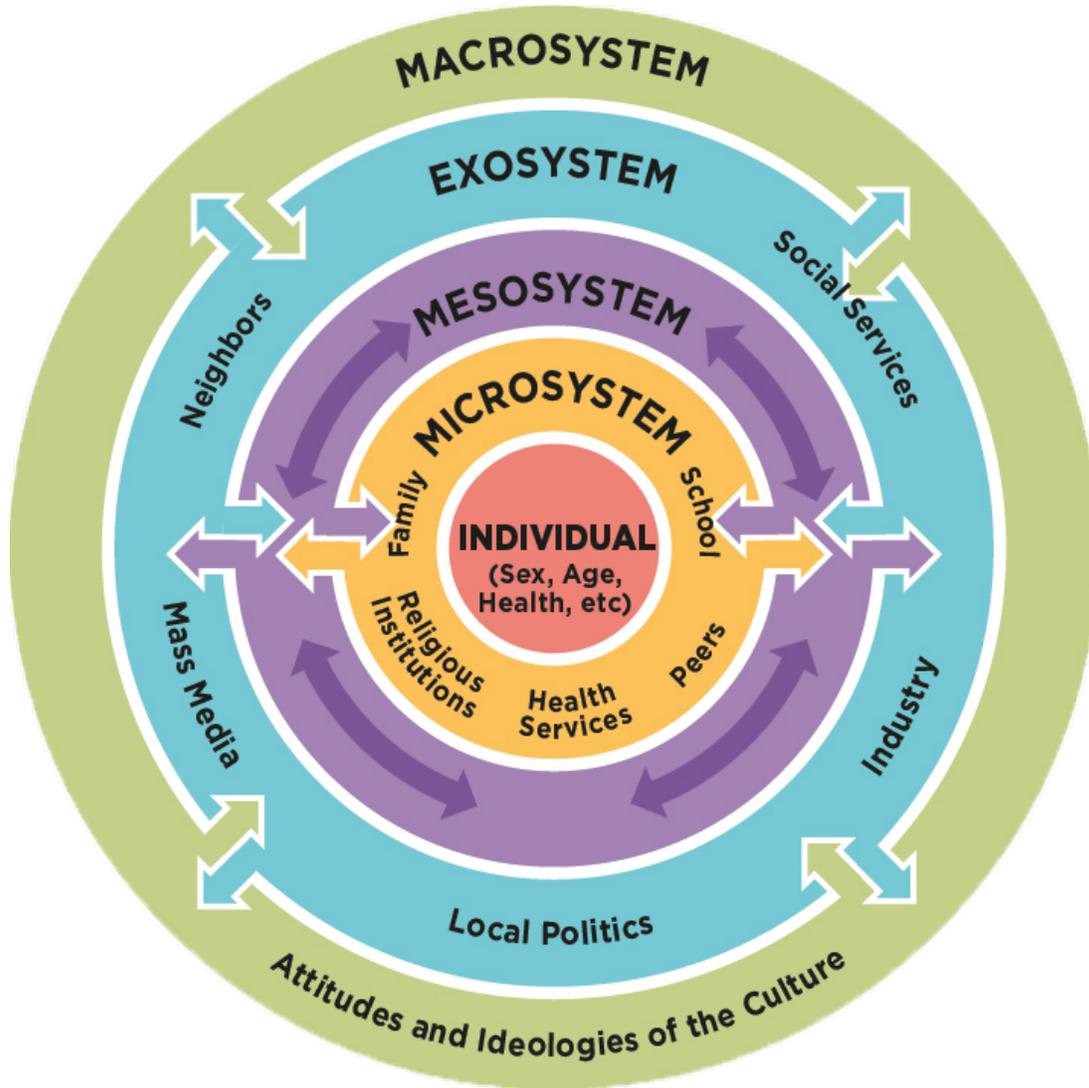


Figure 1. Ecological Systems Theory (Le Menestrel, 2016, p. 73). Reprinted with permission.

Ecological systems theory examines individuals' interactions within communities. Bronfenbrenner and Morris (1998) and Bronfenbrenner (2005) explained the five systems theory, with the circle's core being the individual. The factors influencing the core individual are sex, age, and health. Next, the microsystem includes family, school, peers, health services, and

religious institutions, directly affecting the individual alone or in combination. This layer incorporates social status, positions, and peer relationships. Next is the mesosystem, connecting the relationships between two or more microsystems. For example, the family's connection to the individual's education would be part of the mesosystem. The ecosystem follows in the embedded circles. The ecosystem does not involve the individual directly but includes the outside influences that affect the individual's decisions. For example, if a parent transferred to a new job out of state, the child (the core individual), would be affected by both the move and the new school, even though the child was not directly involved in the decision to move. The macrosystem comes after the mesosystem. This system encompasses outside attitudes and social stereotypes affecting an individual. For example, being born into a low-income family may influence an individual to work harder to overcome stereotypes (Sincero, 2012). In 2005, Bronfenbrenner added a final layer, the chronosystem. The chronosystem highlights the effect of sociohistorical events on the four systems embedded within the system over time. This system identified the shifts and transitions in one's lifespan. An example of this level of influence would be when a child experiences his parent not being called back to work due to business closures resulting from COVID-19. Bronfenbrenner (2005) developed these systems to identify why individuals react to different life events and varying environments. Ecological systems theory helps to identify why individuals respond differently to different situations and environments. In many ways, ecological systems theory identifies the individual responses to multiple events like COVID-19.

Ecological Systems Theory Applied to Public School Education

Students' and parents' choices can be understood more accurately when their personal developmental and environmental influences are identified. Bronfenbrenner's (2005) theory was

initially developed to understand child development in the context of environmental effects. The ecological systems theory has been used to understand how children and parents interact and make choices within the school setting (Bronfenbrenner & Morris, 1998; Knopf & Swick, 2008). Bronfenbrenner (1979) compared his systems model to a set of Russian nesting dolls surrounding the child. Social media, news, health care, and political affiliation can indirectly affect parents and students. However, Bronfenbrenner's theory still holds sex, age, health, and learning ability at the core. Bronfenbrenner and Morris (2006) noted that a student's sex could affect expectations and participation. For example, boys are assumed to perform better and have more interest in science than girls even though no performance differences exist (Tenenbaum & Leaper, 2003). Once educators understand a student, they can decide on the best ways to meet their educational needs. By understanding child development in environmental influences, effective supports could be established to meet students' needs.

The first system encircling the student is the microsystem. Bronfenbrenner's (2005) microsystem includes interaction with peers, schools, health services, family, and religious sectors. The microsystem consists of the many natural environments in which the child lives and interacts. To fully understand the child, the home, school, community, and culture must be examined and studied by psychologists (Bronfenbrenner, 1986). Bronfenbrenner (1977) said, "Much of contemporary developmental psychology is the science of the strange behavior of children in strange situations with strange adults for the briefest possible periods of time" (p. 513). His theory emphasizes the child's everyday interactive environments and understands the influences on the individual. For example, when a student goes to school, the student could develop a relationship with the school counselor. The school environment has provided the child with a direct relationship with a counselor, who could positively influence the student's actions

and emotions. The microsystem would include any human interaction within the individual's immediate environment, including the educational institution.

The second system is the mesosystem. Bronfenbrenner (2005) identified the mesosystem as the level that connects two or more microsystems. For instance, if a child's parent reached out to his or her teacher with a concern, the teacher's and parent's interactions and connections could affect the child's educational development. Bronfenbrenner's theory has been applied to the study of student achievement in reading, and achievement levels appear linked to the parent's attitude toward reading and the resources within the home (Chiu & Chow, 2015). Whether the connection between home and school is through a conversation between parents and teachers or indirectly by parents' attitudes, the connection between microsystems influences the child. This interaction exemplifies the mesosystem.

The third system is the exosystem. Bronfenbrenner (2005) proposed that the third circle does not explicitly involve the individual but the environmental factors that affect the student. The exosystem in school would include the groups controlling public education in the United States. Funding from state governments, school board officials making policies affecting faculty and students, and parent-teacher organizations offering additional resources can influence the exosystem (Bower & Griffin, 2011). The state government, the school board, and involved organizations do not explicitly involve the student. However, the student is still expected to follow these groups' policies and norms. While students have no control over the exosystem, having a role within this system influences their actions and behaviors.

The fourth layer is the macrosystem. Bronfenbrenner (2005) added this layer to acknowledge the larger social context and culture affecting the individual. Living in poverty places an individual in a unique system that offers fewer privileges and opportunities in the

macrosystem. The expected results of having a family that struggles financially, such as having to work during high school and having more responsibilities at home, will affect the student's available time, energy, and motivation for education. The macrosystem exemplifies how these larger social systems, such as family income, can affect a child's education.

The last system is the chronosystem. Bronfenbrenner (2005) added the system because all systems can change based on historical or current events. For example, a perceived rise in school shooting incidents may cause parents to fear sending their children to school (Hong & Eamon, 2012). Over time, the parents choosing to avoid sending their children to school to a perceived rise in school shootings will affect all system levels. In 2020, many parents were faced with sending children to school during a global pandemic. Some parents selected virtual instruction, and other parents chose face-to-face with periods of blended instruction. The reasons for this change and the parental choice were a current event. The chronosystem was added to explain change over time through contemporary and historical events.

Coronavirus Disease Global Pandemic

Large-Scale Educational Changes in Arkansas Due to the Coronavirus Pandemic

Students and teachers searched for normalcy in the educational environment during the COVID-19 pandemic. A district in Washington state was one of the first to start using virtual learning after the arrival of COVID-19, shifting 24,000 students to online learning (Decker, Peele, & Riser-Kositsky, 2020). Many United States' schools did not have the technology or Internet access to shift to virtual learning on short notice. However, the Coronavirus Aid, Relief, and Economics Security or CARES Act was passed by Congress and signed by President Donald Trump on March 27, 2020, to provide \$13.5 billion for the Elementary and Secondary School Emergency Relief Fund (Salguero & Johnson, 2020). Not only would teachers need equipment

and training to change the mode of instructional delivery, but students would need equitable access to devices and Wi-Fi capability. By necessity, education changed in the spring of 2020, and the government financially supported the change.

Importance of Student Access to Technology During the Coronavirus Pandemic

Technology has been used regularly in the United States' education system since the 1990s (Bouchard, 2019). Bouchard wrote that since 1996, national campaigns like Getting America Ready for the 21st Century: Meeting the Technology Literacy Challenge; e-Learning: Putting a World-Class Education at the Fingertips of all Children; and Transforming American Education: Learning Powered by Technology promote virtual teaching and learning. These government initiatives led schools to purchase devices and train students with technology in preparation for college and career readiness. In the 2018-2019 school year, technology experts were excited about public school changes due to the rise of 5G Wi-Fi and virtual reality learning (Zimmerman, 2020). The rapid increase in technology to support teaching and learning has resulted in devices and the Internet becoming an integral part of the United States's educational system, emphasized even more by the COVID-19 pandemic.

