

ONLINE VERSUS FACE-TO-FACE COMMUNICATION SCIENCES AND DISORDERS
GRADUATE STUDENT OUTCOMES: A CAUSAL-COMPARATIVE AND
CORRELATIONAL STUDY

by

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Liberty University

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A COMPARISON OF STUDENT OUTCOMES BETWEEN ONLINE AND FACE-TO-FACE
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ABSTRACT

The purpose of this quantitative causal-comparative and predictive correlational study was to investigate how online CSD graduate students compare to their face-to-face peers based on three measurable student outcomes with an additional investigation of how their age impacts these outcomes. This study is important because the number of online graduate programs in CSD is growing despite a lack of evidence in the research that online programs in this field have similar student outcomes as their face-to-face counterparts. This ex post facto study investigated outcomes from 188 students who graduated from or were previously enrolled in a CSD graduate program from one university that offered both an online program and a face-to-face program. Data were analyzed using a two-way ANOVA and logistic regression. The results of the study found that there was not a statistically significant difference between online CSD graduate students and face-to-face students on three measurable outcomes: passing the Praxis II certification exam in Speech-Language Pathology, scores on the Praxis II certification examination in Speech-Language Pathology, and degree completion rates in program-defined timelines. The results of this study suggest that both online and face-to-face students have an equal opportunity to be successful in a CSD graduate program no matter their age category. Future research would be beneficial to investigate these outcomes across a larger population and additional outcomes (e.g., student perceptions, clinical supervisors, and using both qualitative and quantitative measures).

Keywords: Communication sciences and disorders, online education, graduate programs, face-to-face education, student outcomes, higher education

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List of Abbreviations

American-Speech-Language-Hearing Association (ASHA)

Analysis of variance (ANOVA)

Communication sciences and disorders (CSD)

Institutional Review Boards (IRB)

Variance Inflation Factor (VIF)

CHAPTER ONE: INTRODUCTION

Overview

Online education continues to expand as a viable means of instruction. As higher education institutions increasingly implement online versions of new courses and degree programs, it is critical to investigate this educational modality's efficacy. This chapter will examine the background of distance education and explore the problem of inconclusive research on the effectiveness of online education. This chapter also includes a proposal statement, a discussion of this study's significance, and the proposed study's research questions.

Background

While supporters of online education postulate that this modality can improve society and critics argue that it fails to produce career-ready graduates (Alam & Parvin, 2021), forms of distance education have existed in some form for centuries, and advancements in technology have resulted in a new model of distance education, known as online education (Tamim, 2020). With perceptions still existing on some level that the online education model is inferior to the face-to-face model, combined with administrations' views that online education is paramount for universities' future success, decision-making for implementation and resource allocation might be impeded without clear evidence of online education's strengths and weaknesses (Goralski & Falk, 2017). Despite this uncertainty, online education continues to emerge as a widespread form of instruction, a significant source of growth in enrollment for universities, and a financial response to the rising costs of higher education (Ortagus et al., 2020). However, concerns exist that such cost-savings measures could hinder the quality of learning (Ortagus et al., 2020). Similarly, the lack of information in the literature that explores the effectiveness of online

graduate degree programs in communication sciences and disorders (CSD) could create a problem for relevant institutional policy-makers and prospective students.

Technological advancements that allow for remote learning have contributed to increased learning opportunities in an online format. Recently, the worldwide health crisis of the Coronavirus -19 has necessitated an acceleration of online education for many institutions (Tesar, 2020). According to the National Center for Education Statistics (2019), over 6.9 million students were enrolled in at least one distance learning course in 2018, and students earning a postbaccalaureate degree comprised over 1.2 million of those students. Online enrollment continues to grow despite a decline in face-to-face enrollment, although increased online enrollment may be one agent causing the decline in face-to-face instruction (Peslak, 2019). This trend appears as though it will continue to grow despite the mixed results in the literature on the efficacy of online education (Ortagus, 2018).

Historical Context

Distance education is any form of education in which students are physically separated and not under the instructor's continuous supervision but benefit from the pedagogical planning of material through an educational institution (Kaplan & Haenlein, 2016; Larreamendy-Joerns & Leinhardt, 2006). Evidence of distance learning dates as far back as the 1700s in the form of a stenography course offered through the mail (Kaplan & Haenlein, 2016). The mid-1800s acted as a significant era of distance education expansion when universities targeted populations that did not have access to on-campus learning, such as women or racial minorities (Lee, 2017).

