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The Effects of the Covid-19 Pandemic on English Standardized State Test Scores in Ohio

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The Effects of the COVID-19 Pandemic on English Standardized State Test Scores in Ohio

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The thesis entitled **'The Effects of the COVID-19 Pandemic on English Standardized State Test Scores in Ohio'** presented by **Shelby Dalton**, a candidate for the degree of **Master of Science in Mathematics**, has been approved and worthy of acceptance.

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Abstract

As online learning becomes more popular, it is important to understand how it affects academic achievement. The COVID-19 pandemic has impacted how schools operate tremendously, including an abrupt transition to online learning. The current study seeks to improve the understanding of how much this transition has affected students and their academic achievement. This study examines how the COVID-19 pandemic has affected ELA-II tenth grade test scores using socioeconomic status (SES), disability category, the type of instructional delivery in the 2020-2021 academic year, and ELA-I eighth grade test scores as predictor variables. The data was obtained from Rock Hill Local Schools, a school district in the Appalachian region of Ohio. The purpose of this study is to provide information about how factors regarding the COVID-19 pandemic have affected students' ELA-II test scores. The results show that ELA-I test scores are a significant predictor of ELA-II test scores of tenth grade students during the 2020-2021 academic year. The results also show that the mean difference in ELA-II test scores between students whose instruction was delivered face-to-face and students whose instruction was delivered online for the 2020-2021 academic year was not statistically significant. This study found that the mean difference between ELA-II test scores for students with high SES and students with low SES was statistically significant. The results of this study imply that early test scores and SES have a significant impact on future test scores.

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Chapter 1: Introduction

Introduction

The general field of interest is how the COVID-19 pandemic has affected students and teachers alike in many aspects of the learning environment. This study will look at how the knowledge, or lack of knowledge, of online learning has affected the learning environment in schools.

It is important to investigate these factors because the future of education is ever changing and hybrid learning has been on the rise, even before the pandemic started. If educators learn how full-time online learning has affected students and their abilities to learn, then schools can make adjustments to better help hybrid learning students in the future. This study aims to provide information on how the COVID-19 pandemic has affected students' tenth grade ELA-II test scores in a school in the Appalachian region of Ohio.

Theoretical Framework

The theoretical framework for this study is Cognitive Load Theory (CLT) and Cognitive Theory of Multimedia Learning (CTML). CLT is an instructional design theory that describes how instructional materials should be designed according to how humans function cognitively for optimal learning outcomes. According to this theory, there are three types of cognitive input: intrinsic load, extraneous load, and germane load (Dudley, Dean, Cairney, & Van Bergen, 2020 and Hadie et al., 2021). CTML is an instructional design theory that describes how multimedia instructional materials should be designed according to how humans function cognitively for optimal learning outcomes. These theories focus on preventing overload of the working memory (Dudley et al., 2020; Hadie et al., 2021). These theories are important to this study

because they will aid in the understanding of how students' academic achievement may have been affected by abruptly transitioning to online learning.

Background of the Problem

As online learning is becoming more popular, there have been several studies conducted to examine how it is affecting students' learning. One study (see Hadie et al., 2021) shows that the implementation of CLT and CTML could be an effective way to promote students' learning and self-motivation during online learning for health professions. This study compared traditional in-person learning and CLT-based online learning. The results showed there was significant evidence that the CLT-based online learning was effective across the different health disciplines. This study also found that students that attended the CLT-based online learning had a significant increase in their self-motivation and engagement. Further research would be needed to investigate how this applies to other non-health professions (Hadie et al., 2021). Another study by Dudley et al. (2020) shows that CLT could be useful in learning physical literacy. The results of the study indicate that the cognitive load can be divided into two different parts, the working memory and the long-term memory. By overloading the working memory, there is a higher chance that any knowledge that is acquired will be misinterpreted or will not be retained at all when transitioning to the long-term memory (Dudley et al., 2020). A CLT-based class is achievable across different styles of instruction such as lectures, in-person learning, and online learning. These classes are an effective way to enhance students' learning across different areas of study and at difficult comprehension levels in health sciences (Hadie et al., 2021). A study by Martindale, Pearson, Curda, & Pilcher (2005) found that an online study

program for a standardized state test in Florida was more effective in the elementary grades compared to the secondary grades. Their possible explanation for this was that at the high school level, teachers may have not had time to use this study program whereas elementary teachers felt that it was necessary to use the study program to prepare students for the standardized state tests to come in their education careers. CLT could be a possible enhancement to online learning that would help students gain more knowledge and motivation through online learning.

There's no doubt the COVID-19 pandemic has affected many aspects of life. Specifically, the school setting has looked very different for everyone. Online learning has been implemented in many different forms in the classroom, including synchronous and asynchronous lessons. There is an increasing demand to study how online school is affecting students. The findings on this so far have been inconsistent (Hadie et al., 2021). There are many factors that could play a role in tandem with the pandemic that could affect students' performance in the classroom such as socioeconomic status (SES), whether the student has a disability and what disability they have, as well as whether they were in-person or online for the academic year following the nationwide quarantine.

Online learning has been on the rise in schools, even before the outbreak of the COVID-19 pandemic. There are many online study programs for standardized state tests across the country that can be effective when used appropriately (Martindale et al., 2005). However, there are not many studies on how going to school completely online affects test scores. The proposed study will examine the effects of SES, disability, the type of instructional delivery, and

the English Language Arts (ELA-I) test scores from the end of the eighth grade year on the English Language Arts (ELA-II) test scores from the end of the tenth grade year.

In the spring of 2020, in the United States, online learning abruptly became the primary source of instruction for most schools when the COVID-19 pandemic began. This transition came with many challenges for students and teachers as they had to move to online learning almost overnight. Teachers were faced with the obstacle of technical competency as they had to rapidly move their classes to completely remote. They needed to have proper planning for their online classes in order for them to be effective learning experiences (Hadie et al., 2021). Students also faced several obstacles, such as access to reliable Wi-Fi and video, quiet places to work and study, possible finance problems from themselves or their parents not being able to work during the nationwide quarantine, and self-motivation (Gonzalez-Ramirez et al., 2021). There are many challenging factors that played a role in the rapid transition from face-to-face learning to online learning for both the teachers and the students.

There have been several studies on the ways that online learning can be effective, but there have not been many on how online learning affects test scores at the high school level. Therefore, this study seeks to investigate the different factors that could potentially affect test scores at the high school level, including how instruction was delivered, SES, disabilities, and previous test scores. This study will investigate the effect that these factors have on the ELA-II test scores.

Statement of the Problem

The research problem is whether the COVID-19 pandemic has affected ELA-II test scores among tenth grade students. The need for this study is that there is little information known about how online learning affects test scores. So, by performing this study, educators will gain knowledge about ways they can adjust their online learning environments to better help students succeed.

Purpose of the Study

The purpose of this study is to provide information to school administrators and teachers about how the COVID-19 pandemic has affected students' ELA-II test scores. Factors such as type of instructional delivery, SES, disability category, and ELA-I test scores will be investigated to determine how ELA-II test scores have been affected.

Significance of the Study

This study is important because online learning has become very prominent over the last year due to the pandemic. This study will improve the subject area of online learning because it will investigate which, if any, of the proposed factors affect ELA-II test scores with the major difference between the two groups of students being how instruction was delivered, either face-to-face or online.

Primary Research Questions

The primary research question is “Are SES, disability category, and eighth grade ELA-I test scores significant predictors of tenth grade ELA-II test scores for students whose instruction was delivered face-to-face?” Additional questions are “Is there a significant difference in mean ELA-II test scores across the type of instructional delivery in the experimental group?” and “Is there a significant difference in mean ELA-II test scores across SES in the control group and the experimental group?”

Research Design

This study is explanatory with quantitative data. The analysis for this study will examine ELA-II test scores across the different factors. The ELA-II test scores will also be examined across the two different groups of students, the control group (tenth grade students during the 2017-2018 academic year) and the experimental group (tenth grade students during the 2020-2021 academic year). In this study, the type of instructional delivery, SES, disability category, and the ELA-I test scores are the independent variables and the ELA-II test scores are the dependent variables.