In this modern age, even students in impoverished regions often have access to the Internet, but the problem is often a lack of sustainability to the access. The United States Department of Education (2020) reported that 87% of households had a computer, and 77% had Internet access. However, Internet access was a barrier in low socioeconomic homes due to the cost. During COVID-19, the Trump administration spent \$86 million on broadband access in eight rural states, and this support helped connect students in poverty areas that would have been left without access to schoolwork (Fletcher, Freemon, & Logan, 2020). One parent commented

that having access at home would allow her to stop taking her child to the McDonald's parking lot for Internet access (Harris, 2020). When onsite schooling and Internet access were unavailable to particular students, they would access their education through local community hotspots. According to Lake and Makori (2020), students living in rural and low-income areas were less likely to attend classes through synchronous instruction platforms. Based on an April 2020 Pew Research survey during the pandemic, 43% of virtual students used a cellphone to complete schoolwork (Vogels, Perrin, Rainie, & Anderson, 2020). Though students from low socioeconomic households may have Internet access, the problem is that the Internet is not reliable enough for school needs.

Instructional Delivery

Rise of Technology in Education

Types of instructional delivery have been the subject of debate in education. Distance learning started as early as 1728, when the first shorthand class was offered through the mail (Bouchard, 2019). However, distance learning has shifted from radios to televisions to computers over the years as technology has advanced. Virtual and blended instruction has been adapted to meet the needs of 21st-century instructors and learners. These models of teaching can be found in public high schools across the United States.

Virtual instruction has helped traditional brick-and-mortar schools to widen curriculum needs to individualize schedules for students. For example, Virtual Arkansas (2021) is one virtual platform offered to public schools in Arkansas to meet students' educational needs. Virtual Arkansas started as an Arkansas consortium in 1994 that offered various remote classes across the state. Virtual Arkansas has evolved into an online platform that offers over 80 courses to meet students' virtual needs in a high

school setting. Virtual Arkansas has served as a way for smaller schools to offer courses that could not have been offered due to low enrollment. Virtual Arkansas also has helped fill in the gaps for schools that cannot secure teachers in high needs or shortage areas like upper-level mathematics and science courses. Virtual instruction is used to enhance and individualize learning for students but is just one of the learning options.

Some schools in the United States and Arkansas only offered virtual instruction, meaning no onsite attendance was required, even before COVID-19. Molnar et al. (2019) reported that in the 2017-2018 school year, 268 districts were offering entirely virtual schools and 233 charter schools that were 100% virtual in the United States, with 297,712 students enrolled. The graduation rate for virtual learning schools in 2017-2018 was 50.1% compared to 84% for traditional, brick-and-mortar schools (Molnar et al., 2019). Arkansas Virtual Academy enrolled over 3,800 students in the 2018 school year (Arkansas DESE, 2020a). Virtual Academy is one example of a virtual learning environment. Many schools in the nation were already offering 100% virtual instruction to students.

Changes in Instructional Delivery as the Coronavirus Pandemic Persisted

In the spring of 2020, schools were forced to teach virtually, but preventive measures to reduce the spread of COVID-19 throughout the summer allowed districts to offer two choices for Fall 2020: face-to-face with possible pivoting to blended and virtual options in instructional delivery. Arkansas schools had to prepare to pivot between face-to-face and remote learning quickly. The Centers for Disease Control and Prevention (2020), the Arkansas Department of Health (2020), and the Arkansas DESE (2020a) provided guidelines for allowing students to attend school in brick-and-mortar buildings safely. Teachers had training on new safety procedures, and students would be required to wear a mask when social distancing could not be

implemented. Teachers were trained to provide a six-foot radius for students. As this training and preparation took place, administration, faculty, and staff realized that valuing face-to-face learning meant valuing COVID-19 safety. In the summer of 2020, the Arkansas DESE allowed waivers to release mandated seat time and allowed schools to receive state money if students attended school through virtual models (Arkansas DESE, 2020b). As a result of approved state waivers, virtual instruction models became feasible for schools to offer students whose parents were uncomfortable sending them amidst the pandemic. In the fall of 2020, 22% of Arkansas school-aged students attended school virtually, 65% blended, and the remaining 13% in other delivery methods (Howell, 2020b). Parents were encouraged to pick the instructional delivery method that fit the needs of their children. Instructional delivery in Arkansas changed due to COVID-19.

Virtual Learning

Virtual learning quickly became a growing part of Arkansas public schools during the pandemic. Students who completed core academic classes at home were considered virtual learners through a device connected to the Internet. When using virtual learning, schools provided education through a school-adopted, online learning management system (Arkansas DESE, 2020b). Arkansas schools included their choice of learning management systems in their Ready for Learning Plans, which Arkansas DESE required in preparation for the Fall 2020 semester (Arkansas DESE, 2020b). When President Trump signed the CARES Act, Arkansas DESE contracted the Arkansas Public School Resource Center to facilitate, train, and provide schools with a program called Lincoln Learning. Therefore, schools and parents had access to a free learning management system as an option for online student learning (Arkansas Public School Resource Center,

2020). Keeping Lincoln Learning past the 2020-2021 school year would cost schools \$300.00 per course and \$150.00 per student (Arkansas Public School Resource Center, 2020). These virtual instructional delivery options provided comfort for parents whose concern was protecting their children from COVID-19. The virtual learning option provided peace of mind for many parents during the pandemic, but continuation would not come without substantial expense.

COVID-19 also caused concern for teachers in public school systems, including increased workloads, students' attendance, and the risk of getting COVID-19. Schaffhauser (2020b) stated that teachers' most significant struggles with remote learning were the lack of time and access to devices. Decisions were left to the districts, but the teachers prepared face-to-face lessons for students and worked remotely during the COVID-19 pandemic. Asking teachers to teach face-to-face and remote students required them to increase their contracted workloads. Not only was remote or blended education a struggle for teachers, but the risk of contracting COVID-19 made instruction more complex. Education Week (2021) reported that the first school official died from COVID-19 on March 12, 2020. As deaths in education occurred early in the pandemic, teachers questioned going back to the classroom. On April 8, 2020, Education Week reported that 66% of teachers surveyed reported morale levels lower than before COVID-19. Teachers were not only worried about students' learning but also the increased workload and personal health.

Due to COVID-19 and the shift to virtual instruction, some students felt more successful. One sixth-grader, Bobby, at North Brookfield Elementary in Western Massachusetts, noted success using virtual instruction because he could take breaks when

needed and rewind instruction. Before COVID-19, Bobby, who struggles with attention deficit disorder, could not focus on the teacher without frequent breaks (Tesfaye, 2021). The educational effects of COVID-19 could allow for new instructional possibilities. Andrea Parrish from John Hopkins School of Education and director at IDEALS Institute stated that some parents of autistic students had found success in virtual instruction (Tesfaye, 2021). Virtual instruction could significantly affect students' academic success when face-to-face instruction may not offer specific learners' needs. When the individual needs of the learner were considered, some learners felt more successful with virtual learning.

On the other hand, some students felt defeated due to COVID-19 and the shift to virtual instruction. Drew, an 11th-grade student-athlete and enrolled in three advanced placement classes, felt defeated and behind due to virtual instruction because of COVID-19. Drew talked about being left out of class discussions due to virtual learning and missing hands-on experiences. Drew said that studying for tests and completing assignments were harder when the teacher was not in the same room to help (D. Dogan, personal communication, March 13, 2021). The Centers for Disease Control and Prevention (2021) identified that 25% of parents with children receiving virtual learning reported poorer mental and emotional health, compared to 16% in students receiving blended instruction. A mother of two from New York City, said, "I think we have normalized this remote way of learning, and there is nothing normal about it" (Wood & Mascarenhas, 2021, para. 5). Instructional type can significantly affect a student's academic success when social and emotional needs are not met. Students can quickly feel defeated when their instructional needs are not considered.

Blended Instruction

Based on school and public health guidelines, a school might not allow for consistent onsite, face-to-face instruction but a blend of onsite, face-to-face instruction and remote instruction using traditional, onsite teaching methods with technology platforms and blended learning resources while pivoting synchronously (Arkansas DESE, 2020a; Longo, 2016). Students would often pivot, as groups or individuals, back and forth between remote and face-to-face learning due to virus exposure. If COVID-19 cases increased through a school or the district, the chances of remaining at school and delivering instruction face-to-face decreased.

When large numbers of faculty, staff, or students were isolated after testing positive for COVID-19 or were quarantined after being a close contact, the building was required to close for a specific number of days. In Arkansas, 174 districts pivoted back and forth between face-to-face and remote learning within the first 10 weeks of the 2020-2021 school year (Arkansas DESE, 2020b). Face-to-face to remote learning set the pace for blended instructional delivery in Arkansas. Because of COVID-19, staff members and students were in and out of the building, not allowing for a consistent instructional and learning routine.

States and districts ensured that learning would continue with different instructional delivery models. The Los Gatos Union School District adopted a blended model that copied the terms *roomers and zoomers*, first used by Shelby Reedy of Irving Independent School District in Texas (Wong, 2021). As Reedy taught, students in the classroom were referred to as *roomers*, and students learning from home were referred to as *zoomers*. This model allowed equity for students in class and at home synchronously through Zoom (Irving Independent School District, 2021). Arcia Dorosti, the director of curriculum, instruction, and assessment, said, “Online is not ideal either, but we are concerned about the social-emotional needs of our students and want to

allow them to rejoin their classmates” (Wong, 2021, para.10). The Los Gatos District purchased each teacher a new laptop and replaced document cameras with tablets to supplement blended instruction (Wong, 2021). As blended learning emerged, teachers and school staff transitioned and became creative to value students' learning and social-emotional needs. In many ways, during the pandemic, districts learned as they progressed with instructional delivery.

School Lunch Eligibility and Achievement

Taking care of students, physically and academically, has been a priority since the foundational start of public school education. The United States Department of Agriculture (2020) develops yearly guidelines to ensure that students in low socioeconomic homes have access to free or reduced-price lunches at school. The National School Lunch Program was developed under President Truman in 1946 to provide healthy meals to students in need at a reduced or free cost. Over 7 million students qualified, and 70 years later, over 30 million students received free and reduced-price meals when the program started. Free and reduced-price school breakfast and lunches allow students to concentrate on learning instead of hunger (Vanco Education, 2020). Students’ physical needs should come before academic needs. The National School Lunch Program addressed the basic human need of hunger to ensure students would be ready to learn.

The number of students qualifying for free and reduced-price meals before COVID-19 varied based on regional and geographic areas. Forty-nine percent of the nation’s poverty is rural (Chau, Thampi, & Wight, 2009). Rural poverty is defined as less than 50,000 people and nonmetropolitan areas (Joliffe, 2004). Joliffe (2004) focused on rural areas having a 5% higher poverty rate than urban areas and reported that students living in poverty had less access to books, influencing them to watch more television. In Arkansas, 44% of the population is

classified rural, with 67% of students meeting the eligibility for free and reduced-price lunch, compared to 57% in urban areas (University of Arkansas Systems, 2013). The resources in rural areas can create educational challenges for students qualifying for free and reduced-price lunches. School lunch eligibility can have a direct effect on the success of students.

School lunch eligibility and socioeconomic status can positively or negatively affect students' achievement in reading and mathematics. Students from high socioeconomic status have an advantage over students from homes with poverty. Froiland, Powell, and Diamond (2014) found that family and neighborhood played a vital role in students' early literacy in the United States. Students who have access to literacy early develop skills needed for adequate reading achievement. Students from low-income households often enter high school 5 years behind in literacy skills than high-income households (Reardon et al., 2013). Students from low socioeconomic households have a lower success rate in mathematics than students from higher socioeconomic households (Doerschuk et al., 2016). Understanding the prominence of school lunch eligibility and achievement in reading and mathematics is critical for many school leaders to make research-based decisions to determine the next steps for reading success. Positive and negative effects on student achievement can exist when considering student lunch eligibility and socioeconomic status.