According to Kaplan and Haenlein (2016), distance education evolved over three main periods, including the invention of the printed materials, the invention of television, and the invention of the internet. A significant historical period that drove the expansion of distance education in the

United States was after World War II with the implementation of the Montgomery G.I. Bill (McMurray, 2007). McMurray (2007) explained that veterans returning home from war now had the financial means to attend higher education. The GI Bill of Rights' support of service members encouraged the use of distance education mediums, such as correspondence and (recently) the internet, to allow service members to pursue their education while actively deployed. As the most recent technological advancements continue to change the learning landscape, the internet has transformed distance education into a model commonly referred to as online education (Larreamendy-Joerns & Leinhardt, 2006; Lee, 2017).

Online education is often portrayed as an entirely new and innovative form of education (Lee, 2017). However, online education exists as a form of distance education rather than an independent, stand-alone model (Larreamendy-Joerns & Leinhardt, 2006). Online education is an instructional alternative that uses modern social technologies, such as the internet and computers, to improve distance learning (Hiltz & Turoff, 2005; Larreamendy-Joerns & Leinhardt, 2006). Online education is set apart from older models of distance education in that it allows for increased real-time collaboration and interaction between students and instructors (Lee, 2017).

Social Context

Over the last century, the changing social climate necessitated that universities implement innovative changes to the traditional model of higher education. The influx of veterans who began pursuing higher education due to the Montgomery G.I. Bill strained universities' resources (McMurray, 2007). The increased number of veterans in education also altered the social background of students. The student population changed from primarily upper-middle-class to

include students from reduced socioeconomic status, married with families, and with more career-orientated mindsets. (McMurray, 2007).

The desire to make education accessible to all populations (e.g., race, gender, age, and economic statuses), those restricted by life circumstances, and to develop citizens with the education necessary to advance the economy have all influenced the progression of distance education (Lee, 2017; Tracey & Richey, 2005). Most universities offering distance education want education to be readily available to the general public and underserved populations (Lee, 2017). In response to government funding cutbacks, financial considerations, and technological advancements, educational institutions are increasingly offering distance education through online mediums (Lee, 2017).

Globalization, the celebration of life-long learning, and the increased ease of access to education provide opportunities for more people to increase their knowledge on a worldwide level (Literat, 2015). Therefore, the increased numbers of qualified participants in the workforce could provide social and economic benefits to society. However, critics of online education fear it could result in a two-tiered system separating those who can attend courses on-campus and those who must participate online due to life circumstances, perhaps widening educational inequalities (Literat, 2015). Additionally, if online education is generally inferior to face-to-face instruction, negative implications could include a workforce pool comprised of inadequately educated people. Therefore, investigating if the online modality results in similar student outcomes as face-to-face education is essential when considering the social impact of a quality education.

Theoretical Framework

Arghode et al. (2017) analyzed four adult learning theories that had implications for online learning. The four theories analyzed included behaviorism, cognitivism, constructivism, and humanism. While all four theories have some relevance toward adult learning, the theory of humanism relates well to concepts for both online and adult learning while also considering the role of the instructor in the learning process. Humanism focuses on self-directed learning within which adults take ownership of their education and have the freedom and responsibility for their growth and development (Arghode et al., 2017; Merriam et al., 2012). Instructors play a role in facilitating the adults' move into self-directed learning (Arghode et al., 2017). Embedded under humanism is andragogy, also known as the adult learning theory, which Arghode et al. (2017) argued does not meet the criteria to be considered a theory. Instead, andragogy acts as a model under the theory of humanism. Andragogy postulates that adults learn differently than children (Knowles, 1980). According to the principles of andragogy, adult learners are considered those who identify as responsible for themselves (Arghode et al., 2017), desire to learn to successfully fulfill their roles in society (Knowles, 1980), and tend to move from dependent to independent learners (Arghode et al., 2017). However, it is essential to note that adult learners vary in their abilities to self-direct their learning (Knowles, 1980). Considering the concepts of andragogy under the umbrella of humanism theory, the question arises if online education, which requires a high level of self-directed learning, will produce similar student outcomes as face-to-face learning modalities.

Background Conclusions

Distance education has existed for some time and will continue to evolve (Larreamendy-Joerns & Leinhardt, 2006). New technological advancements that allow for greater collaboration, such as the internet, will continue to influence the growth of online education (Larreamendy-

Joerns & Leinhardt, 2006; Lee, 2017). Social factors have changed the dynamic of student characteristics, which has resulted in the necessity for universities to redefine their educational models (Lee, 2017; McMurry, 2007; Tracey & Richey, 2005). Theoretical frameworks that postulate that adults learn differently from children guide online education's conceptualization (Arghode et al., 2017; Knowles, 1980; Merriam et al., 2012). However, research findings are inconclusive on whether online education is as effective as face-to-face education (Ortagus, 2018). For newer disciplines venturing into the online model, such as CSD, the literature has no to minimal research on the effectiveness of the online modality. Further research is warranted in this discipline to investigate student outcomes in the online model compared to their face-to-face peers.