The data for the current study will be obtained from pre-existing data from a school in the Appalachian region of Ohio, Rock Hill Local Schools, and will include information about students who were in the tenth grade during the 2017-2018 and 2020-2021 academic years. It is contained in the school’s database and will be provided by the assistant superintendent and the high school guidance counselor. The data will include information about socioeconomic status, disability category, ELA-I test scores, ELA-II test scores, and type of instructional delivery

for the 2020-2021 academic year. The data for both the control group and the experimental group, after cleansing, will include 179 students total. The school will provide the data with all personal identifying information removed. The data will be maintained in Google Sheets in two different spreadsheets, one for the control group and one for the experimental group. R will be used for the analysis of the data (Hornik & R Core Team, 2022).

Assumptions, Limitations, and Scope

The assumptions being made in this study are that students did their best work on the ELA-I and ELA-II tests and that students completed their coursework to the best of their abilities regardless of whether they were learning online or face-to-face.

The limitations of this study are sample size and the availability of predictors. The results of this study will only be generalizable to the school district where the data was obtained because of the delimitations of using only one school district.

Definition of Terms

ELA-I: This is the end of course test in English Language Arts for eighth grade students (Ohio's State Tests in English Language Arts, Mathematics, Science and Social Studies, 2021).

ELA-II: This is the end of course test in English Language Arts for tenth grade students (Ohio's State Tests in English Language Arts, Mathematics, Science and Social Studies, 2021).

IEP: This is an Individualized Education Program. It gives the layout for special education instruction, supports, and services a student needs to receive to be successful and is legally

guaranteed in a general educational setting in school. They exist in the PreK-12 public education system (Belsky, n.d.).

Cognitive Load Theory (CLT): This is an instructional design theory that describes how instructional materials should be designed according to how humans function cognitively for optimal learning outcomes (Hadie et al., 2021). This focuses on preventing overload of the working memory (Dudley et al., 2020). There are three types of cognitive input: intrinsic load, extraneous load, and germane load (Dudley et al., 2020 and Hadie et al., 2021).

Intrinsic Load: This is the cognitive input that is relevant for the learning process (Hadie et al., 2021).

Extraneous Load: This is the cognitive input that is not relevant to the learning process (Hadie et al., 2021).

Germane Load: This is the cognitive effort used to process learning material (Hadie et al., 2021).

Cognitive Theory of Multimedia Learning (CTML): This is an instructional design theory that describes how multimedia instructional materials should be designed according to how humans function cognitively for optimal learning outcomes (Hadie et al., 2021). This focuses on preventing overload of the working memory (Hadie et al., 2021).

Summary

This chapter introduced the problem of investigating ways the COVID-19 pandemic has affected both students and teachers in the classroom. This chapter gives a brief description of

the research problem, the purpose of the study, the research questions and hypotheses, and the significance of the present study.

Chapter 2: Literature Review

Online Learning

Online learning is the use of technology and the internet for educational purposes (Means et al., 2009 as cited in Adedoyin & Soykan, 2020) and uses the internet as the primary method of delivery of materials (Appana, 2008). According to Riebeiro (2020) as cited in Adedoyin & Soykan (2020), online learning is not a new discovery as online degrees have been surfacing since as far back as the 1980s and the optimal time to mature online education was the 1990s and 2000s. They also say that online learning is a good alternative to face-to-face learning but not an option to replace it. For the last few decades, integrating technology into education has been one of the important points of reform (Lee & Tsai, 2008).

There are many benefits to online learning, such as flexibility in scheduling, interactivity, and self-pacing class work (Smedly, 2010; Leszczyński et al., 2018; Wagner et al., 2008; Amer, 2007 as cited in Adedoyin & Soykan, 2020). Another benefit of online learning is that it has the potential to help the sustainability of university programs that are struggling to have sufficient on campus numbers (Appana, 2008). There are also many disadvantages to online learning. Predominantly, online learning requires self-discipline and time management skills to minimize procrastination to complete assignments on time (Govindarajan & Srivastava, 2020 as cited in Gonzalez-Ramirez et. al., 2021). A study by Pentaraki & Burkholder (2017) as cited in Gonzalez-Ramirez et al. (2021), found that frustration is the major negative emotion that students experience while participating in online learning. A major source of this frustration is usually from experiencing difficulty in self-discipline of completing course work and studying (Gonzalez-Ramirez et al., 2021). There are also distractions that need to be taken into consideration when it comes to online learning. Some of the distractions that must be

considered are human and pet interruptions. These unexpected interruptions may cause a disruption in a student's ability to participate or pay attention in an online learning environment (Adedoyin & Soykan, 2020).

Online learning has raised some concerns over the last few decades. According to Pokhrel & Chhetri (2021), the pedagogy that is available and used in face-to-face learning is not always applicable to online learning and there is not a universal pedagogy that will work for every process of online learning. They also state that it is difficult to find a design that fits the needs and wants of every student. In order for online learning to be an option, students and teachers must have access to proper technology. Access to the appropriate technology is critical for online learning, so teachers or students with poor internet connections may not have the option to participate in online learning environments (Adedoyin & Soykan, 2020). It is also argued that it can be difficult for students with accessibility issues to follow instructions or see class announcements. Another issue with online learning is that it is out of the realm of thought or abilities for some teachers (Roberts, 2003 as cited in Lee & Tsai, 2008).

Face-to-face learning has also been criticized. This learning style has been under scrutiny for the encouragement of passive learning and not nurturing critical thinking and problem solving skills (Banathy, 1994; Hannum & Briggs, 1982 as cited in Appana, 2008). However, there are many softwares that can be used in tandem with face-to-face learning that are beneficial to students. There is evidence that students who use appropriate software for class work achieve higher than students who use more traditional methods (Sasser, 1991 as cited in Martindale, Pearson, Curda, & Pilcher, 2005).

There are two different types of online learning: synchronous and asynchronous. Synchronous online learning is a class in which all students are logged onto the internet based classroom at the same time and can communicate with the teacher and other students in real time and asynchronous online learning is a class in which students can log onto the internet based classroom at their convenience (Appana, 2008). These two types of online learning are often compared but there are limitations and benefits that need to be understood in order for these to be effective and efficient forms of learning (Hrastinksi, 2008 as cited in Adedoyin & Soykan, 2020). A benefit of a synchronous online learning environment is that teachers can provide pre-recorded lectures and video links before class so that class time is used to further the understanding of the material through discussions (Doucet et al., 2020 as cited in Pokhrel & Chhetri, 2021). A common topic for debate is whether students should have their cameras on for synchronous online learning (Austin, Fogler, & Daniel, 2021). Lännström (2020) and Reed (2020) as cited in Austin et al. (2021) states there is debate around whether making students have their cameras on increases their level of anxiety and self-consciousness by increasing the feeling that they are being watched. Austin et al. (2021) argues that this evidence is only supported theoretically, not empirically. According to Castelli & Sarvary (2021) and Rajab & Soheib (2021) as cited in Austin et al. (2021), there is survey research evidence that having cameras on during online classes may cause students to feel self-conscious about their home learning environments. However, they also found that having cameras on during online classes enhanced students' engagement, learning, and accountability by feeling more connected to their classmates. It is reasonable to conclude that having cameras on during online learning has an effect on academic achievement, but it is not inherently clear whether that effect is positive

or negative (Austin et al., 2021). According to Austin et al. (2021), there is evidence to suggest that there may not be a significant negative effect on academic achievement from having cameras on for an online class. They argued that having cameras turned on positively affects self-awareness and may help with personal accountability for classwork. They also found that students were uncomfortable and received no benefits when they could see other students, but not themselves.

There are many factors that affect the effectiveness of online learning. A couple of the factors that have an influence on online learning are the amount of feedback and how interactive the online class is (BoUiger & Martindale, 2004; Hawkes & Dennis, 2003 as cited in Martindale et al., 2005). For online learning to have a chance at being successful, students must have adequate access to the technology that is necessary for online learning (Appana, 2008). It can also be argued that teachers need to have the ability to identify online learning materials that are appropriate for their course and be able to implement the appropriate online pedagogy to support those materials (Goodyear et. al, 2001 as cited in Lee & Tsai, 2008). Another issue that could have an impact on the effectiveness of online learning is the level of confidence and anxiety teachers have about integrating online software into their classes (Lee & Tsai, 2008). According to Conlon (1997) as cited in Appana (2008), there are many teachers that do not support the integration of online software for their classroom because they do not believe that this implementation will solve education problems or they worry about the limitations that come with online learning.