School Lunch Eligibility and Reading Achievement

Many believe reading achievement begins at school, but parents have a powerful influence on reading achievement. Students' first reading competency, beginning before school age, is related to the number of books in a home (Bergen et al., 2016). Students raised in homes of poverty may not have access to the learning supplies, books, and experiences needed to advance in literacy development (Bradley, Corwyn, Mcadoo, & Coll, 2001). Due to limited

financial resources in low-income homes, some students may not have access to alphabet cards, picture books, or libraries. All students need access to learning resources and libraries to develop reading skills.

Data on learning loss is uncertain because most schools do not test achievement in short intervals. Curriculum Associates (2020a) i-Ready platform found that students in an i-Ready sample only learned 87% of what grade-level peers had learned in the past during the fall semester. The reading sample determined that students, on average, were one and a half months behind in reading compared to 3 years before the pandemic. Research with pandemic learning loss based on student lunch eligibility and reading achievement is minimal. Data collection in the Fall was questionable due to assessments not being given when students return to school from summer break and not having Spring 2020 assessment scores.

School Lunch Eligibility and Mathematics Achievement

Many parents felt they were not prepared to work with children on mathematics during COVID-19. Some parents found creative activities in the home and community that incorporated mathematics (Guberman, 2004; Samuels, 2020). Students from low socioeconomic households have a lower success rate in mathematics than students from higher socioeconomic households and could result from access to hands-on learning experiences within the home and community (Doerschuk et al., 2016). Historically on the i-Ready diagnosis test, students in Grades 1-8 had 23% below grade level on the fall diagnostic test. In Fall 2020, 29% of students rated below grade level. Students scoring below grade level were behind at least two or more grade levels (Curriculum Associates, 2020a). Perhaps students tested at home or lacked the confidence needed on the fall diagnostic test. Low socioeconomic households may not have had access to or created opportunities for students to have mathematics exposure during the pandemic. Parents'

resources and training in mathematics could have been limited, therefore, causing parents to lack confidence in their abilities to instruct their children.

Professional Development

Teachers require ongoing professional development. In 1837, Secretary of Education Horace Mann worked to develop training for teachers throughout the state of Massachusetts (Frontline Education, 2021). Training teachers has become an essential part of the ever-changing world of education. Teachers have had to learn to teach through the mail during World War I, the radio during World War II, and virtually through the COVID-19 pandemic. An award-winning national teacher with 38 years of experience in the rural Arkansas Delta stated that the professional development offered by her school district during COVID-19 was invaluable and helped her know how to use the learning management systems needed to navigate technology-based instruction (M. Smith, personal communication, May 3, 2021). Smith talked about her district surveying teachers to identify what each teacher needed to customize learning and prepare for a year of virtual and blended instruction. She went on to say that teachers were trained in one program for each task that needed completion on the device staff would use daily instead of being overwhelmed with a variety of digital learning management tools. The purpose of professional development is to offer high-quality training to teachers in needed areas.

Professional development allows teachers to keep up with the evolution of strategies and research-based practices in education. Before 2016, Arkansas DESE (2016) required Arkansas teachers to complete 60 hours of state-approved professional development each year. Six of those hours had to be in technology. In 2016, the state legislature reduced the professional development hours to 36, with 18 hours linked to the teacher's professional growth plan (Arkansas DESE, 2016). As this shift occurred, professional development in areas like

technology was embedded into the subject area of professional development. Although the professional development hours changed for licensure, teaching contracts in Arkansas remained the same in most districts allowing teachers to have 10 additional days for professional development. Quality professional development is essential for teacher growth.

In March 2020, when the COVID-19 pandemic began to affect the United States' education system, the delivery method for professional development in Arkansas changed abruptly but by necessity. Face-to-face professional development was canceled, and Arkansas teachers attended professional development through online platforms (Arkansas DESE, 2020b). State rules required that face-to-face professional development for teachers also be offered remotely. State conferences were also shifted to online formats. The Arkansas State Data Conference, held annually in June, was moved to an online delivery method. School employees were allowed to attend for free (Arkansas DESE, 2020c). The Arkansas DESE worked to encourage teachers to continue to grow professionally through free online professional development. In response to the pandemic, requirements for the delivery of professional development had to be changed to meet the needs of school teachers.

When Arkansas schools closed in March 2020, students, parents, teachers, and administrators anticipated returning to school before the end of the school year. When this returning to school did not happen, schools' Return to Learning Plans were required to address how they would accommodate pivoting from onsite, face-to-face instruction to blended instruction using technology during the 2020-2021 school year (Arkansas DESE, 2020c). Students needed devices and Internet access at home, and teachers needed professional development and technology to teach remotely. Each district had to identify

their chosen learning management system for blended and virtual instruction in the Return to Learning Plan submitted to and approved by Arkansas DESE (2020c). Arkansas DESE encouraged schools to develop committees and seek stakeholder feedback as they prepared to return to school. As committees worked through these plans, teachers prepared for professional development that would align with these plans in anticipation of returning to school in the fall.

United States educators were asked to prepare to learn new strategies for instructional delivery during the pandemic. In June of 2021, Arkansas Governor Asa Hutchinson and Secretary of Education Johnny Key encouraged districts to continue to plan for students' return to school (Arkansas DESE, 2020c). Jason Evers, superintendent of a rural district in Arkansas, developed district-aligned, customized COVID-19 professional development after identifying staff and teachers' needs through a districtwide needs assessment and professional development survey. The teachers and administrators in the district met weekly through Zoom, and a district committee was formed to address specific instructional needs. The professional development focused on Google Classroom, Zoom, and SMART Technologies (J. Evers, personal communication, August 20, 2020). Teachers left the training with learning management systems ready to address the instruction challenges of the school year. Evers identified that this new way of teaching and learning would require the development of new skills and that some teachers would feel like this approach was double the work for blended and face-to-face instruction. In many ways, professional development evolved during the pandemic.

In Arkansas, some existing professional development legislation had to be modified due to COVID-19. In 2018, Arkansas introduced the Reading Initiative for

Student Excellence to increase the educators' knowledge of teaching reading (Arkansas DESE, 2021a). Elementary and special education teachers had to have pathway proficiency that required 36 hours of training over 18 pathways, and other teachers had to have awareness training, requiring at least 18 hours of training. Due to COVID-19, the Reading Initiative for Student Excellence deadline was extended, and some training was shifted to virtual instruction. Professional development during COVID-19 allowed teachers to assume the role of a student within virtual and blended instructional delivery methods, even though some mandated professional development had to be revised.

Summary

COVID-19 changed education. In March 2020, schools across the United States quickly shifted from the traditional, onsite, face-to-face classroom instruction to full-time virtual instruction (Harrington & Stebbin, 2020). Instructional delivery options for the 2020-2021 school year included virtual and blended teaching using Zoom, Google Meets, and other learning management systems. Readiness plans allowed Arkansas schools to identify virtual and blended learning models (Arkansas DESE, 2020c). Arkansas DESE encouraged schools to offer virtual instruction options and develop a blended instruction method that would allow schools to pivot between face-to-face and remote instruction when COVID-19 numbers increased (Arkansas DESE, 2020c). These instructional methods allowed for the safety of teachers and students yet changed education.

With virtual and blended instructional delivery during the pandemic, student achievement and Internet access were concerns. Carnegie Mellow University and the Massachusetts Institution for Technology disclosed that students from households receiving government assistance were 20% less likely to have Internet access

(Schaffhauser, 2020a). Compounding the problem, 44% of Arkansas' population is rural, with unreliable and minimal Internet access, and 67% of students qualify for free and reduced-price lunches, making access cost prohibitive (University of Arkansas Systems, 2013). Lack of resource accessibility in rural areas could result in educational challenges for students living in poverty. Without reliable Internet access, student achievement could suffer because of the shift to virtual and blended instruction during the pandemic.

COVID-19 caused a shift in teachers' professional development needs due to the transition to virtual and blended teaching instruction. Once the pandemic started and teachers were teaching from home, school districts and vendors across the United States offered free professional development (Schaffhauser, 2020a). With the change in instructional delivery methods, teachers had to acquire knowledge in new areas, which helped prepare teachers to educate students during the pandemic. In Chapter III, the research design, sample, and instrumentation were discussed. The data collection procedures, analytical methods, and limitations were also detailed and reviewed.

CHAPTER III

METHODOLOGY

The literature review was limited on the effects between virtual instruction and blended instruction on student achievement during the COVID-19 pandemic. Federal law waived the 2019-2020 school year assessments (Arkansas DESE, 2020c). Previous research focused on virtual education as an alternative for students interested in learning at home but not required, instead of blended instruction during a global pandemic being required due to school closures. The purpose of this study was to determine the effects by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading and mathematics achievement measured by the ACT Aspire Interim Assessments for seventh-grade and ninth-grade students in Arkansas. The following hypotheses were developed:

1. No significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading achievement as measured by the ACT Aspire Interim Assessment for Reading for seventh-grade students in five schools in Arkansas.
2. No significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading achievement as measured by the ACT Aspire Interim Assessment for Reading for ninth-grade students in five schools in Arkansas.

3. No significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on mathematics achievement as measured by the ACT Aspire Interim Assessment for Mathematics for seventh-grade students in five schools in Arkansas.
4. No significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on mathematics achievement as measured by the ACT Aspire Interim Assessment for Mathematics for ninth-grade students in five schools in Arkansas.

This chapter discussed the research design, sample, instrumentation used to measure each variable, data collection procedures, analytical methods, and limitations.

Research Design

A quantitative, causal-comparative strategy was used to examine the hypotheses with four 2 x 2 factorial ANOVAs. The four hypotheses' independent variables were students' school lunch eligibility (free and reduced-price versus no free and reduced-price) and the instructional delivery method (virtual versus blended). Each independent variable had two levels; therefore, this design had four groups with a 2 x 2 design. Using the 2 x 2 between-groups factorial ANOVA, the final analysis provided interaction means and main effect marginal means. The dependent variables for Hypotheses 1-2 included student achievement from the ACT Aspire Interim Assessment scores in reading for seventh- and ninth-grade students in five Arkansas schools. The dependent variables for

Hypotheses 3-4 included student achievement from the ACT Aspire Interim Assessment scores in mathematics for seventh- and ninth-grade students in five Arkansas schools.

Sample

The sample consisted of 2020-2021 ACT Aspire Interim Assessment scores for reading and mathematics from seventh- and ninth-grade students in five schools in Arkansas. The sample was chosen from schools offering virtual and blended instructional methods during the 2020-2021 school year and administering the ACT Aspire Interim Assessments to students who received virtual and blended instruction between August 2020 and December 2020. Students qualifying for free and reduced-priced lunch based on the 2020-2021 United States Department of Agriculture guidelines determined the school’s lunch eligibility. Table 1 displays the school lunch eligibility, seventh-grade student enrollment, ninth-grade student enrollment, and total school student population.