Problem Statement

While online education was already growing in popularity and already considered mainstream by some (Glazier et al., 2020), the COVID-19 pandemic highlighted the importance of this educational model in a rapid manner around the globe (Hafeez et al., 2022). The substantial growth and focus on online education continue despite mixed results in the literature on the efficacy of online education when considering outcomes related to academics, degree persistence, and student perceptions. The literature includes research that discovered statistically significant differences for some student outcomes that favored the online educational model (Bacolod & Chaudhary, 2018; Bergeler, & Read, 2021; Cummings et al., 2019; Geng & McGinley, 2021). Other research reported statistically significant findings for some student outcomes that favored the face-to-face educational format (Abualadas, & Xu, 2023; Bacolod & Chaudhary, 2018; Cummings et al., 2019; Geng & McGinley 2021). Still, other research studies found no statistically significant differences for some outcomes between the two modalities

(Abualadas, & Xu, 2023; Bergeler, & Read, 2021; Geng & McGinley 2021; Hafeez et al., 2022). While some fields have offered online degree programs for many years, other fields are in their infancy, such as CSD. According to the American-Speech-Language-Hearing Association (n.d.-a), out of 279 master's degree programs offered in CSD, only 14 programs are available entirely online. However, more online CSD master's programs continue to appear. This increase in online CSD programs continues even without evidence that the existing online programs have student outcomes comparable to their face-to-face counterparts. A search of the literature revealed no published studies that compare student outcomes between online and face-to-face CSD graduate programs. Credible CSD graduate programs must meet established student outcomes to achieve or maintain accreditation through the American-Speech-Language-Hearing-Association (ASHA). Universities should also ensure they are producing competent speech-language pathologists as part of their responsibility to preserve the integrity of the field. The problem is there is substantial growth in online CSD graduate programs even though the literature has not fully addressed if online CSD graduate students' outcomes are similar to face-to-face CSD graduate students' outcomes, limiting policy-makers and prospective students' decision-making abilities.

Purpose Statement

The purpose of this quantitative causal-comparative, predictive correlational study is to investigate the relationship between the educational modality (online versus face-to-face) and age category on CSD graduate students' performance on three measurable outcomes. The outcomes to be measured are related to ASHA's requirements for CSD graduate programs to establish or maintain their accreditation. For the causal-comparative design portion of the study, the outcome to be measured includes students' scores on the national certification examination

between the two educational design modalities when considering age category. The outcomes to be measured for the study's predictive correlational design to be investigated include students' success in passing the national examination and student degree completion rates in established program timelines between the two educational design modalities when considering age category.

The independent variables will be the educational format and students' age category. In this study, the educational formats investigated will be online or face-to-face. Online education consists of learning not bound to a physical location, and teaching content is delivered through the internet in asynchronous or synchronous contexts (Sing & Thurman, 2019). Face-to-face learning is considered the traditional form of education in which learning occurs within physical proximity, such as the classroom (Louis-Jean & Cenat, 2020). Students' age will be categorized into one of three age groups at the time of their enrollment in the program. The first age group will be considered traditional students and include students 24 years of age and younger (Jinkens, 2009; Justice & Dornan, 2001). Both considered nontraditional students, the second group will include students between the ages between 25 and 34, and the third group will include students who are 35 years or older (Spitzer, 2000; Gulley, 2020).

The dependent variables will be student scores on the Praxis II in Speech Language Pathology certification examination, students' success status on the Praxis II in Speech Language Pathology certification examination, and student graduation rates within program-established timelines. The certification exam, otherwise known as the Praxis II Exam in Speech Language Pathology, is a standardized test that must be passed for speech-language pathologists to become certified by ASHA (American-Speech-Language-Hearing Association, n.d.-b). For this study, students' success in meeting the required score will be investigated based on their first attempt at

taking the examination. Graduation within program timelines would correlate to time-to-degree, which is the elapsed time in calendar years that it takes a student to finish a degree from initial enrollment to graduation (Yue et al., 2017). Kappe and Van Der Flier (2012) defined time-to-graduation, a different way of phrasing time-to-degree, as the time it takes students to complete the curriculum required for graduation. The sample will consist of data collected on student outcomes from online and face-to-face university programs. The data will include students' outcomes from previously enrolled students who have already graduated or unenrolled from CSD master's programs. The intention is to include data from students who attended online graduate programs that have existed long enough to have the required data and compare them to an equal number of face-to-face programs.

Significance of the Study

Online education has reached a point in which it is an integral part of higher education, and institutions need to focus on the quality of their online education programs (Lee, 2017). Ortagus (2018) stated that previous research had reported inconclusive findings on student outcomes in online education. Consequently, higher education stakeholders must rely on limited evidence to judge the effectiveness of online instruction (Ortagus, 2018). As this modality continues to expand, the need for more conclusive evidence of online education's effectiveness is vital. When considering the adult learning theory, which claims that adults learn differently than children and evolve into self-directed learners (Knowles, 1980; Knowles et al., 2017), it is important to investigate if online education supports this idea. Theoretically, this study adds to the adult learning theory literature because online education lends itself to a more self-directed learning approach.