The implementation of online learning has grown tremendously over the last decade. According to Watson et al. (2010) and Miron & Gulosino (2016) as cited in Bueno (2020),

full-time online schools in the United States are the fastest growing choice of school. They also found that there is not much evidence on how attending an online school full-time affects academic achievement. However, Goldenberg & Cuoco (1996), Russell (1997), Sanders (2001), and Schifter (1997) as cited in Martindale et al. (2005) argue that there is substantial evidence that supports the hypothesis that online learning affects academic achievement in a positive way. There is a gap between what disciplines online learning can be effective for and what disciplines are not compatible with online learning (Leszczyński et al., 2018 as cited in Adedoyin & Soykan, 2020). According to Appana (2008), students as young as adolescents are capable of learning from an online platform if they can commit to learning and have the proper guidance and encouragement.

There is some controversy around how online assessments should be delivered. One argument is that if teachers use multiple choice techniques too often, that the results may not be enough to evaluate the students' actual level of understanding of the content (Appana, 2008). Another argument is that teachers are limited to the amount of supervision they can have on students while taking assessments, so it is nearly impossible to control students cheating (Arkorful & Abaidoo, 2015 as cited in Adedoyin & Soykan, 2020). Pokhrel & Chhetri (2021) agree that while participating in online learning and taking online assessments, it is difficult for teachers to prove the authenticity of students' work and the level of actual learning the students are receiving.

There is little evidence on how returning to a face-to-face classroom from an online classroom affects academic achievement. However, Bueno (2020) finds that students who attend a fully virtual school achieve less in English and Math compared to students who attend

a face-to-face school. They also found that students who returned to a face-to-face school after temporarily attending a virtual school for an academic year recovered to the academic level they were at before entering the virtual school. The Center for Research on Education Outcomes (2015) as cited in Bueno (2020) concluded that, typically, fully virtual schools have negative impacts on academic achievement.

Online learning is not a new concept and will not go away anytime soon (Appana, 2008). The popularity of online learning will increase and become more widely accepted and integrated into normal classroom instruction.

Background on Socioeconomic Status (SES) and Academic Achievement

There is a significant impact of parental education and income on the early years of a child's development (Knudsen, Heckman, Cameron, & Shonkoff, 2006 as cited in ElHassan et al., 2018). Currie & Thomas (1999) found that early test scores are significant predictors of future test scores. The way SES is defined has a significant effect on how strong the relationship is between SES and academic achievement (White, 1982). White (1982) suggests that as students age, the relationship between SES and academic achievement decreases. Students that are from a low SES household are likely to receive less schooling because of a lack of opportunity, not because they lack the ability to succeed academically (Ashenfelter & Rouse, 1997 as cited in Currie & Thomas, 1999). Rothstein (2015) as cited in White et al. (2016) claims that the economic disadvantages are what affect students' academic achievement the most. Students from a high socioeconomic background are more likely to receive academic assistance than students from a low socioeconomic background (Currie & Thomas, 1999).

Research by Sirin (2005) finds that the SES of the parents significantly affects their childrens' academic achievement. However, Lindo (2014) and Sirin (2005) as cited in White et al. (2016) argues that there are inconsistencies in the research about how SES impacts academic achievement. However, there is no lack of studies that support a strong relationship between SES and academic achievement (White, 1982). The results of these studies are inconsistent on whether there is a positive or negative correlation. The findings of Sirin (2005), claim that using dichotomous variables for SES tend to produce weaker correlations to academic success as compared to using multiple levels of SES. According to White (1982), the traditional variables used to determine SES are income, parents' education, and parents' occupation, where income has the highest correlation. Typically, in the school setting, students' SES is determined by their eligibility for free and reduced lunch. White (1982) also claims that combining more than one predictor is more highly correlated with SES than using only one predictor. If there was a universally accepted, specific definition of what SES is, correlations could be compared much easier and there would be clearer evidence of the relationship between SES and academic achievement (White, 1982).

White (1982) suggests that the relationship between SES and academic achievement is probably lower than expected. There is evidence to support that overtime, the correlation between SES and academic achievement has decreased since White's research in 1982 (Sirin, 2005). ElHassan et al. (2018) found that maternal SES has a strong correlation with academic achievement.

COVID-19, Online Learning, and Students with Disabilities

The COVID-19 pandemic has affected every student around the world in many ways, but students with disabilities are facing many more challenges than they were already struggling with on a daily basis (UNICEF, 2020 as cited in Kumar & Priyadarshini, 2021). Students that require special needs can have many different disabilities such as visual or hearing impairments, physical disabilities, or learning disabilities (Pokhrel & Chhetri, 2021). A study by Kumar & Priyadarshini (2021) reported that while all students' mental and social health was affected, students with disabilities suffered greatly because the nearly overnight transition to online learning gave schools little to no time to develop adequate plans for students with disabilities. They also say that the social distancing along with the quick transition to online learning has had a significant negative effect on the academic achievement of disabled students as well as their physical, mental, and social health. Pokhrel & Chhetri (2021) agrees and states that students with disabilities need even more support throughout this situation. Disabled students need many more resources and specialized instruction from schools and teachers (Kumar & Priyadarshini, 2021). Online learning can be a challenge for students with disabilities. In a study by King & Ryan (2019) as cited in Kumar & Priyadarshini (2021), they found that students with disabilities learn more effectively through face-to-face learning.

Disabled students already face daily struggles in a face-to-face learning setting such as needing physical and occupational therapies, but these services become nearly impossible to provide in online learning settings (Herscowitz, 2020 as cited in Kumar & Priyadarshini, 2021). UNESCO Policy Brief (2020) as cited in Kumar & Priyadarshini (2021) predicted that the COVID-19 pandemic would increase the exclusion of students with disabilities in education.

There are many important objectives that need to be fulfilled when teaching disabled students. According to Kumar & Priyadarshini (2021), one of the most important objectives is ensuring that students are able to follow along with instruction, as well as making sure they retain and can recall the information taught. They also say that parents of disabled children reported their children struggled to retain content during online learning. Students with learning disabilities may experience increased frustration from online learning (Appana, 2008). However, Basilaia & Kvavadze (2020) as cited in Pokhrel & Chhetri (2021) argue that online learning has benefitted physically disabled students because they had more opportunity to participate with their classmates with little movement necessary.

The Impact of COVID-19 on Students and Education

There is no doubt that the COVID-19 pandemic has created one of the largest disruptions in education that has affected almost 1.6 billion learners in over 200 countries (Pokhrel & Chhetri, 2021). According to García-Morales, Garrido-Moreno, & Martín-Rojas (2021), "a disruption implies a sudden break or interruption." So, when this definition is applied to an educational setting, there is a sudden interruption of the established techniques of teaching (Carolan et al., 2020; Mishra et al., 2020 as cited in García-Morales et al., 2021). The pandemic has significantly affected students not only in education, but in mental health and day to day routines (Chaturvedi, Vishwakarma, & Singh, 2021 as cited in Kumar & Priyadarshini, 2021). This disruption that the pandemic has caused was unexpected and has brought about significant changes (Krishnamurthy, 2020 as cited in García-Morales et al., 2021). In only a few weeks, there were major changes to educational instructional methods from the traditional

face-to-face learning to online learning (Mishra et al., 2020 as cited in García-Morales et al., 2021). During the spring of 2020, students from elementary to secondary educational settings experienced an incredible change to their learning environments due to the pandemic (Gonzalez-Ramirez et al., 2021).

Regardless of whether learning is mostly face-to-face or mostly online, an emergency of any kind causes a disruption that impacts students and teachers in many ways, including students' academic achievement and students' and teachers' personal lives (Chick, 2013 as cited in Kumar & Priyadarshini, 2021). According to Jandrić et al. (2020) as cited in Kumar & Priyadarshini (2021), teachers reported that the online learning environments caused by the pandemic brought about many struggles for not only teachers and students, but their families as well. The results of a study by Kumar & Priyadarshini (2021) show that online learning has many factors that went beyond the classroom and affected students in social and emotional ways. The online classes were not the only concern that students had to worry about, during this time, their home environments were going through stressful changes that could cause them to fall behind academically such as having to care for their sick family members and taking them to see doctors (Pokhrel & Chhetri, 2021). According to Pokhrel & Chhetri (2021), a large portion of the population had less income than before the pandemic or even no income because of office and business closures, which lead to economic, as well as social and emotional, issues for students. They also say that with so many students now learning from home, the gap for equal conducive learning environments is widening.