Table 1

School Lunch Eligibility Percentages, Grade and School Sizes, & Instruction Type for the Accessible Population

School	SLE (%)	7th-Grade Student Size	9th-Grade Student Size	School Student Population K-12	Instruction Type
A	64	91	87	1,115	V/B
B	53	182	186	2,720	V/B
C	43	44	48	609	V/B
D	69	86	106	1,227	V/B
E	58	27	26	374	V/B

Note. SLE = school lunch eligibility; V = virtual instruction; B = blended instruction.

Three of the five schools were predominantly European American, and two had a significant African American student population. See Table 2 for the racial makeup of the schools.

Table 2

Student Race for the Accessible Population

School	African American	Asian	European American	Hispanic	More than 2 races
A	< 1%	0%	95%	4%	< 1%
B	30%	1%	65%	3%	1%
C	5%	0%	90%	4%	1%
D	46%	0%	47%	5%	2%
E	5%	0%	90%	4%	1%

All scores were seventh- and ninth-grade 2020-2021 ACT Interim Assessments in Reading and Mathematics. The samples included scores from students who required no academic accommodations or modifications and had reportable scores in reading and mathematics on the ACT Interim Assessments given before January 1, 2021. Only students with reading and mathematics scores were included, and students with missing values were excluded from the sample. A stratified random sample technique was used to generate the different groups for each hypothesis. First, reading and mathematics scores from the five Arkansas schools were pooled into one accessible population for the seventh-grade students. The scores were analyzed but not the students. Second, scores

were stratified by the instructional delivery method they received (virtual versus blended) and their school lunch eligibility (free and reduced-price versus no free and reduced-price). Third, a random sample of 15 female and 15 male scores were taken from each stratum to create 30 scores each for the four groups: Group 1—virtual/free and reduced-price, Group 2—virtual/no free and reduced-price, Group 3—blended/free and reduced-price, and Group 4—blended/no free and reduced-price. This process was then repeated for the ninth-grade scores. Over three hundred scores were reported for each grade from the five schools. Each sample consisted of 120 scores from seventh grade for the ACT Aspire Interim Assessments for Reading and Mathematics and 120 student scores from ninth grade for the ACT Aspire Interim Assessment for Reading and Mathematics. Table 2 displays the student demographics for each school.

Instrumentation

Arkansas DESE offers schools access to four ACT Aspire Interim Assessments for students before the ACT Aspire Summative Assessment. In the summer of 2015, the Arkansas DESE adopted the ACT Aspire Summative Assessment as the state assessment (Arkansas DESE, 2020b.). The ACT Aspire Interim Assessment is a formative assessment administered four times each year in Grades 3-10. ACT Aspire offers interim assessments in reading, English, mathematics, and science administered in the classroom, allowing 45 minutes per interim assessment (ACT Aspire, 2021). ACT Aspire Summative Assessment measures readiness in English, mathematics, reading, and science. The four ACT Aspire Interim Assessments allow for quick data as schools prepare students for the ACT Aspire Summative Assessment.

The ACT Aspire Interim Assessment contains content in four subject areas: English, reading, mathematics, and science. Each subject area receives a scale score, and the lowest score across all grades and subjects is 150. The highest obtainable score varies based on grade and subject area. The highest scores in reading are a 164-scale score for seventh grade and a 165-scale score for ninth grade. The highest scale score in mathematics in seventh and ninth grades is a 180. The scale score can be compared to the ACT Interim Readiness Benchmark score to determine if students are on target for meeting the benchmark on the ACT Summative Assessment (ACT Aspire, 2021). Table 3 displays information for the four content subjects tested.

Table 3

Times, Internal Consistency Reliability, Standard Error, & Scale Score Range Information for ACT Aspire Interim Assessment

Content	Time in Minutes	Cronbach Alpha Reliability	SE	Scale Score Ranges
Reading	45	.74-.80	1.58-1.73	150-165
Mathematics	45	.74-.77	2.33-2.42	150-180

The timing of the content assessments is the same for the ACT Aspire Interim Assessments. Each assessment had a Cronbach’s Alpha Reliability Coefficient of over .70 (ACT Aspire, 2021).

Data Collection Procedures

Each district's personnel administered the 2020-2021 ACT Aspire Interim Assessments in Reading and Mathematics. Each student took interim assessments, and scores were submitted electronically. ACT Interim Assessments are computer-graded, and results are recorded in the online ACT Aspire Data Portal (ACT Aspire, 2021). ACT Aspire Interim Assessment assigns a scale score and proficiency rating based on the ACT Readiness Benchmark for each student in English, reading, mathematics, and science reported to the local district and Arkansas DESE. After IRB approval, permission to use the data from each school's superintendent in the five districts was granted. An authorized user downloaded the data file from the ACT Aspire Data Portal in each district, including scale scores for seventh- and ninth-grade students in reading and mathematics. Also, the schools provided downloaded data from the state database that included student gender, school lunch eligibility, and grade level. Authorized school district personnel entered the instructional delivery methods into the Arkansas Public School Computer Network during COVID-19, then added the students' lunch eligibility, gender, and achievement data to the spreadsheet. Personal student information was removed and replaced with research numbers. Data from the five schools were combined into one spreadsheet, and only students with reading and mathematics scores were included in the sample. Students with missing values were excluded from the sample. The data were then exported for analysis.

Analytical Methods

IBM Statistical Package for Social Science (SPSS) Version 26 was used to analyze the data collected. *IBM SPSS for Intermediate Statistics* was used to determine

the correct test for the research design (Leech et al., 2015). Data were collected and reported from five schools for the four hypotheses. The four hypotheses used the following codes for each school: instructional delivery (1 = virtual, 2 = blended) and school lunch eligibility (0 = free and reduced-price, 2 = no free and reduced-price).

Hypothesis 1 was analyzed with a 2 x 2 factorial between-groups ANOVA using the instructional delivery method and school lunch eligibility as the independent variables and reading achievement in seventh grade measured by the 2020-2021 ACT Interim Assessment for Reading the dependent variable. Hypothesis 2 was analyzed with a 2 x 2 factorial between-groups ANOVA using the instructional delivery method and school lunch status as the independent variables and reading achievement in ninth grade measured by the 2020-2021 ACT Interim Assessment for Reading the dependent variable. Hypothesis 3 was analyzed with a 2 x 2 factorial between-groups ANOVA using the instructional delivery method and school lunch eligibility as the independent variables and mathematics achievement in seventh grade measured by the 2020-2021 ACT Interim Assessment for Mathematics the dependent variable. Hypothesis 4 was analyzed with a 2 x 2 factorial between-groups ANOVA using the instructional delivery method and school lunch eligibility as the independent variables and mathematics achievement in ninth grade measured by the 2020-2021 ACT Interim Assessment for Mathematics the dependent variable. Finally, a two-tail test with a .05 level of significance was used to test the four hypotheses.

Limitations

Several limitations existed that could affect the reliability and generalization of the results of this study. First, not all schools in Arkansas administered the ACT Interim

Assessment due to COVID-19. This fact limited the number of schools that could provide data for the study. Most Arkansas schools administered the Northwest Evaluation Association Assessment instead of the ACT Interim Assessments (Arkansas DESE, 2020d). The Arkansas DESE paid schools' testing costs to administer the Northwest Evaluation Association Assessment to third through eighth grades. Administrating both assessments was viewed as burdensome by some school leaders. An Arkansas school district superintendent stated that he did not want any additional stress placed on teachers during a global pandemic (J. Priest, personal communication, November 16, 2020). Therefore, they decided as a team not to administer the ACT Interim Assessments. Some schools elected not to provide interim assessments for the 2020-2021 school year due to the COVID-19 pandemic, affecting the accessible population of available scores.

Second, no previous research was located on virtual and blended instruction during a global pandemic. Battenfeld (2021), a clinical professor of American and New England Studies at Boston University, found that schools closed no more than 4 months during the 1918 influenza pandemic; however, instruction stopped due to no technology to shift learning modes (Battenfeld, 2021). Teachers and administrators had to address students' immediate needs and fears while preparing students for learning and sometimes shifting instructional type. Teachers and administrators had to develop instructional plans without previous research or training before the pandemic.

Third, the study did not consider the teachers' experience and educational levels. In 2019, a 16-year review was published on teaching experience and student achievement and noted that teaching experience positively affected student achievement (Podolsky, Kini, & Darling-Hammond, 2019). Arkansas DESE tracks teaching experience and

educational experience for association with standardized testing scores; however, Arkansas DESE has only been tracking the information (Arkansas DESE, 2021b). A teacher of 18 years returned to college to obtain 18 hours of advanced mathematics classes to help develop more rigorous mathematics skills so her students could receive college credit for advanced placement classes (J. Bratton, personal communication, July 23, 2021). Teacher educational experience and educational levels can contribute to greater understanding.

The fourth limitation was that teachers in the five districts did not receive professional development on virtual instruction and blended instruction in a standard format. The schools used different digital teaching platforms and technologies for teacher training to pivot from face-to-face to remote instruction. Additionally, no common resources for instructional delivery were employed across schools. However, in July 2020, after President Trump signed the Coronavirus Aid, Relief, and Economic Securities Act, Arkansas DESE contracted with the Arkansas Public School Resource Center to give schools the option of using a virtual program called Lincoln Learning with no expense to the district. This program allowed the schools to offer a digital, virtual program to upload the classes needed based on the student class schedule found in the state's student registration database (Arkansas Public School Resource Center, 2020). Arkansas's school districts purchased and invested in different learning management systems and trained teachers in the selected platforms. Some school personnel selected free programs like Google Classroom, and others purchased programs like Blackboard. Google Classroom had 40 million users before COVID-19 and during COVID-19 moved

to over 150 million users (Perez, 2021). Local school district leaders decided on the professional development and online resources used during COVID-19.

The fifth limitation was that the study did not consider the social and emotional effects of COVID-19 on the teachers and students. Little research exists on the social and emotional effects on teachers and students during COVID-19. However, during the pandemic, 64% of teachers surveyed stated that they were not paid enough during a global pandemic for the risk taken (Will, 2021). Before COVID-19, concern about student mental health issues had grown over the last decade; however, 80% of students reported that COVID-19 caused them to feel stressed, isolated, lonely, and sad (Becker, 2021). School districts across the United States said that suicide and self-harm cases rose at an alarming rate (Becker, 2021). COVID-19 has affected the mental health of teachers and students across the world. The limitation of social and emotional health could not be measured and could have contributed negatively to performance on the ACT Interim Assessments.

Summary

A quantitative, causal-comparative strategy was used to examine the hypotheses with four 2 x 2 factorial between-groups ANOVAs. The uncontrollable factors may have influenced the outcomes or data interpretations of the research. Data were collected from the ACT Aspire Interim Assessments in Reading and Mathematics and reported from five schools for the four hypotheses. The research findings could be affected by the design of the study and the influences of COVID-19. Chapter IV presents the results of the analytical techniques used for each hypothesis.