For new disciplines venturing into online education, such as the health and allied sciences, studies that address gaps in the literature are critical. Williams (2006) called for more research investigating the efficacy of online education in the allied health fields. Researchers have begun to respond to this call but admit further research is still needed (He et al., 2020). Even researchers who have attempted to complete systematic reviews on the efficacy of online learning in the health sciences report limitations in the studies analyzed, such as poor sampling procedures and inadequate descriptions of methodologies (Regmi & Jones, 2020). Empirically, this study will add to the literature to help fill in the gap on the effectiveness of online education in the allied and health sciences, specifically communication sciences and disorders.

For CSD graduate programs, a lack of evidence that online programs are effective for the field of speech-language pathology restricts educational policy-makers' ability to determine the need for program improvement initiatives. Also, a lack of research impedes prospective students' ability to make an educated choice when choosing between an online or face-to-face CSD graduate program. This study will add information to the literature that measures important student outcomes in online CSD programs. This study will provide practical information for decision and policy-makers and establish a foundation for future research to investigate more factors, such as students, instructors, supervisors, and employers' perceptions of the efficacy of online CSD programs' education.

Research Questions

RQ1: Is there a statistically significant difference in national certification examination scores for communication sciences and disorders graduate students based on the educational format (online versus face-to-face) and age category?

RQ2: How accurately can success on the national certification examination on the first attempt be predicted from a linear combination of communication sciences and disorders graduate students' educational format (online versus face-to-face) and age category?

RQ3: How accurately can degree completion in program-defined timelines be predicted from a linear combination of communication sciences and disorders graduate students' educational format (online versus face-to-face) and age category?

Definitions

1. *Adult Learning Theory* – The adult learning theory postulates that adults learn differently than children and move toward self-directed learning to fulfill their role in society (Knowles, 1980).
2. *Age* – Age refers to a student's age when the student begins the degree program, which will be grouped either as a traditional student or within one of two groups considered nontraditional students (Jinkens, 2009; Justice & Dornan, 2001; Spitzer, 2000).
3. *American-Speech-Language Association (ASHA)* – The American-Speech-Language Association is the national accrediting association for the fields of speech-language pathology and audiology (American-Speech-Hearing-Association, n.d.-c).
4. *Androgyny* – Androgyny is a conceptual framework that views adults moving from dependent to independent learners to self-direct their learning to reach their full potential to fulfill their roles in society (Arghode et al., 2017; Knowles, 1980; Merriam et al., 2007).
5. *Certification exam* – A certification examination is a standardized test that must be passed for speech-language pathologists to become certified (American-Speech-Language-Hearing Association, n.d.-d).

6. *Communication Sciences and Disorders (CSD)* – Communication Sciences and Disorders is the career field for speech-language pathologists, audiologists, and hearing scientists (American-Speech-Hearing-Association, n.d.-b).
7. *Distance education* – Distance education is any form of education in which students are separated by physical distance and not under the continuous supervision of an instructor but benefit from the pedagogical planning of material through an educational institution (Kaplan & Haenlein, 2016; Larreamendy-Joerns & Leinhardt, 2006).
8. *Humanism* – Humanism is a theory that postulates that adults take ownership of their learning and have the freedom and responsibility for their growth and development (Arghode et al., 2017; Merriam et al., 2007).
9. *Nontraditional Student* – A nontraditional is a student who is 25 years of age or older (Spitzer, 2012; Gulley, 2020)
10. *Online education* – Online education is an instructional alternative in education that uses modern social technologies to improve distance learning (Hiltz & Turoff, 2005; Larreamendy-Joerns & Leinhardt, 2006).
11. *Praxis examination* – The Praxis examination is a national certification examination required by the American-Speech-Language-Hearing Association for speech-language pathologists to receive their certification (American-Speech-Language-Hearing-Association, n.d.-c).
12. *Program timeline* – Program timeline refers to the time to degree or the elapsed time in calendar years that it takes a student to finish a degree from initial enrollment to graduation (Yue et al., 2017).

13. *Traditional Student* – A traditional student is a student who is 24 years of age or younger (Jinkens, 2009; Justice & Dornan, 2001).

CHAPTER TWO: LITERATURE REVIEW

Overview

This chapter will provide an overview of the existing literature that pertains to student outcomes between online and face-to-face educational modalities. The theoretical framework chosen is Knowles' adult learning theory, otherwise referred to as andragogy. The first section will discuss the adult learning theory and its relation to the different learning environments. The second section will synthesize the recent literature related to relevant student outcomes between online and face-to-face students. A discussion of the gaps in the literature supports the need for this study.