Students are not the only ones that have faced adverse effects of online learning. Their parents and guardians have had to quickly adapt to their children learning online by having to

provide adequate technology and learning environments (Garbe et al. 2020; Sahu, 2020 as cited in Mseleku, 2020). According to Kumar & Priyadarshini, (2021), some parents even reported that they felt they could not properly support their children during their online learning experiences because of their personal limitations and lack of knowledge of the process of online learning. They also noted that parents were experiencing anxiety from having to manage their time between working from home and providing adequate support and encouragement to their children who were learning from home. The majority of these parents felt that there was a definite need for some kind of training for the online learning process so they could properly help their children.

Students basically had to adapt to an entirely different learning platform overnight, but they were not necessarily prepared to do so (Gonzalez-Ramirez et al., 2021). They had to learn how to navigate online learning while struggling with the new skills required for effective learning, such as self-pacing and self-motivation, to complete classwork (Kocdar et al., 2018 as cited in Gonzalez-Ramirez et al., 2021).

COVID-19 and Online Learning

According to Gonzalez-Ramirez et al. (2021), students generally consider face-to-face learning much more effective than online learning. Students feel that face-to-face learning is more real and that they have more opportunities to interact with their classmates and teachers (Radha et al., 2020 as cited in Mseleku, 2020). However, the COVID-19 pandemic has opened the door to enhancing the effectiveness of online learning (Pokhrel & Chhetri, 2021).

When the pandemic started, there was a need to protect students but also a need to maintain minimal disruption to the learning process, so many schools opted to transition to online learning platforms (Kumar & Priyadarshini, 2021). The immediate school closings forced students and teachers to enter the unfamiliar territory of online learning (Carolan et al., 2020 as cited in García-Morales et al., 2021).

The pandemic has created a "new normal" that has forced the transition to online learning (García-Morales et al., 2021). This includes a change in the pedagogy and the level of personal instruction students are able to receive even though online learning has been on the rise since before the pandemic started (Mishra et al., 2020 as cited in García-Morales et al., 2021).

Students were given a unique opportunity in the spring of 2020 because they were able to learn in both face-to-face and online environments from the same teachers (Gonzalez-Ramirez et al., 2021). However, Gonzalez-Ramirez (2021) suggests that this transition was hasty and forced by the situation of the pandemic and was used as an experiment. This transition brought a brand new experience for most students and teachers but with no alternative learning options available (Pokhrel & Chhetri, 2021). However, the emergency online learning should not be considered the same as effective and efficient online learning because the transition due to the pandemic lacked proper planning (Adedoyin & Soykan, 2020).

How COVID-19 has Affected Learning

In the spring of 2020, school systems were turned upside down as they had to figure out ways to continue providing an education to students without face-to-face learning as an option.

So, in order to achieve this, schools opted for a nearly overnight transition to online learning (Chang & Fang, 2020; Daniel, 2020; Ferdig et al., 2020; Hodges et al., 2020; Marinoni et al., 2020; Raaper & Brown, 2020; Radha et al., 2020; Shahzad et al., 2020; Wotto, 2020; Zhu & Liu, 2020 as cited in Mseleku, 2020). However, this abrupt transition to online learning exposed weaknesses such as teachers' lack of knowledge of online learning, lack of adequate home learning environments for students, and difficulties with access to technology for both teachers and students (Pokhrel & Chhetri, 2021). In order for this transition to be successful, schools needed to be aware of these obstacles and create plans on how to overcome them (García-Morales et al., 2021).

According to García-Morales et al. (2021), there are several different methods for online learning that have emerged through the pandemic that have proven to be useful for teaching and assessments. This study also argues that assessments are crucial and the transition to online learning will significantly affect how well students are able to learn. So, there is the debate of how to handle the assessments that are carried out through online settings. According to Flaherty (2020) as cited in Adedoyin & Soykan (2020), the Director of Center for Excellence in Teaching at Grand View University, Kevin Gannon, is in support that grading should be adjusted for the disruptions that the pandemic has caused because students are not receiving the same learning opportunities through the emergency online learning.

There are many obstacles that students and teachers need to overcome that the abrupt transition to online learning brought about. Some of these challenges include a difficult learning environment, lack of knowledge about online learning, and difficulties accessing the online learning setting because of connectivity issues and lack of appropriate technology

(Mseleku, 2020). Access to a conducive learning environment at home can be a major challenge for some students, especially those from lower income households (Ronnie et al., 2020 as cited in Mseleku, 2020). According to research by Fishbane & Tomer (2020) as cited by Adedoyin & Soykan (2020), students of low socioeconomic status are more likely to fall behind academically because they generally have more difficulties affording reliable internet service. A lack of privacy while learning can also affect low socioeconomic students' academic achievement. Demuyakor (2020) as cited by Mseleku (2020) reported that some students have to go to the bathroom to participate in online learning because of loud or disruptive backgrounds. This supports the argument that some of the challenges that have a negative effect on academic achievement caused by the abrupt transition to online learning were not fully explored beforehand (Mseleku, 2020). Education claims that learning must be inclusive and equal for all, but the pandemic has caused inequalities with online learning becoming the normal delivery method (Kumar & Priyadarshini, 2021).

There has been an increase in the connection between teachers and parents (Pokhrel & Chhetri, 2021). This unique situation has offered incredible opportunities for cooperation and shared problem solving between teachers and parents as they are now in similar situations for online learning (Doucet et al., 2020 as cited in Pokhrel & Chhetri, 2021). In the online learning environment, parents have had to take on the role of helping students and observing their progress (Kumar & Priyadarshini, 2021). However, this new role did not come without its own challenges. According to Kumar & Priyadarshini (2021), parents experienced anxiety while trying to balance working from home and helping their children learn online.

How COVID-19 has Affected Academic Achievement

The COVID-19 pandemic has undoubtedly affected students across the world, but there is little research on how this has affected academic achievement (Mseleku, 2020). One study by Gonzalez et al. (2020) as cited in Mseleku (2020) researched how students were achieving before and after the quarantine caused by the pandemic. They found that there was a significant increase in academic achievement in online learning environments in years prior. This study also did not find an effect of the pandemic on academic achievement, but they predict that it will negatively affect academic achievement.

There has been research that has looked at single issues with online learning, but a study by Mseleku (2020) seeked to establish that online learning experiences more than one obstacle. One obstacle is that not all teachers, especially older teachers, are comfortable teaching online or knowledgeable in how to conduct teaching online (Govindarajan & Srivastava, 2020 as cited in García-Morales et al., 2021). There are specific skills that are required for effective and efficient online learning that could be problematic for teachers, such as general knowledge about technology used in online learning and how to solve problems quickly regarding the technology (García-Morales et al., 2021). Bueno (2020) presented evidence that fully online schools negatively impact academic achievement and argued that the abrupt transition to full-time online learning environments caused by the pandemic will have a negative effect on students' academic achievement. However, Bueno (2020) also reported evidence that students who return to a face-to-face learning environment almost recover fully to the academic level they were at before transitioning to full-time online learning environments. According to this study, students returning to face-to-face learning settings

should be a major priority for the education system. However, there are lessons that educators can learn from online learning during the pandemic. According to Pokhrel & Chhetri (2021), one lesson that can be learned is that students and teachers should be familiar with different online tools that can be used for education. When face-to-face learning resumes on a regular basis, online learning should still be encouraged to enhance the learning in the classroom (Pokhrel & Chhetri, 2021).

Chapter 3: Methodology

Introduction

This study aims to provide insight into how the COVID-19 pandemic has affected students' ELA-II test scores using SES, disability category, type of instructional delivery during the 2020-2021 academic year, and ELA-I test scores as predictors. The current study is significant because online learning is becoming more popular among educational settings. This study will investigate which factors, if any, have a significant effect on test scores.

This is an explanatory study with quantitative data. There are two groups of students: the control group, which consists of tenth grade students from the 2017-2018 academic year, and the experimental group, which consists of tenth grade students from the 2020-2021 academic year.