CHAPTER IV

RESULTS

The purpose of this study was to determine the effects of virtual and blended instruction and school lunch eligibility on the ACT Aspire Interim Assessments for Reading and Mathematics during the COVID-19 pandemic in five Arkansas schools for seventh- and ninth-grade student scores. The four independent variables were students' school lunch eligibility (eligible for free and reduced-price versus no free and reduced-price) and the instructional delivery method (virtual versus blended). The dependent variables for Hypotheses 1-2 included student achievement scores from the ACT Aspire Interim Assessment for Reading for seventh- and ninth-grade in five Arkansas schools. The dependent variables for Hypotheses 3-4 included student achievement scores from the ACT Aspire Interim Assessment for Mathematics for seventh- and ninth-grade in five Arkansas schools.

Data were collected and coded for the four hypotheses: school lunch eligibility (0 = free or reduced-price eligibility, 1 = not eligible for free or reduced-price lunch) and instructional delivery method (0 = virtual instruction, 1 = blended instruction). Using *IBM Statistical Packages for the Social Science (SPSS) Grad Pack 27*, each hypothesis was analyzed with a 2 x 2 factorial ANOVA with a between-group design. The gender stratification was 120 boys and 120 girls enrolled in five Arkansas Public Schools for each hypothesis. Histograms were used to check for assumptions of normality. The

statistics analysis was used to check for assumptions of normality. The Levene's test of variance checked the homogeneity of variances.

Hypothesis 1

Hypothesis 1 stated no significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading achievement as measured by the ACT Aspire Interim Assessment for Reading for seventh-grade students in five schools in Arkansas. A 2 x 2 factorial ANOVA was conducted to test the hypotheses. Before running the factorial ANOVA, data were randomly selected and stratified by gender. The data were checked for clerical errors, missing values, and assumptions of independence. Data were reviewed for outliers, assumptions of normality, and homogeneity of variances. Table 4 displays the group means and standard deviation for seventh-grade reading achievement by instructional delivery and school lunch eligibility.

Table 4

Means, Standard Deviations, & Numbers for ACT Interim Assessment Reading Achievement Scale Scores as a Function of Instructional Type and School Lunch Eligibility

SLE	Instruction						Total		
	Virtual			Blended			M	SD	n
	M	SD	n	M	SD	n			
F/R	159.97	2.80	30	160.27	3.63	30	160.12	3.22	60
NF/R	159.63	4.82	30	161.30	3.48	30	160.47	4.25	60
Total	159.80	3.91	60	160.78	3.56	60			

Note. SLE = School Lunch Eligibility; F/R = free or reduced-price eligibility; NF/R = no free or reduced-price eligibility.

The groups met the assumption of independence based on the design selected. An examination of the box and whisker plots for each set of reading scores revealed no extreme outliers within the samples. The skewness and kurtosis values were within the 1.0 and -1.0 range. The Shapiro Wilks test was used to test for normality in the four groups (virtual-F/R, $W(30) = 0.94, p = .065$; virtual-no F/R, $W(30) = 0.91, p = .013$; blended-F/R, $W(30) = 0.95, p = .201$; blended-no F/R, $W(30) = 0.95, p = .139$). Only the virtual-no F/R group violated the assumption of normality. The histograms revealed a slight positive skew. Despite this violation of the assumption of normal distribution, data analysis using ANOVA was deemed appropriate as ANOVA is considered robust to mild violations of the assumption (Leech et al., 2015). Levene's test of equality of variance, $F(3, 116) = 2.63, p = .053$, indicated that the assumption of homogeneity of variances

was not significant and, therefore, not violated. A 2 x 2 factorial between-groups ANOVA was performed to test the interaction effect between instruction and school lunch status on the reading achievement of the seventh-grade students' scores. The results of the factorial ANOVA analysis are displayed in Table 5.

Table 5

Factorial Analysis of Variance Results for ACT Interim Reading Scale Scores as a Function of Instructional Type and School Lunch Eligibility

Source	SS	df	MS	F	p	ES
Instruction	29.01	1	29.01	2.06	.154	0.017
SLE	3.66	1	3.66	0.26	.610	0.002
Instruction*SLE	14.01	1	14.01	0.99	.321	0.008
Error	1634.10	116	14.09			

Note. SLE = School Lunch Eligibility.

Results of the factorial ANOVA analysis indicated no significant interaction between instructional type and school lunch eligibility, $F(1, 116) = 0.99, p = .321, ES = 0.008$. According to Cohen (1988), this result was a small effect size. Instructional type and school lunch eligibility did not combine to significantly affect seventh-grade reading achievement based on ACT Interim Assessment for Reading scores, and the null hypothesis was retained. Given that no significant interaction between the variables of instructional type and school lunch eligibility existed, the main effect of each variable was examined separately. The main effect for instructional type was not significant, $F(1, 116) = 2.06, p = .154, ES = 0.017$. Similarly, the main effect for school lunch eligibility

was not significant, $F(1, 116) = 0.26, p = .610, ES = 0.002$. All of the results had a small effect size (Cohen, 1988). Figure 2 displays the means for reading achievement for seventh-grade students.

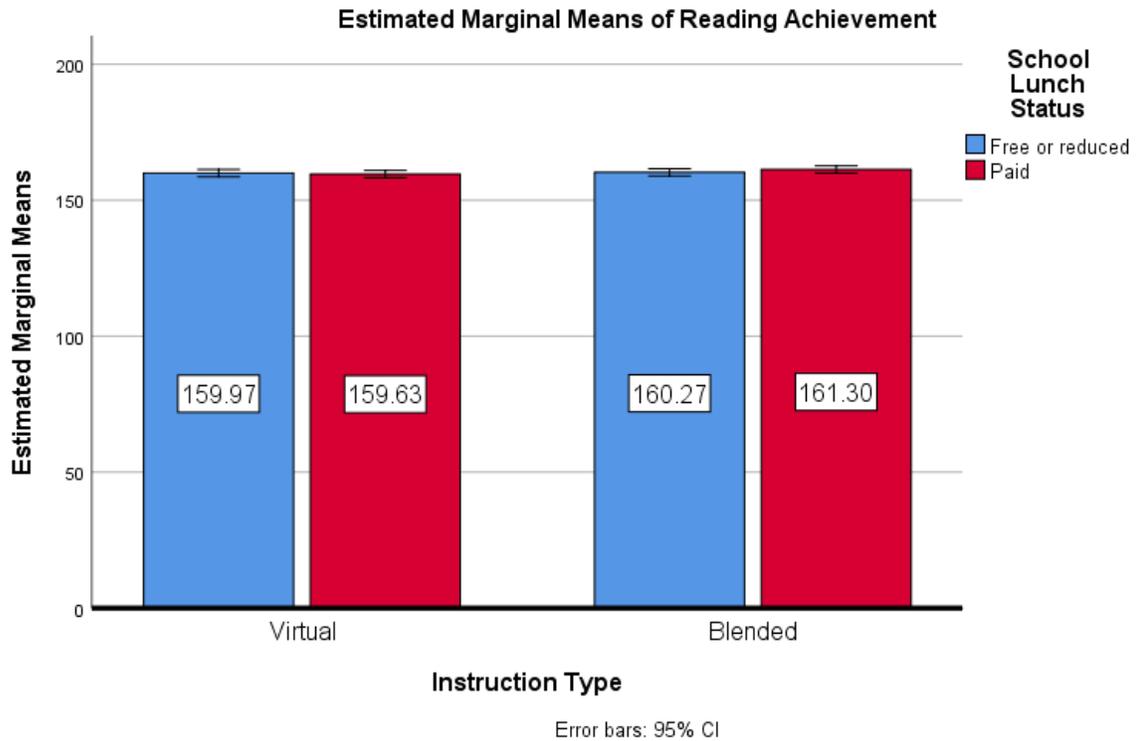


Figure 2. Mean for reading achievement by instruction type and free school-lunch eligibility.

Regarding the instructional type, the mean of the reading scores of the virtual instructional group ($M = 159.80, SD = 3.91$) was not significantly different from the mean of the group using the blended instructional model ($M = 160.78, SD = 3.56$). Regarding school lunch eligibility, the mean of the reading scores for the free and reduced-price lunch group ($M = 160.12, SD = 3.22$) was not significantly different from the mean of the no free or reduced-price eligibility group ($M = 160.47, SD = 4.25$).

Overall, the students indicated no combined or individual effect of instructional type and school lunch eligibility during COVID-19 on reading performance of seventh-grade scores on the ACT Aspire Interim Assessment.

Hypothesis 2

Hypothesis 2 stated no significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading achievement as measured by the ACT Aspire Interim Assessment for Reading for ninth-grade students in five schools in Arkansas. To test the hypotheses, a 2 x 2 factorial ANOVA was conducted. Before running the factorial ANOVA, data were randomly selected and stratified by gender. The data were checked for clerical errors, missing values, and assumptions of independence. Data were reviewed for outliers, assumptions of normality, and homogeneity of variances. Table 6 displays the group means and standard deviation for reading achievement in ninth grade by instructional delivery and school lunch eligibility.

Table 6

Means, Standard Deviations, & Numbers for ACT Interim Assessment Reading Achievement Scale Scores as a Function of Instructional Type and School Lunch Eligibility

	Instruction						Total		
	Virtual			Blended			<i>M</i>	<i>SD</i>	<i>n</i>
SLE	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>			
F/R	157.10	4.27	30	159.70	3.79	30	158.40	4.21	60
NF/R	159.07	4.66	30	159.80	4.47	30	159.43	4.54	60
Total	158.08	4.54	60	159.75	4.11	60			

Note. SLE = School Lunch Eligibility; F/R = free or reduced-price eligibility; NF/R = no free or reduced-price eligibility.

The groups met the assumption of independence based on the design selected. An examination of the box and whisker plots for each set of reading scores revealed no extreme outliers within the samples. The skewness and kurtosis values were within the 1.0 and -1.0 range, except for the virtual-F/R group. The Shapiro Wilks test was used to test for normality in the four groups (virtual-F/R, $W(30) = 0.87, p = .002$; virtual-no F/R, $W(30) = 0.93, p = .044$; blended-F/R, $W(30) = 0.96, p = .262$; blended-no F/R, $W(30) = 0.91, p = .014$). Except for the blended-F/R group, all the groups violated the assumption of normality. The histograms revealed slight positive skews. Despite these violations of the assumption of normal distribution, analysis of data using ANOVA was deemed appropriate as ANOVA is considered robust to mild violations of the assumption (Leech

et al., 2015). Levene’s test of equality of variance, $F(3, 116) = 0.58, p = .631$, indicated that the assumption of homogeneity of variances was not significant and therefore not violated. A 2 x 2 factorial between-groups ANOVA was performed to test the interaction effect between instruction and school lunch status on the reading achievement of the ninth-grade students’ scores. Table 7 includes the results of the factorial ANOVA analysis.

Table 7

Factorial Analysis of Variance Results for ACT Interim Reading Scale Scores as a Function of Instructional Type and School Lunch Eligibility

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>ES</i>
Instruction	83.33	1	83.33	4.49	.036	0.037
SLE	32.03	1	32.03	1.73	.192	0.015
Instruction*SLE	26.13	1	26.13	1.41	.238	0.012
Error	2153.67	116	18.57			

Note. SLE = School Lunch Eligibility.