Theoretical Framework

The theory that guides this study is the adult learning theory, or andragogy, under the umbrella of humanism. A theoretical framework provides the foundation, or blueprint, to support or guide a study (Grant & Osanloo, 2014). Theories on adult learning provide a framework for investigating adult learning outcomes in different educational modalities, such as online and face-to-face formats. Degree programs offered in online and in-person formats provide unique learning experiences that may require different internal learning skills of adult students. When considering various theories related to adult learning, Arghode et al. (2017) analyzed four main theories: behaviorism, cognitivism, constructivism, and humanism. While all of the theories have merit to adult learning, the theory of humanism relates well to both online and adult education.

Humanism

Education from a humanistic perspective emphasizes the self-development and fulfillment of the learner and focuses on the independence, self-reliance, and self-awareness of the student (Arghode et al., 2017; Milheim, 2011). Humanism finds its roots in self-directed

learning (Arghode et al., 2017; Merriam et al., 2012). Self-directed learning is the idea that adults take ownership of their education (Arghode et al., 2017). Sze-Yeng and Hussain (2010) defined self-directed learning as learners' ability to manage their learning. Adult learners view themselves as responsible for the learning process, and they take the initiative for their learning, which may or may not include help from the instructor (Sze-Yeng & Hussain, 2010). Garrison (1997) created a self-directed learning model that included three dimensions: self-management, self-monitoring, and motivation. Self-management is related to task control in which learners have choices, access to appropriate resources and materials, and a degree of flexibility. Self-monitoring refers to learners' cognitive and metacognitive processes, such as creating personal meaning of what they have learned, planning and modifying their thinking to reach their goals, and monitoring their learning strategies. This aspect requires students to possess the skills of critical reflection and the ability to receive and respond to internal and external feedback. Motivation considers learners' perceived value of the material and their anticipated success in reaching their learning goals. This aspect is related to control and responsibility of the learning process based on both extrinsic and intrinsic conditions. Garrison's model provides a multidimensional view of self-directed learning in which instructors should pay attention to all three dimensions (Knowles et al., 2015).

Learners' autonomy, preferences, and motivation are essential considerations of the humanistic view (Javadi & Tahamsbi, 2020). When viewing education through the humanistic lens, it is important to consider the learning process and the conditions present in which learning occurs (Javadi & Tahamsbi, 2020). These considerations are relevant when considering the very different experiences offered through the online and face-to-face educational modalities, and the theory of humanism has implications for both face-to-face and online learning environments

(Arghode et al., 2017). This theory emphasizes peer collaboration through face-to-face cooperation (Javadi & Tahamsbi, 2020), a potential challenge in online environments. Educators need to consciously change their approach to instruction between online and face-to-face programs, considering how to effectively engage and communicate with online learners (Milheim, 2011). Instructors may have difficulty discerning learner's interests in an online format, and, therefore, learning content should be carefully designed to meet the needs of adult learners (Arghode et al., 2017).

Embedded under humanism is the concept of andragogy (Arghode et al., 2017). Merriam et al. (2012) postulated that humanism informs andragogy, commonly referred to as the adult learning theory. This literature review will focus primarily on the tenets of Malcolm Knowles' adult learning theory and how it impacts learning in different educational modalities.

Adult Learning Theory (Andragogy)

A top scholar often credited with popularizing the adult learning theory, or andragogy, is Malcolm Knowles (Loeng, 2017). However, Alexander Kapp initially coined the term "andragogy" in the 1800s (Loeng, 2017). Loeng (2017) explained that Alexander Kapp deliberated the importance of adult education focusing on a person's inner qualities and self-knowledge. Kapp emphasized reason, and he did not focus on knowledge's practical use by not giving much regard to adults' potential impact on the world around them in response to their learning. Contemporary approaches to adult learning mirror tenants of Kapp's vision of andragogy, including the significance of teacher-student dialogue (with neither subordinate nor superior to the other), self-education, and life-long learning (Loeng, 2017). According to Loeng, the main difference between Kapp's definition of andragogy and modern-day learning theories is Kapp's lack of focus on the importance of experience in the learning process. Contemporary

adult learning theories emphasize the role of experience in adult learning, and experience has replaced the importance Kapp placed on reason (Loeng, 2017). As perhaps the most well-known author of andragogy, existing literature commonly references Malcolm Knowles' postulations on how adults learn (Arghode et al., 2017; Merriam, 2001).