Data was provided by the assistant superintendent and the high school guidance counselor from pre-existing data from Rock Hill Local Schools, a school in the Appalachian region of Ohio. Any identifiable information will be removed from the data prior to being received by the researcher. The data will be maintained in two spreadsheets and R will be used for the analysis (Hornik and The R Core Team, 2022). The information that the data will include is SES, disability category, ELA-I test scores, ELA-II test scores, and type of instructional delivery during the 2020-2021 academic year.

Setting and Participants

This data was provided to the researcher with any personal identifiers removed by the assistant superintendent and the high school guidance counselor. The data was provided

uncleansed in multiple spreadsheets. The researcher combined the raw data into two spreadsheets, one for the control group and one for the experimental group using the variables provided by the school.

Instrumentation

There are two English Language Arts tests given to students, the ELA-I test and the ELA-II test. According to the Ohio Department of Education website, the ELA-I test is given in the spring as an end of course test to eighth grade students and the ELA-II test is given in the spring as an end of course test to tenth grade students. Students have 105 minutes to complete each of the two parts on both tests for a total of 210 minutes. These tests have two separate writing prompts that require the support of the reading passages. If a student needs additional time and does not have an IEP that allows for additional testing time, they may have 15 additional minutes per section for a total of 30 extra minutes at each school district's discretion (Ohio's State Tests in English Language Arts, Mathematics, Science and Social Studies, 2021).

According to McLeod, D'Amico & Protheroe (2003) as cited in Merino & Beckman (2010), standardized tests are required in reading and math every year from third grade to eighth grade and at least once from tenth grade to twelfth grade because of No Child Left Behind. One study by Merino & Beckman (2010) found that oral reading fluency alone and the combination of oral reading fluency and MAZE are significant predictors of the Nebraska state standardized test in reading for second grade through fifth grade. However, they also found that oral reading fluency alone was a stronger predictor of the standardized reading test scores than MAZE. Oral reading fluency and MAZE are reading curriculum-based measurements that are used

commonly across the country (Merino & Beckman, 2010). MAZE testing is a multiple choice test where a student is given 3 minutes per sentence to correctly identify every seventh word of a sentence from a choice of 3 words (Sharpschool, n.d.). Another study by Wiley & Deno (2005) as cited in Merino & Beckman (2010) also found that oral reading fluency was a stronger predictor than MAZE of standardized reading test scores in Minnesota.

Disability category is measured by the category the disability is in on the student's IEP. The categories are the following: multiple disabilities other than deaf/blind, deaf and/or blind, visual impairments, speech/language disabilities, orthopedic impairments, emotionally disturbed, intellectual disabilities, specific learning disabilities, autism, traumatic brain injury, major/minor other health impairments, and developmental delay. For the purpose of this study, disability categories were grouped into 3 levels. The first level (A) is no disability. The second level (B) is multiple disabilities other than deaf and blind, deaf and/or blind, visual impairments, speech and language impairments, orthopedic disabilities, emotionally disturbed, major/minor other health disabilities. The third level (C) is intellectual disabilities, specific learning disabilities, autism, traumatic brain injuries, and developmental delays.

There is evidence that English achievement and Math achievement are correlated. The English and Math components of a test were proven to be indicators of academic success (Common Core State Standards Initiative, 2010a, 2010b; No Child Left Behind, 2002 as cited in White et al., 2016). According to Marsh (1986), Marsh & Hau (2004), Möller et al. (2009) as cited in Parker, Marsh, Morin, Seaton, & Van Zanden (2014), English self-concepts and Math self-concepts were highly correlated among younger adolescents compared to a smaller correlation among older adolescents. Möller and Marsh (2013) as cited in Parker et al. (2014)

claim that dimensional comparisons occur when people compare their strengths across different subject areas and that this typically leads to contrasting effects between more distant subject areas such as English and Math. The results of a study by Parker et al. (2014) found evidence to support that the relationship between Math and English self-concepts equal out in secondary school, according to the change between two of the models they used. They also found evidence to suggest that before Math and English self-concepts equal out, Math self-concepts were positively predicted by Math achievement levels but negatively predicted by English achievement levels.

Procedure

Approval from the Institutional Review Board (IRB) was obtained for this study. In order to obtain the data, the researcher had to first reach out to Rock Hill Local Schools, a school in the Appalachian region of Ohio, to inquire about their need for the current study. The researcher contacted the superintendent who approved the study to be conducted and directed them to the assistant superintendent to aid in obtaining the necessary data.

The assistant superintendent provided most of the data required to conduct the study. In order to maintain confidentiality for the students, the assistant superintendent agreed to send the data to the guidance counselor at the high school to obtain the remainder of the information. This allowed the data to be provided to the researcher with any personal identifiable information removed. The data obtained from the guidance counselor and the assistant superintendent was sent uncleansed via email across three spreadsheets using Microsoft Excel. The researcher took this data and combined it into two spreadsheets; one for

the control group and one for the experimental group using Google Sheets. The data will be kept on Google Sheets throughout the duration of the study. The spreadsheets will then be deleted promptly at the conclusion of the study.

Data Processing and Analysis

The analysis of this data will begin by creating a model of SES, disability category, type of instructional delivery, and ELA-I test scores across the ELA-II test scores. This model will be created using multiple regression. The control group consists of a group of students that completed both the ELA-I and the ELA-II tests before the COVID-19 pandemic interrupted traditional learning. These students completed the ELA-I test in the 2015-2016 academic year and the ELA-II test in the 2017-2018 academic year. The experimental group consists of a group of students who completed the ELA-I test before the COVID-19 disruption and completed the ELA-II test after the COVID-19 disruption. These students completed the ELA-I test in the 2018-2019 academic year and the ELA-II test in the 2020-2021 academic year.

The primary research question, “Are SES, disability category, and eighth grade ELA-I test scores significant predictors of tenth grade ELA-II test scores for students whose instruction was delivered face-to-face?” will be analyzed using multiple regression. The second and third questions, “Is there a significant difference in mean ELA-II test scores across the type of instructional delivery in the experimental group?” and “Is there a significant difference in mean ELA-II test scores across SES in the control group and the experimental group?” will both be analyzed using a two-sample t-test.

The three assumptions of multiple regression analysis are that there is a linear relationship between the independent and dependent variables, normality of residuals, and there is no multicollinearity. The four assumptions for t-tests are normality, homogeneity of variance, independence, and random sampling.

The variables that will be used in this study are disability category, SES, ELA-I test scores, type of instructional delivery for the 2020-2021 academic year, and ELA-II test scores. The ELA-II test scores are the dependent variable. The independent variables are the disability category, SES, ELA-I test scores, and type of instructional delivery. The ELA-I test scores are a quantitative variable. SES and type of instructional delivery are dichotomous variables. Disability category is a categorical variable with 3 levels. Disability category, SES, ELA-I test scores and type of instructional delivery are all predictor variables.

The model for the first research question will be created analyzing SES, disability category, and the control group ELA-I test scores across the control group ELA-II test scores using multiple regression techniques. The model will then be used to create predicted ELA-II test scores for those students whose instruction was delivered face-to-face in the experimental group. An ANOVA will be conducted on the residuals from the experimental group. Dummy variables for the disability category will be used for this model with disability A (no disability) as the comparison group. The t-test for the second research question will be conducted using the experimental group and the t-test for the third research question will be conducted using the combination of the control group and the experimental group. The results will be described using means and standard deviations for the quantitative variables and the dependent variable and percentages (%) and frequencies for the categorical variables.

Summary

This study will analyze how the ELA-II test scores were impacted by the COVID-19 pandemic using disability category, SES, ELA-I test scores, and type of instructional delivery during the 2020-2021 academic year as predictors. The analysis of the first research question will use multiple regression techniques. A model will be created using the control group. The data for the students whose instruction was delivered face-to-face from the experimental group will then be entered into the model to analyze the residuals of the observed ELA-II test scores and the predicted ELA-II test scores. Two sample t-tests will be conducted for the second and third research questions. The data was provided by a school in the Appalachian region of Ohio. Any personal identifiers were removed from the data before being given to the researcher. The data was cleansed by the researcher and placed into spreadsheets until the conclusion of the study.