Results of the factorial ANOVA analysis indicated no significant interaction between instructional type and school lunch eligibility, $F(1, 116) = 1.41, p = .238, ES = 0.012$. According to Cohen (1988), this result is a small effect size. Instructional type and school lunch eligibility did not combine to affect ninth-grade reading achievement based on ACT Interim scores significantly, and the null hypothesis was retained. Given that no significant interaction between the variables of instructional type and school lunch eligibility existed, the main effect of each variable was examined separately. The main

effect for instructional type was significant, $F(1, 116) = 4.49, p = .036, ES = 0.037$. However, the main effect for school lunch eligibility was not significant, $F(1, 116) = 1.73, p = .192, ES = 0.015$. All of the results had a small effect size (Cohen, 1988). Figure 3 displays the means for reading achievement for the ninth-grade students.

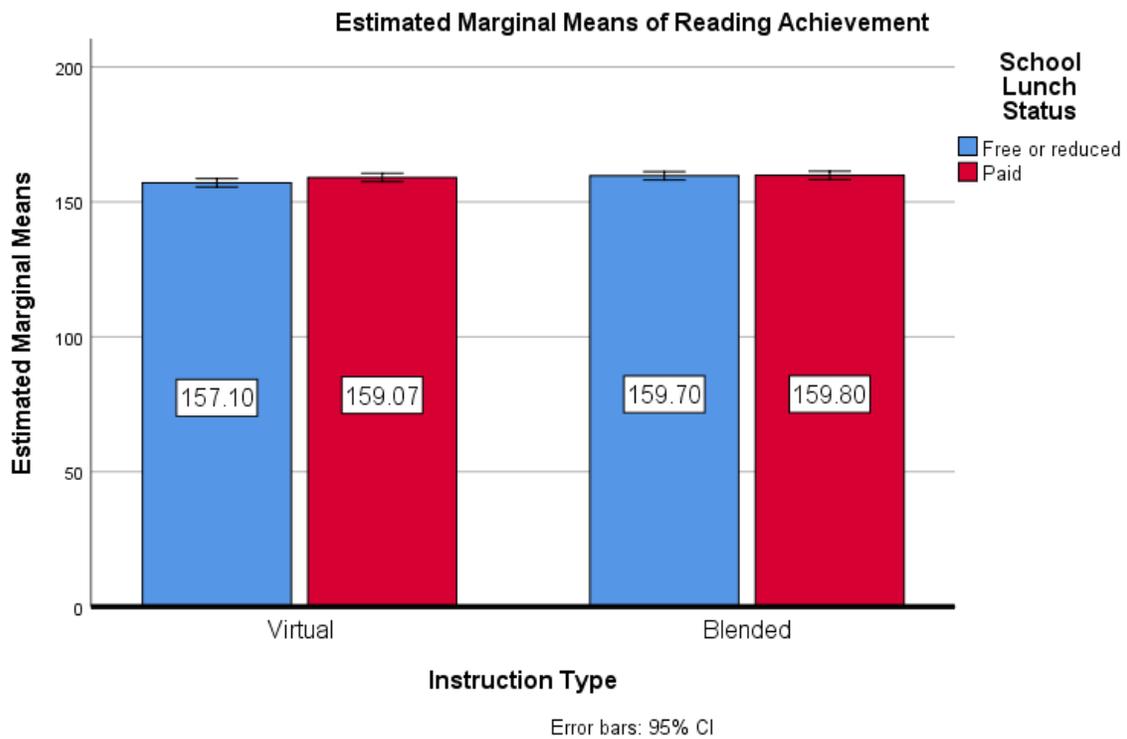


Figure 3. Mean for reading achievement by instructional type and school lunch status.

Regarding the instructional type, the mean of the reading scores of the virtual instructional group ($M = 158.08, SD = 4.54$) was significantly lower compared to the mean of the group using the blended instructional model ($M = 159.75, SD = 4.11$). Regarding school lunch eligibility, the mean of the reading scores for the free and reduced-price lunch group ($M = 158.40, SD = 4.21$) was not significantly different from the mean of the no free or reduced-price eligibility group ($M = 159.43, SD = 4.54$).

Overall, the students indicated no combined or individual effect of school lunch eligibility during COVID-19 on reading performance of ninth-grade scores on the ACT Aspire Interim Assessment. However, the blended instructional group did score significantly higher than the virtual instruction group; yet, the difference had a small effect.

Hypothesis 3

Hypothesis 3 stated no significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on mathematics achievement as measured by the ACT Aspire Interim Assessment for Mathematics for seventh-grade students in five schools in Arkansas. To test the hypotheses, a 2 x 2 factorial ANOVA was conducted. Before running the factorial ANOVA, data were randomly selected and stratified by gender. The data were checked for clerical errors, missing values, and assumptions of independence. Data were reviewed for outliers, assumptions of normality, and homogeneity of variances. Table 8 displays the groups means and standard deviation for mathematics achievement in seventh grade by instructional delivery and school lunch eligibility.

Table 8

Means, Standard Deviations, & Numbers for ACT Interim Assessment Mathematics Achievement Scale Scores as a Function of Instructional Type and School Lunch Eligibility

SLE	Instruction						Total		
	Virtual			Blended			<i>M</i>	<i>SD</i>	<i>n</i>
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
F/R	159.37	3.20	30	159.60	4.16	30	159.48	3.68	60
NF/R	159.43	4.58	30	158.63	3.94	30	159.03	4.25	60
Total	159.40	3.92	60	159.12	4.04	60			

Note. SLE = School Lunch Eligibility; F/R = free or reduced-price eligibility; NF/R = no free or reduced-price eligibility.

The groups met the assumption of independence based on the design selected. An examination of the box and whisker plots for each set of mathematics scores revealed no extreme outliers within the samples. The skewness and kurtosis values were within the 1.0 and -1.0 range except for the virtual-F/R group. The Shapiro Wilks test was used to test for normality in the four groups (virtual-F/R, $W(30) = 0.97, p = .629$; virtual-no F/R, $W(30) = 0.89, p = .004$; blended-F/R, $W(30) = 0.95, p = .205$; blended-no F/R, $W(30) = 0.95, p = .139$). Only the virtual-no F/R group violated the assumption of normality. The histograms revealed a slight positive skew. Despite this violation of the assumption of normal distribution, analysis of data using ANOVA was deemed appropriate as ANOVA is considered robust to mild violations of the assumption (Leech et al., 2015). Levene's test of equality of variance, $F(3, 116) = 0.69, p = .560$, indicated that the assumption of

homogeneity of variances was not significant and therefore not violated. A 2 x 2 factorial between-groups ANOVA was performed to test the interaction effect between instruction and school lunch status on the mathematics achievement of the seventh-grade students' scores. The results of the factorial ANOVA analysis are displayed in Table 9.

Table 9

Factorial Analysis of Variance Results for ACT Interim Mathematics Scale Scores as a Function of Instructional Type and School Lunch Eligibility

Source	SS	df	MS	F	p	ES
Instruction	2.41	1	2.41	0.15	.699	0.001
SLE	6.08	1	6.08	0.38	.539	0.003
Instruction*SLE	8.01	1	8.01	0.50	.481	0.004
Error	1854.50	116	15.99			

Note. SLE = School Lunch Eligibility.

Results of the factorial ANOVA analysis indicated no significant interaction between instructional type and school lunch eligibility, $F(1, 116) = 0.50, p = .481, ES = 0.004$. According to Cohen (1988), this result is a small effect size. Instructional type and school lunch eligibility did not combine to significantly effect seventh-grade mathematics achievement based on ACT Interim scores, and the null hypothesis was retained. Given that no significant interaction between the variables of instructional type and school lunch eligibility existed, the main effect of each variable was examined separately. The main effect for instructional type was not significant, $F(1, 116) = 0.15, p = .699, ES = 0.001$. Similarly, the main effect for school lunch eligibility was not significant, $F(1, 116) =$

0.38, $p = .539$, $ES = 0.003$. All of the results had a small effect size (Cohen, 1988). Figure 4 displays the means for mathematics achievement for seventh-grade students.

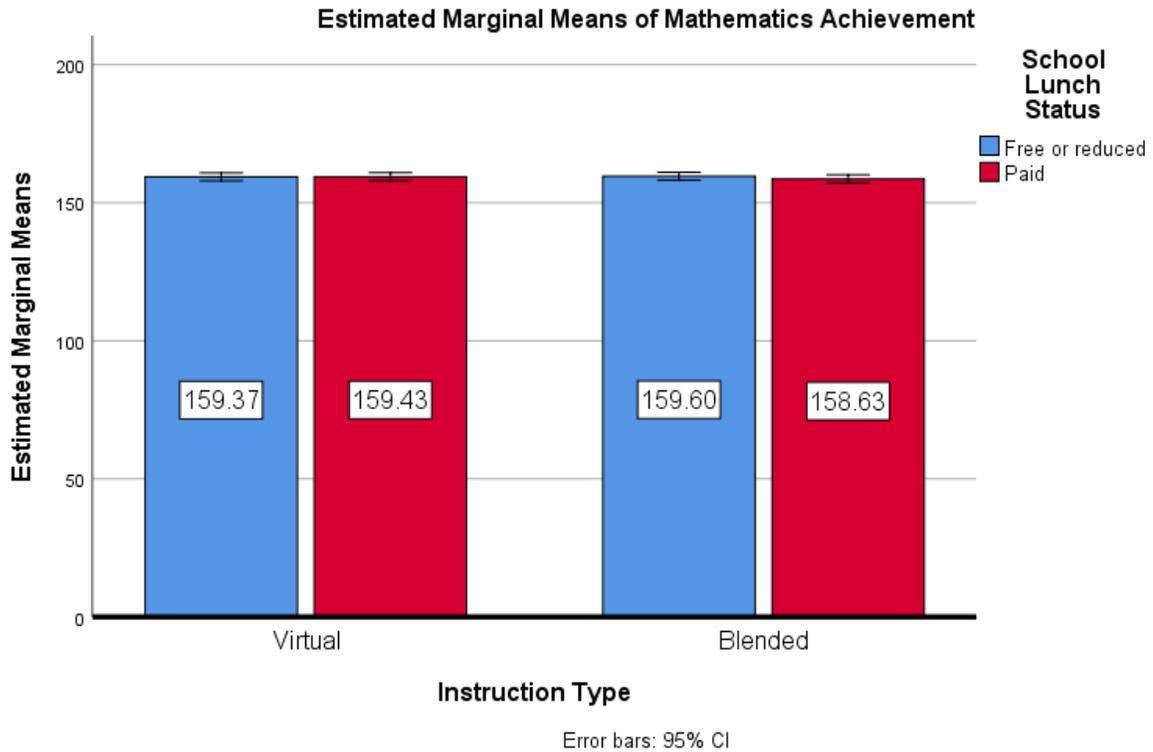


Figure 4. Mean for mathematics achievement by instructional type and free school-lunch eligibility.

Regarding the instructional type, the mean of the mathematics scores of the virtual instructional group ($M = 159.40$, $SD = 3.92$) was not significantly different from the mean of the group using the blended instructional model ($M = 159.12$, $SD = 4.04$).

Regarding school lunch eligibility, the mean of the mathematics scores for the free and reduced-price lunch group ($M = 159.48$, $SD = 3.68$) was not significantly different from the mean of the no free or reduced-price eligibility group ($M = 159.03$, $SD = 4.25$).

Overall, the students indicated no combined or individual effect of instructional type and

school lunch eligibility during COVID-19 on mathematics performance of seventh-grade scores on the ACT Aspire Interim Assessment.