Malcolm Knowles' definition of adult learning, or andragogy, emerged in the 1960s when he proposed that adults learn differently than children (Merriam, 2001). In the first few decades of its inception, many scholars debated if andragogy met the criteria to be considered a theory. A consensus is that andragogy does not meet the requirements to be considered a theory (Arghode et al., 2017; Merriam, 2001). Instead, andragogy acts as a model under the theory of humanism that includes principles that apply to many adult learning scenarios (Arghode et al., 2017; Merriam, 2001). Knowles himself acknowledged that an adult learner's dependency on an instructor varies depending on the adult's preexisting knowledge on the topic in question (Merriam, 2001). Therefore, modern acceptance is that the learning situation is a more significant factor than the learner in andragogy (Merriam, 2001). Despite postulations that it does not fulfill a theory's requirements, andragogy is often synonymously referred to as the adult learning theory and credited to Malcolm Knowles (Clapper, 2010; Arghode et al., 2017; Merriam, 2001). With the growth of learning environments that differ from the traditional in-person format, andragogy's updated focus on the learning environment, including how and why adults learn, is relevant to apply as a theoretical context when comparing different educational formats.

The root of the adult learning theory resides in the idea that adults learn differently than children. Knowles (1980) defined adults as people who have roles in society typically viewed as being fulfilled by adults and those who identify as responsible for themselves. Adults desire to

learn to successfully fulfill their roles in society (Knowles, 1980). Six main principles are emphasized that relate to adult learning in recent advancements of the theory (Knowles et al., 2015). The six principles explained by Knowles et al. (2015) include the learning process, learners' self-concept, learners' experience, learners' readiness to learn, learners' orientation to learning, and learners' motivation to learn.

The Learning Process

The first principle of andragogy is that adult learners need to know about the learning process, including how learning will occur, what will be learned, and why the information is important (Knowles et al., 2015). According to Knowles et al. (2015), these three dimensions allow adult learners to be involved in the learning process through mutual planning and as learning partners. The belief is that adults need to have control over their learning (e.g., learning strategies), even when the teaching material is predetermined. Kim (2009) reported that the ability for adults to have control over the pace and sequence of instruction was motivating for adult learners. However, a lack of feedback was demotivating (Kim, 2009), demonstrating the importance of the idea presented by Knowles of "learning partners" to create involvement with others in the learning process instead of learning as a solitary endeavor. This involvement makes the learning process more meaningful to adult learners (Knowles et al., 2015).

Knowles et al. (2015) cautioned that the three dimensions of the learning process (i.e., how, what, and why) are specific to each situation, and there is no way to generalize a particular model to all learning situations. However, the how, what, and why of learning are still essential elements to consider in all adult learning situations (Knowles et al., 2015). Related to online versus face-to-face education, the "how" is delivered in very different ways, potentially impacting the learning outcomes of adult learners.

Self-Concept

The second principle of andragogy is that the concept of the learner changes as adults become independent and self-directed humans (Knowles et al., 2015). According to Knowles (1980), adults begin to view themselves as producers, and their self-fulfillment comes from their performances in various roles (i.e., spouse, employee, and parent). As self-directed individuals, Knowles et al. (2015) postulated two types of self-directed learning: self-teaching and personal autonomy. In self-teaching, adults take over the learning process to gain knowledge about a specific subject. In personal autonomy, adults control the goal and purpose of learning. They will choose how learning occurs, such as in a teacher-centered or student-centered model or online or face-to-face formats. Knowles (1980) stated that adult learners could quickly shift back into the pedagogical mindset of learning in which "they sit back and say, 'Teach me'" (p. 46). Therefore, learning designs need to encourage adults to move toward self-directed learning (Knowles et al., 2015), which Grow (1991) conceptualized in four stages.

Four Stages of Self-directed Learners. Knowles et al. (2015) referenced Grow's (1991) four stages of becoming an autonomous learner. The stages move along a continuum from dependent, interested, involved, and self-directed. Before exploring Grow's stages, it is important to understand that self-directed learning is situational (Knowles et al., 2015). Learners may choose to learn in an environment that does not match their self-directed learning abilities. For example, they may be autonomous learners but choose to learn in a highly controlled, teacher-centered environment. Problems might arise when there is a mismatch between instructors' teaching styles and learners' stages of self-directed learning (Grow, 1991). A mismatch could also occur in an educational format. For example, if a student is a dependent learner, the inherent self-directed nature of online education may create difficulties for the student.

Dependent Learner. Grow's (1991) first stage of learning autonomy is the dependent learner. In this stage, Grow described the learner as highly reliant on the instructor. Students in this stage require an authority figure that directs them on what material to learn, how to learn it, and when to learn it. This stage is considered teacher-centered, and adult learners may be dependent learners all the time or situationally dependent (Grow, 1991). For example, autonomous learners may be dependent learners in an area that they feel like they have limited knowledge or expertise. While Grow stated that it is not a defect to be a learner in this stage, it can be a limitation. Instructors of students in this stage act as coaches that provide immediate feedback and specific guidelines (Grow, 1991; Knowles et al., 2015). They must also be ready to overcome resistance when dependent learners challenge their authority (Grow, 1991).