Chapter 4: Results

The purpose of this study was to provide information about how the COVID-19 pandemic has affected students' ELA-II test scores using SES, disability category, type of instructional delivery during the 2020-2021 academic year, and ELA-I test scores as predictors. The research questions for this study were:

1. Are SES, disability category, and eighth grade ELA-I test scores significant predictors of tenth grade ELA-II test scores for students whose instruction was delivered face-to-face?
2. Is there a significant difference in mean ELA-II test scores across the type of instructional delivery in the experimental group?
3. Is there a significant difference in mean ELA-II test scores across SES in the control group and the experimental group?

The data used for this study was provided from Rock Hill Local Schools by the assistant superintendent and high school guidance counselor with all personal identifying information removed before being received by the researcher. The data was divided into two groups: the control group and the experimental group. The control group consisted of students who were tenth grade students during the 2017-2018 academic year and the experimental group consisted of tenth grade students during the 2020-2021 academic year. There were 179 total students in this study. Significance levels were set at .05.

Data Cleansing

Throughout the data analysis, the results of the commands used and the computation results were documented on a hard drive and in a handwritten logbook for reference. The

researcher received the data uncleansed. 40 students overall were excluded from the data used in this study because of missing or incomplete data. 18 students were removed from the control group and 22 students were removed from the experimental group.

Description of Participants

There were 179 students included in the data used for this study with n = 96 (53.63%) students in the control group and n = 83 (46.37%) students in the experimental group. The independent variables were disability category, SES, type of instructional delivery during the 2020-2021 academic year, and ELA-I test scores. Disability category was divided into 3 levels: A - no disability; B - multiple disabilities other than deaf and blind, deaf and/or blind, visual impairments, speech and language impairments, orthopedic disabilities, emotionally disturbed, major/minor other health disabilities; and C - intellectual disabilities, specific learning disabilities, autism, traumatic brain injuries, and developmental delays. The control group had 77 students in disability category A (mean = 707.247, sd = 23.740), 7 students in disability category B (mean = 659.143, sd = 18.650), and 12 students in disability category C (mean = 668.583, sd = 13.345). The experimental group had 71 students in disability category A (mean = 701.268, sd = 24.972), 3 students in disability category B (mean = 677.000, sd = 19.313), and 9 students in disability category C (mean = 681.333, sd = 14.327). SES was coded dichotomously: high and low. This was determined by whether or not a student qualified for SNAP, meaning that they do not exceed 130% of the federal poverty guidelines (Ohio Department of Job and Family Services). The control group had 71 students with high SES (mean = 704.958, sd = 26.799) and 25 students with low SES (mean = 681.720, sd = 24.220). The experimental group

had 64 with high SES (mean = 699.609, sd = 25.017) and 19 with low SES (mean = 693.579, sd = 24.329). ELA-I test scores were a quantitative variable (Control Group: mean = 696.469, sd = 43.390; Experimental Group: mean = 700.422, sd = 25.692). The dependent variable was ELA-II test scores (Control Group: mean = 698.906, sd = 27.973; Experimental Group: mean = 698.229, sd = 24.845). There was a high correlation between ELA-I test scores and ELA-II test scores across both groups of students (Control Group = 0.741, Experimental Group = 0.787).

Data Analysis

All analyses were performed using R (Hornik and R Core Team, 2022).

Research Question #1: "Are SES, disability category, and eighth grade ELA-I test scores significant predictors of tenth grade ELA-II test scores for students whose instruction was delivered face-to-face?"

Research Hypothesis #1: SES, disability category, and eighth grade ELA- test scores will be significant predictors of tenth grade ELA-II test scores for students whose instruction was delivered face-to-face.

Multiple regression techniques were used to analyze the control group. The reference groups were disability A (no disability) and SES High (does not qualify for SNAP). A standard multiple regression was performed between the dependent variable, ELA-II test scores (mean = 698.906, sd = 27.973) and the independent variables, disability category (A: mean = 707.247, sd = 23.740; B: mean = 659.143, sd = 18.650; C: mean = 668.583, sd = 13.345), SES (High: mean = 704.958, sd = 26.799; Low: mean = 681.720, sd = 24.220), and ELA-I test scores (mean =

696.469, sd = 43.390). The number of cases for this group is more than 15 per predictor (n=96), so there is no concern for adequate sample size.

The results of this analysis expressed no concerns with the assumptions of independence or multicollinearity. However, there are some concerns for the normality of residuals. The independence assumption was verified by the Durbin-Watson test (D-W Statistic = 1.622, p = .062). The normality of residuals assumption was verified by the Shapiro-Wilks test for normality (W = 0.966, p < .05). The multicollinearity assumption was verified by using Variance Inflation Factors, which range from 1.177 (SES) to 1.474 (disability category).

The full model was statistically significant (F(4, 91) = 38.850, p < .001). The combination of predictors contributed to approximately 61.45% of the variance in ELA-II test scores. The full model (see Table 1) revealed statistical significance for disability category B when compared to disability category A (t = -2.581, p < .05, (-35.661, -4.646)), disability category C when compared to disability category A (t = -3.154, p < .01, (-30.685, -6.971)), and ELA-I test scores (t = 7.659, p < .001, (0.273, 0.464)). The GG-QQ Plot of the residuals of the model with all cases is shown in Figure 1.

	t-value	p-value	95% Confidence Interval
Disability B	-2.581	< .05	(-35.661, -4.646)
Disability C	-3.154	< .01	(-30.685, -6.971)
SES Low	-1.564	.121	(-15.561, 1.852)
ELA-I	7.659	< .001	(0.273, 0.464)
Adjusted R^2 = 0.6145, F(4,91) = 38.850, p < .001			

Table 1. Control Group with All Cases

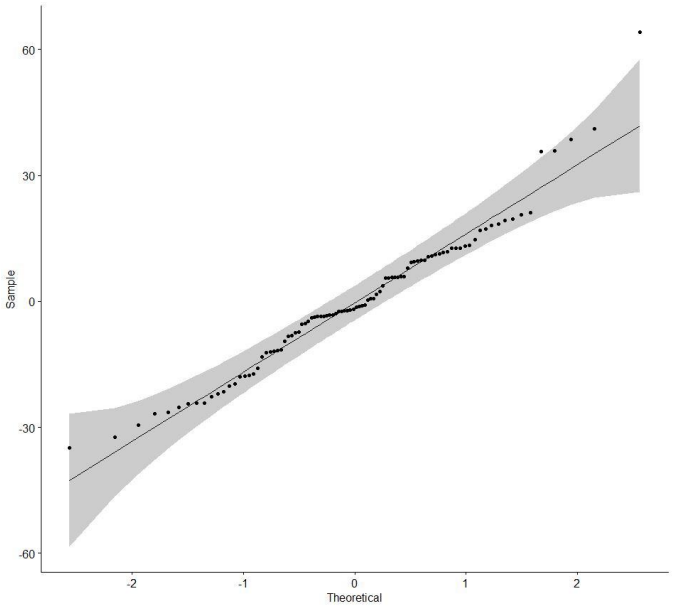

Figure 1. GG-QQ Plot of the Residuals of the Model with All Cases

The examination of outlier cases, high standardized residuals, and influential cases through casewise diagnostics led to the deletion of case 91. The analysis was then performed with the deletion of this case.

A standard multiple regression was performed between the dependent variable, ELA-II test scores (mean = 699.326, sd = 27.816) and the independent variables, disability category (A: mean = 707.247, sd = 23.740; B: mean = 659.167, sd = 20.430; C: mean = 668.583, sd = 13.345), SES (High: mean = 704.958, sd = 26.799; Low: mean = 682.667, sd = 24.264), and ELA-I test scores (mean = 698.832, sd = 36.892) with case 91 deleted. The number of cases for this group is more than 15 per predictor (n=95), so there is no concern for adequate sample size.

The results of this analysis expressed no concerns with the assumptions of independence, multicollinearity, or normality of residuals. The independence assumption was verified by the Durbin-Watson test (D-W Statistic = 1.637, p = .080). The normality of residuals assumption was verified by the Shapiro-Wilks test for normality (W = 0.992, p = .830). The

multicollinearity assumption was verified by using Variance Inflation Factors, which range from 1.143 (SES) to 1.412 (disability category).