Hypothesis 4

Hypothesis 4 stated no significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on mathematics achievement as measured by the ACT Aspire Interim Assessment for Mathematics for ninth-grade students in five schools in Arkansas. To test the hypotheses, a 2 x 2 factorial ANOVA was conducted. Before running the factorial ANOVA, data were randomly selected and stratified by gender. The data were checked for clerical errors, missing values, and assumptions of independence. Data were reviewed for outliers, assumptions of normality, and homogeneity of variances. Table 10 displays the groups means and standard deviation for mathematics achievement in ninth grade by instructional delivery and school lunch eligibility.

Table 10

Means, Standard Deviations, Numbers for ACT Interim Assessment Mathematics Achievement Scale Scores as a Function of Instructional Type and School Lunch Eligibility

	Instruction						Total		
	Virtual			Blended					
SLE	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
F/R	158.30	3.97	30	158.17	3.54	30	158.23	3.73	60
NF/R	157.87	5.13	30	157.73	4.11	30	157.80	4.61	60
Total	158.08	4.55	60	157.95	3.81	60			

Note. SLE = School Lunch Eligibility; F/R = free or reduced-price eligibility; NF/R = no free or reduced-price eligibility.

The groups met the assumption of independence based on the design selected. An examination of the box and whisker plots for each set of mathematics scores revealed no extreme outliers within the samples. The skewness and kurtosis values were within the 1.0 and -1.0 range except for the virtual-no F/R and the blended-no F/R groups, both with a slight positive skew. The Shapiro Wilks test was used to test for normality in the four groups (virtual-F/R, $W(30) = 0.98, p = .699$; virtual-no F/R, $W(30) = 0.90, p = .007$; blended-F/R, $W(30) = 0.94, p = .090$; blended-no F/R, $W(30) = 0.93, p = .059$). Only the virtual-no F/R group violated the assumption of normality. The histograms revealed a slight positive skew. Despite this violation of the assumption of normal distribution, analysis of data using ANOVA was deemed appropriate as ANOVA is considered robust to mild violations of the assumption (Leech et al., 2015). Levene's test of equality of

variance, $F(3, 116) = 1.12, p = .344$, indicated that the assumption of homogeneity of variances was not significant and therefore, not violated. A 2 x 2 factorial between-groups ANOVA was performed to test the interaction effect between instruction and school lunch status on the mathematics achievement of the ninth-grade students' scores. The results of the factorial ANOVA analysis are displayed in Table 11.

Table 11

Factorial Analysis of Variance Results for ACT Interim Mathematics Scale Scores as a Function of Instructional Type and School Lunch Eligibility

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	<i>ES</i>
Instruction	0.53	1	0.53	0.03	.863	0.000
SLE	5.63	1	5.63	0.32	.576	0.003
Instruction*SLE	0.00	1	0.00	0.00	1.000	0.000
Error	2073.80	116	17.88			

Note. SLE = School Lunch Eligibility.

Results of the factorial ANOVA analysis indicated no significant interaction between instructional type and school lunch eligibility, $F(1, 116) = 0.00, p = 1.000, ES = 0.000$. According to Cohen (1988), this result is a small effect size. Instructional type and school lunch eligibility did not combine to affect ninth-grade mathematics achievement based on ACT Interim scores significantly, and the null hypothesis was retained. Given that no significant interaction between the variables of instructional type and school lunch eligibility existed, the main effect of each variable was examined separately. The main effect for instructional type was not significant, $F(1, 116) = 0.03, p = .863, ES = 0.000$.

Similarly, the main effect for school lunch eligibility was not significant, $F(1, 116) = 0.32, p = .576, ES = 0.003$. All of the results had a small effect size (Cohen, 1988). Figure 5 displays the means for mathematics achievement for ninth-grade students.

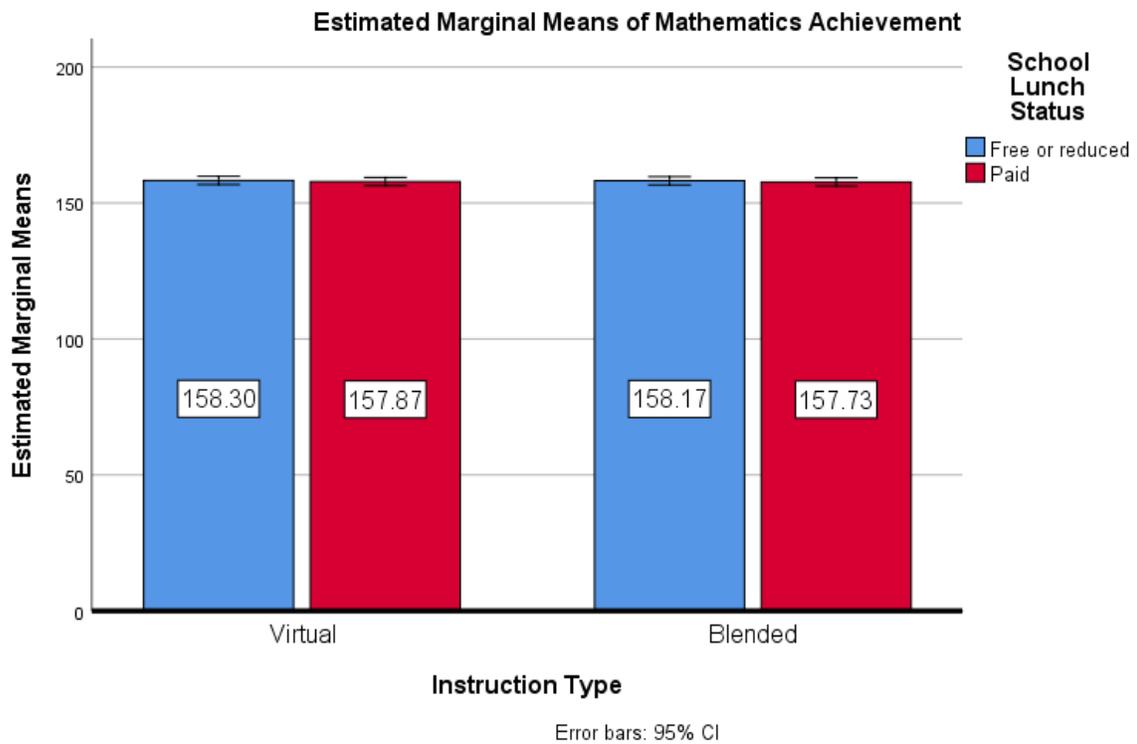


Figure 5. Mean for mathematics achievement by instructional type and free school-lunch eligibility.

Regarding the instructional type, the mean of the mathematics scores of the virtual instructional group ($M = 158.08, SD = 4.55$) was not significantly different from the mean of the group using the blended instructional model ($M = 157.95, SD = 3.81$). Regarding school lunch eligibility, the mean of the mathematics scores for the free and reduced-price lunch group ($M = 158.23, SD = 3.73$) was not significantly different from the mean of the no free or reduced-price eligibility group ($M = 157.80, SD = 4.61$).

Overall, the students indicated no combined or individual effect of instructional type and school lunch eligibility during COVID-19 on mathematics performance of ninth-grade scores on the ACT Aspire Interim Assessment.

Summary

The purpose of this study was to determine the effects by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading and mathematics achievement measured by the ACT Aspire Interim Assessment for seventh- and ninth-grade students in five schools in Arkansas. Table 12 summarizes the results of the interaction and main effects of the four hypotheses.

Table 12

Summary of Statistical Significance of Instructional Type and School Lunch Eligibility on Reading and Mathematics Achievement by Hypothesis

Variables by H ₀	H1	H2	H3	H4
Instructional Type	.154	.036	.699	.863
School Lunch Eligibility	.610	.192	.539	.576
Instructional Type*SLE	.321	.238	.481	1.000

Note. SLE = School Lunch Eligibility.

For the interaction effect of instructional type and school lunch eligibility, no significant interactions existed for the four hypotheses. Overall, no main effect of instructional type or school lunch eligibility existed for three of the four hypotheses. For Hypothesis 2 though, the mean score for the instructional type was significant with a small effect size; therefore, the null hypothesis was rejected. The main effect of instructional type did

affect reading scores, indicating that a significance existed between virtual and blended reading instruction in the ninth grade. Chapter V includes a discussion of the findings for the hypotheses, implications within the review of related literature, and recommendations for practice and future research.

CHAPTER V

DISCUSSION

The purpose of this study was to determine the effects of virtual and blended instruction and school lunch eligibility on student achievement during the COVID-19 pandemic. Superintendent Joe Gothard from St. Paul, Michigan, stated, “There is not a single student in this country who is to blame for COVID-19, yet we know the impact is harming students in disproportionate ways” (Sawchuk, 2020, para.10). School leaders, teachers, parents, and students have struggled to determine what instruction should be implemented during this difficult time, and research-based decisions are necessary to make informed decisions. Still, limited research is available to guide schools on instructional delivery, virtual or blended, during a global pandemic. Over the past year, instructional decisions have been simpler for some schools and parents than others based on environmental resources and support.

This chapter summarized the four hypotheses’ results regarding virtual and blended instruction based on school lunch eligibility in seventh and ninth grades determined by the ACT Aspire Interim Assessments for Reading and Mathematics. Based on the results and the literature review, virtual and blended instruction implications during COVID-19 were presented. Next, recommendations for educators to consider when implementing virtual instruction and blended instruction were provided. Finally, recommendations were offered for future research considerations.

Findings and Implications

For Hypotheses 1-4, 2 x 2 factorial ANOVAs were conducted using the virtual instruction versus blended instruction and school lunch eligibility (free and reduced-price versus no free and reduced-price) as the independent variables. The dependent variables were student achievement from ACT Interim Assessment in Reading and Mathematics scores for seventh and ninth grades from five Arkansas schools. The data were also stratified by gender (male versus female).

Hypothesis 1

Hypotheses 1 stated no significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading achievement as measured by the ACT Aspire Interim Assessment for Reading for seventh-grade students in five schools in Arkansas. No significant interaction effect or main effect of instructional delivery and school lunch eligibility was found on reading achievement for the seventh-grade students. These findings did not support Bronfenbrenner's (2005) ecological systems theory that explains how students respond to environmental situations. However, the findings only provided a snapshot of environmental influences during a very unusual and brief time. Because Bronfenbrenner's (1979) theory also describes the effects of ecological factors over a lifetime, the long-term effects of providing instruction to students in a pandemic environment might not become apparent for research studies in the future. The theory has argued that people are affected differently by their diverse environments, settings, and interactions (Sincero, 2012) and acknowledges why people behave differently in various environmental settings.

Virtual learning quickly became a growing part of Arkansas public schools during the pandemic. Arkansas schools included their choice of learning management systems in their Ready for Learning Plans, which Arkansas DESE required in preparation for the Fall 2020 semester (Arkansas DESE, 2020b). These virtual instructional delivery options provided comfort for parents whose concern was protecting their children from COVID-19. However, COVID-19 also caused concern for teachers in public school systems, including increased workloads, students' attendance, and the risk of getting COVID-19. Decisions were left to the districts, but the teachers prepared face-to-face lessons for students and worked remotely during the COVID-19 pandemic. Not only was remote or blended education a struggle for teachers, but the risk of contracting COVID-19 made instruction more complex.