Interested Learner. The second stage in Grow's (1991) model of learning autonomy is the interested student (Knowles et al., 2015). Students in this stage are often known as good students (Grow, 1991). Grow stated that these students are easily motivated, confident (even if they have no or minimal knowledge about the subject), and are willing to complete assignments. Instructors in this stage act as guides or motivators (Knowles et al., 2015). Still leaning toward a teacher-centered model, instructors use a directive approach (Grow, 1991). They clearly explain and justify each assignment. Teachers of students in this stage are highly supportive of their students and utilize an enthusiastic lecture style (Grow, 1991). Grow explained that instructors help these students move along the continuum toward becoming autonomous learners by assisting students in setting goals and developing learning strategies. According to Grow, instructors considered "good" or "inspiring" are this stage of teachers. This type of teaching is also seen outside of the educational environment in great lecturers or evangelists (Grow, 1991).

Involved Learners. In the third stage of Grow's (1991) model, learners are participants,

or involved, in their education (Knowles et al., 2015). In this stage, Grow stated that students possess skills and knowledge and are ready to learn with a guide. Students may learn some material independently, and they often benefit from exploring how they learn (e.g., consciously using learning strategies). Learners still need support to develop their confidence, sense of direction, self-concept, and ability to learn from others. Instructors of students in this stage act more as facilitators (Knowles et al., 2015) and take more of a participant role in the learning process (Grow, 1991). Students in this stage begin to recognize their instructors as current or future equals, but they may still require support to continue their learning (Grow, 1991). Collaborative work, such as group projects, are enjoyable to learners in this stage (Grow, 1991; Knowles et al., 2015).

Self-Directed Learners. The final stage of Grow's (1991) model of becoming an autonomous learner is the self-directed student (Knowles et al., 2015). Students in this stage independently set their own goals and standards (Grow, 1991). According to Grow, these students take responsibility for their learning and may or may not require help from experts. They have effective time management, self-evaluation, and information gathering skills. They make efficient use of educational resources. This stage is a very student-centered model (Grow, 1991), and instructors teaching students in this stage act more as consultants or delegators (Knowles et al., 2015). The relationship between learner and teacher is more collegial (Grow, 1991). Examples of students in this stage might be those completing an internship or dissertation (Knowles et al., 2015).

Updated Self-Directed Learning Models. Garrison's (1997) model, discussed earlier, provided a more formal model of Grow's (1991) stages of self-directed learning (Knowles et al., 2015). To recap, Garrison's model included three dimensions: self-management, self-monitoring,

and motivation (Garrison, 1997). More recently, Du Toit-Brits (2018) proposed a holistic and transformative self-directed learning model that postulated that students want to control their education and typically enjoy learning. Du Toit-Brits stated that, hopefully, adults become life-long learners who are goal-oriented and who use learning for belonging, becoming, experiencing, and doing. Knowles did not promote self-directed learning skills with any specific educational format in mind, such as online or face-to-face. However, in his earlier works, online education was not as prevalent as it is today. Many online instructional design practices take a self-directed learning approach (Halpern & Tucker, 2015). By virtue of their design, online educational models naturally guard against adults returning to or remaining in a pedagogical mindset because technology-based learning requires students to be ready to be self-directed learners (Knowles et al., 2015). However, online models may not consider that not all adults are at the self-directed stage of learning, and some adults may require more support than others in the learning process.

Experience

The third principle of andragogy is that learners' experiences play a role in the learning process because they provide more meaning than passive learning (Knowles, 1980; Knowles et al., 2015). Adult learners have increasing numbers and types of experiences to bring with them to the learning process (Knowles et al., 2015). Knowles (1980) stated that adults gain their identity from their experiences or what they have done, while children achieve their identity by what has been done to them or other external sources. Since adults are a rich resource themselves for learning, adult learning practices should focus on experiential learning, practical application, and objective reflection (self-reflection) to learn from the process of learning itself (Knowles, 1980). Older adult learners may also benefit from having a career that allows them to apply new

knowledge. This benefit is from reflecting on past, current, or anticipated experiences because they help students create relevancy of their current learning (Knowles et al., 2015).

Another popular theory that expands on andragogy's emphasis on the importance of experience is the experiential theory. Initially proposed by Kolb beginning in the 1970s, this theory postulates that learning occurs in a cyclical process that moves through phases of concrete experiences, reflective practices, abstract conceptualization, and active experimentation (Kolb, 2014). Learning is viewed as continuous, is actually relearning, and is considered a life-long process (Kolb, 2014). The experiential theory expands on the andragogy's focus on experience in adult learning, and it is relevant because ASHA requires CSD graduate students to obtain 400 hundred hours of clinical experience (American-Speech-Language-Hearing-Association, n.d.-e). The extensive clinical experience required of graduate students may help override any educational weaknesses present in online or face-to-face instructional models.