The full model against the intercept only model was statistically significant (F(4, 90) = 55.360, p < .001). The combination of predictors contributed to approximately 69.82% of the variance in ELA-II test scores. The full model (see Table 2) revealed statistical significance for disability category B when compared to disability category A (t = -3.703, p < .001, (-39.548, -11.930)), disability category C when compared to disability category A (t = -2.323, p < .05, (-23.217, -1.810)), and ELA-I test scores (t = 10.164, p < .001, (0.399, 0.593)). The GG-QQ plot of the residuals from the model with case 91 removed is shown in Figure 2.

	t-value	p-value	95% Confidence Interval
Disability B	-3.703	< .001	(-39.548, -11.930)
Disability C	-2.323	< .05	(-23.217, -1.810)
SES Low	-1.922	.058	(-15.080, 0.249)
ELA-I	10.164	< .001	(0.399, 0.593)
Adjusted R^2 = 0.6982, F(4,90) = 55.360, p < .001			

Table 2. Control Group with Case 91 Removed

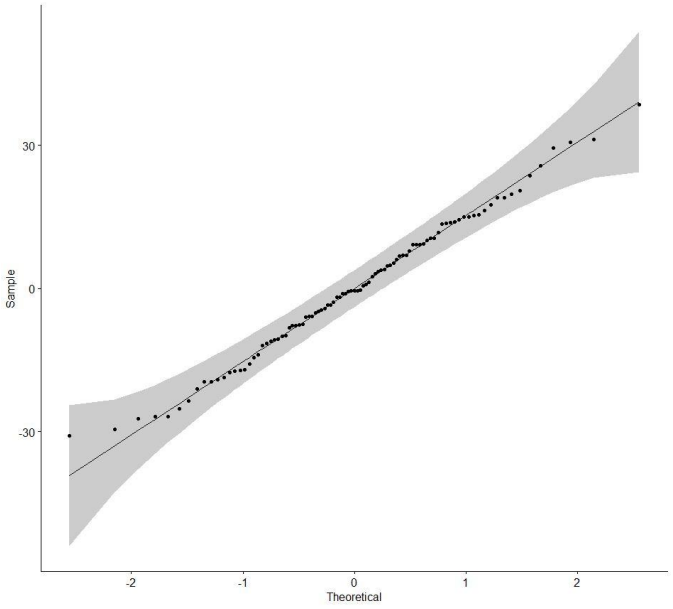

Figure 2. GG-QQ Plot of the Residuals of the Model with Case 91 Removed

The experimental group was then examined and all cases that were not face-to-face instruction were removed. There were 17 cases that were removed from the experimental group for this research question. These cases from the experimental group were then used in the equation for the full model with case 91 removed to create a predicted model. The residuals of the observed and the predicted ELA-II test scores were examined. There were 6 cases with a residual greater than 20. There were 8 cases with a residual less than -20.

An ANOVA was conducted on the residuals across disability category, SES, and ELA-I test scores. There were no concerns for the assumptions of normality and equal variances. The normality assumption was verified using the Shapiro-Wilks test for normality ($W = 0.974$, $p = .186$) and the equal variances assumption was verified using Levene's Test of Equal Variances (test statistic = 2.218, $p = .117$). As seen in Table 3, ELA-I test scores were statistically significant ($F(2, 61) = 12.528$, $p < .001$, cohen-f = 0.436, achieved post-hoc power of 0.931).

	Sum sq	df	Mean Sq	F-value	p-value
Disability	492	2	246	0.969	.385
SES	22	1	22	0.088	.768
ELA-I	3178	1	3178	12.528	< .001
Error	15475	61	254		
Total	19167				

Table 3. ANOVA of Residuals Across Disability, SES, and ELA-I Test Scores

Research Question #2: "Is there a significant difference in mean ELA-II test scores across the type of instructional delivery in the experimental group?"

Research Hypothesis #2: There is a significant difference in mean ELA-II test scores across the type of instructional delivery in the experimental group.

This research question was addressed by conducting a two-sample t-test of the experimental group examining the mean difference between ELA-II test scores across the type of instructional delivery. A priori power analysis was conducted using G*Power 3.1.9.7. The results indicate that in order to achieve a desired power of .80, that a sample size of 1026 students is needed. Therefore, adequate power is a concern with a sample size of the experimental group of 83.

There are three assumptions that need to be verified to conduct a t-test; independence, equal variances, and normality. The results of this analysis expressed no concerns with the assumptions. The normality assumption was verified by the Shapiro-Wilks test for normality

(Face-to-Face: W = 0.975, p = .211; Online: W = 0.971, p = .832). The equal variances assumption was verified by Levene's Test of Equal Variances (test statistic = 2.314, p = .132).

On average, ELA-II test scores for students whose instruction was delivered face-to-face (mean = 699.242, sd = 26.200) were higher than students whose instruction was delivered online (mean = 694.294, sd = 18.821). However, the difference was not statistically significant (t(33.881) = 0.885, p = .382, 95% confidence interval (-6.411, 16.308)). A small effect size was represented (d = .217). A boxplot of ELA-II test scores across the type of instructional delivery is shown in Figure 3.

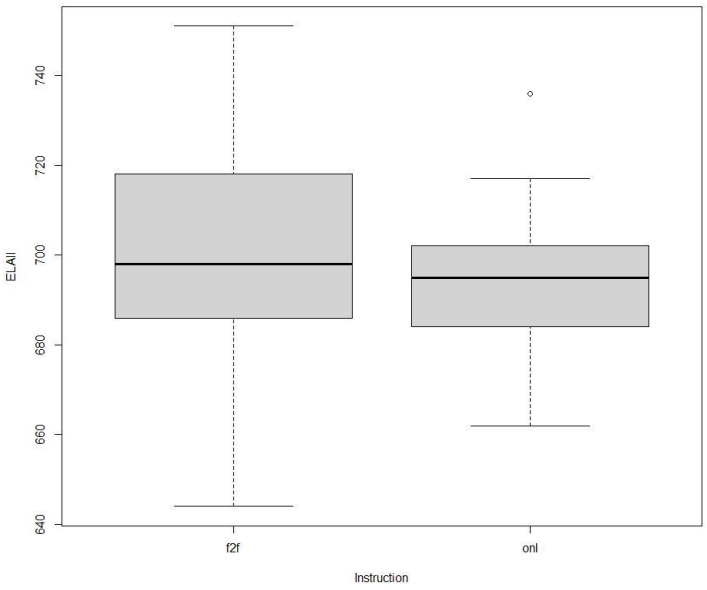

Figure 3. Boxplot of ELA-II Test Scores Across Type of Instructional Delivery in the Experimental Group

Research Question #3: "Is there a significant difference in mean ELA-II test scores across SES in the control group and the experimental group?"

Research Hypothesis #3: There is a significant difference in mean ELA-II test scores across SES in the control group and the experimental group.

This research question was addressed by conducting a two-sample t-test of the control group and the experimental group examining the mean difference between ELA-II test scores across SES. A priori power analysis was conducted using G*Power 3.1.9.7. The results indicate that in order to achieve a desired power of .80, that a sample size of 116 students is needed. Therefore, adequate power is not a concern with a sample size of 179.

There are three assumptions that need to be verified to conduct a t-test; independence, equal variances, and normality. The normality assumption was verified by the Shapiro-Wilks test for normality (High: $W = 0.992$, $p = .617$; Low: $W = 0.931$, $p < .05$). There is no concern for the normality for high SES, but there is possible concern for the normality for low SES. The equal variances assumption was verified by Levene's Test of Equal Variances (test statistic = 0.008, $p = .929$).

On average, ELA-II test scores (mean = 698.592, sd = 26.497) for students who have high SES (mean = 702.422, sd = 26.012) were higher than students with low SES (mean = 686.841, sd = 24.708). The two samples t-test revealed statistical significance ($t(76.474) = 3.585$, $p < .001$, 95% confidence interval (6.926, 24.236)). A moderate effect size was represented ($d = .614$). A boxplot of ELA-II test scores across SES is shown in Figure 4.