Hypothesis 2

Hypotheses 2 stated no significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on reading achievement as measured by the ACT Aspire Interim Assessment for Reading for ninth-grade students in five schools in Arkansas. No significant interaction effect or main effect of school lunch eligibility was found on reading achievement for the ninth-grade students. However, the main effect of instructional type did significantly affect reading scores, with a small effect size. Schaffhauser (2020) stated that teachers' most significant struggles with remote learning were the lack of time and access to devices. Teachers prepared face-to-face lessons for students and worked remotely during the COVID-19 pandemic, requiring them to increase their contracted workloads with minimal professional development. Again, the long-term negative educational

consequences of COVID-19 are yet unforeseen, but the positive instructional possibilities for the future look promising. The Los Gatos Union School District recommended a model that simultaneously educated virtual and blended learners through a merged digital classroom (Wong, 2021). This model taught students in the classroom and at home synchronously at the same time through Zoom. New research and more time for school districts to support teaching in a blended environment could promote better transitions when major disruptions to face-to-face instruction occur.

Hypothesis 3

Hypotheses 3 stated no significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on mathematics achievement scores as measured by the ACT Aspire Interim Assessment for Mathematics for seventh grade in five schools in Arkansas. No significant interaction effect or main effect of instructional delivery and school lunch eligibility was found on mathematics achievement for the seventh-grade students. In 2020, parents were faced with sending children to schools during a global pandemic. Some parents selected virtual instruction, and others chose face-to-face with transition periods between the school and home setting or blended instruction. On one hand, Doerschuk et al. (2016) revealed that students from low socioeconomic households had a lower success rate in mathematics than students from higher socioeconomic households due to access to hands-on learning experiences within the home and community. However, Guberman (2004) noted that parents could find creative activities in the home and community that incorporated mathematics, which could be applicable during the time students spent at home during the 2020-2021 global pandemic. Yet, while students were at home in a virtual learning

setting or during a pivot that forced students to learn from home, many parents still had to work and could not provide the emotional, technical, or instructional support needed for students to progress through a difficult period.

Hypothesis 4

Hypotheses 4 stated no significant differences will exist by school lunch eligibility between students participating in virtual instruction versus blended instruction on mathematics achievement scores as measured by the ACT Aspire Interim Assessment for Mathematics for ninth grade in five schools in Arkansas. No significant interaction effect or main effect of instructional delivery and school lunch eligibility was found on mathematics achievement for the ninth-grade students. A district in Washington state was one of the first to start using virtual learning after the arrival of COVID-19, shifting 24,000 students to online learning (Decker et al., 2020). However, many United States' schools did not have the technology or Internet capabilities to shift quickly. The Coronavirus Aid, Relief, and Economics Security or CARES Act was passed to provide \$13.5 billion for the Elementary and Secondary School Emergency Relief Fund to ensure that students had computers and the Internet (Salguero & Johnson, 2020). Arkansas Governor Asa Hutchinson postponed the Fall 2020 semester for 2 weeks to allow supplies and devices to arrive (Kruse, 2020). However, schools were still at varying levels of preparedness to provide students with devices, provide Internet accessibility, and operate learning management systems.

Instructional Delivery (Virtual Instruction Versus Blended Instruction)

The question of instructional delivery based on online teaching platforms for student achievement is not new. Distance learning started as early as 1728, but

technology has been used regularly in the United States' education system since the 1990s (Bouchard, 2019). Many Arkansas schools have successfully used Virtual Arkansas (2021) since the late 1990s to offer over 80 online classes and provide schools with a virtual instruction plan. The study only found one significant difference between students receiving virtual or blended instruction based on the ACT Aspire Interim Assessments for Reading and Mathematics scores, the ninth-grade reading students, and this significant finding only had a small effect size. However, the education system would have stopped without virtual learning when schools were closed in the spring of 2020 due to COVID-19. The United States Census Bureau's Household Pulse survey noted that 93% of United States households used some online learning (McElrath, 2020). However, virtual instruction does not come without limitations. Parents felt more equipped to help students with reading than mathematics during the pandemic (Samuels, 2020). Offering virtual instruction may result in fewer opportunities for student interactions and collaboration, which could negatively influence students' health. However, students' social and emotional wellbeing was not measured for this study.

As school districts and administrators reflect on instructional changes during COVID-19, the adjustment of instructional type is a factor to be considered. Although, some schools in the United States and Arkansas offered virtual instruction even before COVID-19. The graduation rate for virtual instruction schools in 2017-2018 was 50.1% compared to 84% for traditional, brick-and-mortar schools (Molnar et al., 2019). Because this study's results indicated only one significant main effect for instructional type, overall, these results revealed that instructional delivery type was not a major factor for students' success.

Arkansas teachers' most significant struggle with remote learning was the lack of time and access to devices (Schaffhauser, 2017b). A superintendent at Harrisburg School District could not get devices in until November of 2020 (C. Ferrell, personal communication, November 4, 2020). Some students felt successful due to the shift to virtual instruction during COVID-19. For example, Bobby felt like he could master his work and move at his own pace in virtual instruction due to his struggles with attention deficit disorder, which made Bobby more comfortable as he learned (Tesfaye, 2021). However, Drew, an 11th-grade student-athlete and enrolled in three advanced placement classes, felt defeated and talked about being left out of class discussions and missing hands-on experiences. Studying for tests and completing assignments were harder when the teacher was not in the same room to help (D. Dogan, personal communication, March 13, 2021). In addition, teachers were also affected by the constant changes. On April 8, 2020, Education Week reported that 66% of teachers surveyed reported morale levels lower than before COVID-19. In the first round of COVID-19, teachers were worried about their students' learning and the increased workload and personal health. Before the ACT Interim Assessments used in this research study, the COVID-19 vaccination was not offered to educators or students.

School Lunch Eligibility

One variable that this study investigated was school lunch eligibility. Free and reduced-price school breakfast and lunches allow students to concentrate on learning instead of hunger (Vanco Education, 2020). However, beyond the school room, the free and reduced-price lunch eligibility and paid lunch students differ in the accessibility of technology and internet access within the home (Reardon et al., 2013). Because students

differ in their access to technology, data on learning loss is uncertain because most schools do not test achievement in short intervals. Curriculum Associates (2020) i-Ready platform found that students in an i-Ready sample only learned 87% of what grade-level peers had learned the prior semester for students. In addition, students in poverty may not have access to the learning supplies, books, and experiences needed to advance academic development (Bergen et al., 2016). Due to limited financial resources in low-income homes, some students miss out on education and experiences. However, this research did not provide evidence that school lunch eligibility affected student achievement during the pandemic in the sampled schools. One factor complicating the issue was that school lunch eligibility was hard to determine because the United States Department of Agriculture (2020) released an announcement in the Fall of 2020 stating that all students would eat free. This announcement caused some parents not to complete the school lunch eligibility form. For example, one superintendent from a small rural school noted that school lunch eligibility funding based on applications for Title I was down over \$30,000.

School lunch eligibility and socioeconomic status can positively or negatively affect students' achievement in reading and mathematics. However, in this research study, the school lunch eligibility did not affect the outcome. Reardon et al. (2013) found that students who qualify for free or reduced-price lunch entered high school 5 years behind in literacy skills than students from high-income households. In addition, students from low socioeconomic households had a lower success rate in mathematics than students from higher socioeconomic households (Doerschuk et al., 2016). Although the findings of this study are different from prior research, the finds provide questions for

tracking ACT Aspire Summative scores as administrators decide on the next steps during COVID-19 and compare scores over the years to come.

Recommendations

Potential for Practice and Policy

Based on the findings of this study, three recommendations were offered. First, since results have indicated instruction does not affect the achievement scores in five Arkansas schools, except for ninth-grade reading, Arkansas DESE and policymakers may want to reconsider the future of Arkansas education should the pandemic continue or subsequent disruptions to instruction occur. The Arkansas education system has traditionally been brick and mortar until the recent pandemic. Arkansas may consider additional funding for technology supplies and more reliable Internet access to ease the burden on schools and parents, additional teacher training in the blended environment, and incentives for retaining teachers and recruiting new teachers in this new era of instructional delivery. Second, school administrators could give formative assessments throughout the year. Providing more interim assessments helps to see growth and change over time and helps to address academic deficiencies before these become serious.

Third, the affect that COVID-19 will have on education is uncertain, and a significant number of teachers were not trained in handling the pivot to blended or virtual learning. Many teachers were unsure how to develop plans and instruction for virtual instruction and blended instruction. This uncertainty could be a result of districts in the study not providing the same professional development. For example, a nationally award-winning teacher with 38 years of experience in the rural Arkansas Delta stated that the professional development offered by her school district during COVID-19 was invaluable

and helped her know how to use the learning management systems needed to navigate technology-based instruction (M. Smith, personal communication, May 3, 2021). Smith talked about her district surveying teachers to identify what each teacher needed to customize learning and prepare for a year of virtual and blended instruction. Teachers were trained in one program for each task that needed completing on the device staff would use daily instead of being overwhelmed with various digital learning management tools. Professional development aims to offer high-quality training to teachers in needed areas, and the state did not require teachers to train on blended instruction models.

Future Research Considerations

This study provided minimal evidence that the instructional delivery and school lunch eligibility affected the ACT Aspire Interim Assessment for Reading and Mathematics scores in seventh and ninth grades. The following recommendations were offered for future research considerations:

1. The present study used a single set of achievement data scores from 1 year. The seventh- and ninth-grade years were selected because these grades are transitional years in the standards and the study's school districts. A longitudinal study could be implemented to examine the achievement scores' trends over multiple years and throughout the COVID-19 pandemic.
2. The number of schools in Arkansas giving the ACT Aspires Interim Assessments for Reading and Mathematics was limited and may have affected the study's sample size. Future researchers might consider using the ACT Aspire Summative Assessment scores during a pandemic to obtain a broader sample.

3. The ACT Aspire Interim Assessments for Reading and Mathematics used in the present study may not completely align with the Arkansas State Standards for reading and mathematics. A future study may examine the alignment of the assessment and the dependent variable used.
4. The schools used reported virtual and blended instruction, but individual schools were combined into one pool for sampling purposes. Therefore, data were not stratified by the school because of the low number of scores provided by some of the smaller rural schools.
5. Although the instructional delivery type and scores were used, the professional development offered at the individual schools could be considered in a future study.
6. One variable for choosing the specific schools for the present study involved the examination of several demographic categories. Future research may also explore race and ethnicity variables to reflect on the students' performance using virtual and blended instruction.
7. The study used ACT Aspire Interim Assessments for Reading and Mathematics scores. Since the pandemic has continued into another school year, the ACT Aspire Summative Assessment might provide better longitudinal results of the effects on instruction for the current school year and subsequent school years.
8. An investigation comparing the perceptions of students, teachers, and parents on different instructional methods like face-to-face, blended, and virtual could benefit educational stakeholders.

Conclusion

The purpose of this study was to determine the effects of school lunch eligibility between students participating in virtual instruction and blended instruction on student achievement measured by the ACT Aspire Interim Assessment for Reading and Mathematics scores for seventh- and ninth-grade students. Chapter V included the implications and recommendations for future practice and research. The findings of this study have contributed to knowledge regarding students instructed virtually or blended during a global pandemic.

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