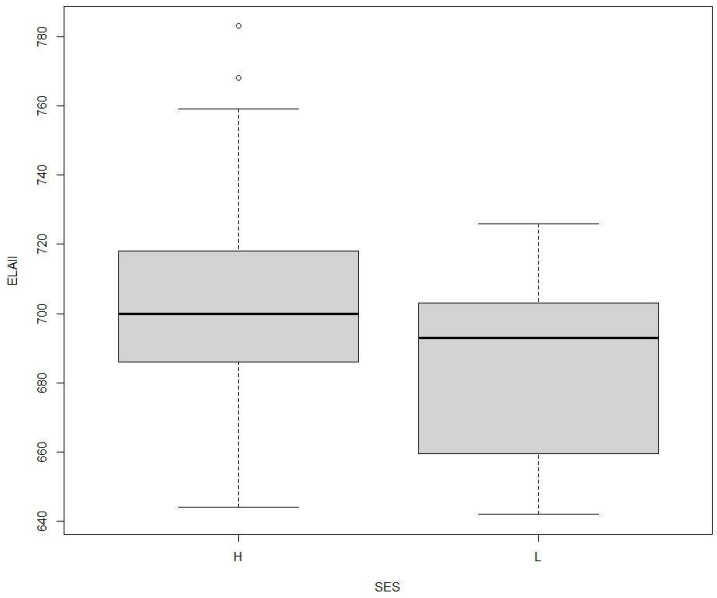

Figure 4. Boxplot of ELA-II Test Scores Across SES

Summary

The results of Research Question #1 showed Disability B, Disability C, and ELA-I test scores as statistically significant predictors in the control group. This model was then used to find the predicted ELA-II test scores for students whose instruction was delivered face-to-face in the experimental group, which were then compared to the observed ELA-II test scores. An ANOVA of the residuals in the experimental group revealed statistical significance for ELA-I test scores. The results of Research Question #2 showed that the mean ELA-II test scores for students whose instruction was delivered face-to-face were higher than those students whose instruction was delivered online, but this difference was not statistically significant. The results of Research Question #3 revealed that ELA-II test scores for students who have a high SES were higher than students who have a low SES and that this difference was statistically significant.

Chapter 5: Conclusion

Introduction

This study looked at how factors regarding the COVID-19 pandemic have affected academic achievement. The first research question was, “Are SES, disability category, and eighth grade ELA-I test scores significant predictors of tenth grade ELA-II test scores for students whose instruction was delivered face-to-face?” The second research question was, “Is there a significant difference in mean ELA-II test scores across the type of instructional delivery in the experimental group?” The third research question was, “Is there a significant difference in mean ELA-II test scores across SES in the control group and the experimental group?” The results of the first research question showed that ELA-I test scores are a significant predictor of ELA-II test scores when the experimental group is added into the model of the control group. The results of the second research question showed that there was a difference in mean ELA-II test scores but the difference is not statistically significant. The results of the third research question showed that there was a statistically significant difference in mean ELA-II test scores across SES in the control group and the experimental group.

The first research question initially looked at the control group. Multiple regression techniques were used. The model of the control group revealed that when compared to disability category A, disability category B and disability category C were statistically significant predictors and ELA-I test scores were statistically significant predictors. In other words, a student’s ELA-II test score can be significantly predicted by their disability category and their ELA-I test scores. On average, students in disability category B scored 3.703 points lower on the

ELA-II test than students with no disability (disability category A), students in disability category C scored 2.323 points lower on the ELA-II test than students with no disability.

The experimental group was added into this regression model to obtain the predicted ELA-II test scores for students whose instruction was delivered face-to-face in the 2020-2021 academic year. The predicted ELA-II test scores were subtracted from the observed ELA-II test scores and the residuals were examined. In the experimental group, 9.09% of the cases had residuals higher than 20, meaning their observed ELA-II test score was more than 20 points higher than their predicted ELA-II test score and 12.12% of the cases had residuals less than -20, meaning their predicted ELA-II test score was more than 20 points higher than their observed ELA-II test score.

An ANOVA was conducted on these residuals across disability category, SES, and ELA-I test scores. The results of this analysis revealed that ELA-I test scores were a statistically significant predictor of ELA-II test scores.

The results of the second research question showed that on average, the ELA-II test scores for students whose instruction was delivered face-to-face was 4.948 points higher than students whose instruction was delivered online, but this difference was not statistically significant. While students who learned face-to-face in the 2020-2021 academic year did score higher on the ELA-II test than students who learned online in the 2020-2021 academic year, online learning did not have a significant effect on ELA-II test scores.

The results of the third research question showed that on average, the ELA-II test scores for students in the control group and the experimental with a high SES was 15.581 points higher than students with a low SES. This difference was statistically significant. This indicates that SES

has a significant impact on ELA-II test scores for both the 2017-2018 and 2020-2021 academic years.

Implications

According to King & Ryan (2019) as cited in Kumar & Priyadarshini (2021), students with disabilities learn most effectively in face-to-face learning environments. According to the current study, disability did not have a statistically significant effect on ELA-II test scores for students who were learning face-to-face with a disability for the 2020-2021 academic year. This result relates to the argument by Kvavadze (2020) as cited in Pokhrel & Chhetri (2021) that online learning has benefitted students who have physical disabilities because there is less movement necessary to participate and interact with their peers.

ELA-I test scores were a significant predictor of ELA-II test scores for both the 2017-2018 and 2020-2021 academic years. This supports the findings of Currie & Thomas (1999) that say early test scores are significant predictors of future test scores. While the ELA-II tests were conducted face-to-face, there were students who chose to participate in online learning for the 2020-2021 academic year.

A study by García-Morales et al. (2021) argues that assessments are crucial and a transition to online learning will significantly affect the academic achievement of students. The difference in the mean ELA-II test scores for the 2020-2021 academic years between face-to-face learning and online learning was not statistically significant in the current study. This result supports the benefits of schedule flexibility and self-pacing class work with online learning presented by Smedly (2010), Leszczyński et al. (2018), Wagner et al. (2008), and Amer

(2007) as cited in Adedoyin & Soykan (2020). The results of the current study argues against the claim by Pokhrel & Chhetri (2021) that not having a unified pedagogy that works for every process of online learning will hinder online education's effectiveness. Specifically related to the COVID-19 pandemic, the current study offers support that there have been many methods for online learning that have proven useful (García-Morales et al., 2021).

The difference in the mean ELA-II test scores between high SES and low SES for the 2017-2018 and 2020-2021 academic years was statistically significant. White (1982) states that the way SES is defined has a significant effect on the strength of the relationship between SES and academic achievement. In the current study, SES is defined dichotomously and according to Sirin (2005), this definition is often associated with a weaker correlation to academic achievement than using multiple levels. However, White (1982) suggests that the effect of SES on academic achievement is lower than would be expected.

Theoretical Framework

The current study supports the claim of the theoretical framework that Cognitive Load Theory (CLT) and Cognitive Theory of Multimedia Learning (CTML) focuses on preventing the overload of the working memory by designing instructional materials that are conducive to optimal learning outcomes. The difference in the mean ELA-II test scores between face-to-face learning and online learning was not statistically significant in the current study, which offers support that the instructional materials for both face-to-face learning and online learning were designed in accordance to how humans function cognitively for optimal learning outcomes.

Limitations and Generalizability

This study had several limitations including a small sample size and the availability of predictor variables. There was also the assumption that students were doing their best work on the ELA-I and ELA-II tests, regardless of their learning environment. The sample size is small and the data was only collected from one school district, so the results of this study can only be generalized to that specific school district. There were some concerns with power in Research Question #1 when an ANOVA was conducted of the residuals of the observed ELA-II test scores and the predicted ELA-II test scores across disability category, SES, and ELA-I test scores. The achieved post-hoc power was 0.931.

Recommendations

To further the current study, one might look at several school districts to increase the sample size and get results that could be generalizable to more than just Rock Hill Local Schools. Including more predictors such as who the students' English teacher was in eighth grade and tenth grade would be another way to expand the current study.

Another recommendation for a future study of this nature would be to include a third group consisting of students who took both the ELA-I test and the ELA-II test after the 2020-2021 academic year. In the current study, the control group took both the ELA-I test and ELA-II test before the 2020-2021 academic year and the experimental group took the ELA-I test before the 2020-2021 academic year and the ELA-II test during the 2020-2021 academic year.

Conclusion

This research gives an insight into how the COVID-19 pandemic has affected the education system and students' academic achievement. This study found that having a disability has a statistically significant effect on ELA-II test scores when compared to having no disability for learning face-to-face across the control group. This study also found that ELA-I test scores are a statistically significant predictor of ELA-II test scores for face-to-face learning for both the control group and the experimental group. The differences in the mean ELA-II test scores across the type of instructional delivery was not statistically significant for the experimental group. However, the difference in the mean ELA-II scores across SES was statistically significant for both the control group and the experimental group.

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