Readiness to Learn

The fourth principle of andragogy is that adults are ready to learn directly related to life situations that create a need to increase knowledge (Knowles et al., 2015). Knowles (1980) stated that adults' readiness to learn depends on their different developmental stages, where they are in life, or what roles they view as their responsibility to fulfill. For example, unmarried adults with no children in their early twenties will be at a different developmental stage and have different roles than married adults with children. Another example might include a young student who has not decided on a career path and may not see a purpose for taking a specific required course, such as an English course. On the other hand, an adult seeking a promotion at work to increase their compensation might be ready to learn and complete any requirements to be eligible for a

promotion. Therefore, if possible, learning tasks should be relevant to the developmental stages of adults (Knowles, 1980).

Knowles (1980) postulated that adult educators who can understand and predict adult life situations could improve their effectiveness as instructors. Knowles and colleagues conceded that creating a model that allows for the variability in adults' readiness or competency to learn is a challenge (Knowles et al., 2015). In the ever-changing demographics of students enrolled in higher education, with an increase in nontraditional students (Rabourn et al., 2018), adjusting for all stages of readiness to learn in students might be more complicated than in past years. Perhaps adjusting for each adult's developmental stage is even more challenging in online learning than in face-to-face environments due to the physical separation of instructor and students and the more self-directed nature of online learning.

Orientation to Learning

The fifth principle of andragogy is that adults' orientation to learning becomes performance-centered because they want to move beyond just acquiring factual knowledge to applying that knowledge (Knowles, 1980; Knowles et al., 2015). Whereas children perceive learning as something to be used later, adults desire to immediately apply the information to real-world situations (Knowles, 1980), and adults learn best when they can readily apply new knowledge to real-life situations (Knowles et al., 2015). According to Knowles et al. (2015), Kolb's experiential learning theory is relevant when considering orientation to learning. Kolb viewed learning as more than just the acquisition of knowledge (Kolb, 2014). Instead, it was the connection between knowledge and experience, with each transforming the other. Learning experiences should influence adult educators to develop a problem-based curriculum because adults typically have a problem-centered or performance-centered mindset. (Knowles, 1980).

Motivation

The sixth principle of andragogy is that adults are typically more motivated than children to learn because learning helps them cope with their adult roles in life (Knowles, 1980; Knowles et al., 2015). Education provides a tool for adults to solve problems or receive internal payoffs (Knowles et al., 2015). Motivation is often attributed to intrinsic or extrinsic origins (Kim, 2009). Kim (2009) defined intrinsic motivation as the desire to learn for internal satisfaction rather than for a particular consequence, such as curiosity. Extrinsic motivation refers to the desire to learn for a separate external consequence, such as a job promotion (Kim, 2009). Yang et al. (2017) supported this principle by concluding that career goals were a significant persistence factor for graduate students. When relating motivation to degree persistence, perceived value (the function of learning) was a personal attribute that facilitated persistence in an online degree (Yang et al., 2017). Also, coursework relevancy to individual or professional needs and the connection between coursework and career goals were program attributes that led to persistence (Yang et al., 2017). Job promotions or new careers goals provide external motivators for adults to persist in the learning process (Yang et al., 2017). Additionally, the time and effort adults had already invested in their education was a significant factor that emerged for online persistence (Yang et al., 2017), suggesting motivation is an essential factor of success.

Wlodowski (1985) postulated four factors that influence adults' motivation to learn (as cited in Knowles et al., 2015). The first factor is that adults desire to be successful learners. The second factor is that adults want volition in their learning, which includes a sense of choice in the process. The third factor is that adults need to find value in what they are learning. The fourth factor is that adults desire the learning experiences to be pleasurable. From a neuroscientific perspective, the more intrinsic motivation an adult has, the more potential there is for learning to

occur (Knowles et al., 2015). The brain is ready to learn because of the positive neurotransmitters produced by the pleasurable, or positive, effects of the learning experience (Knowles et al., 2015). The inherent motivation of adult learners, whether intrinsic or extrinsic, may override any challenges faced within the different educational modalities.

Digital Andragogy

With the rapid expansion of online education, adult learning theory principles are relevant to distance learning because they claim that adults are self-directed learners, possess significant knowledge from previous experiences, and are motivated to learn (Knowles, 1980; Knowles et al., 2015). These principles align well with online courses that emphasize engagement and are designed in a way that is coherent, easy to navigate, and inclusive of all types of learners (Tainsh, 2016). Blackley and Sheffield (2015) coined the term "digital andragogy," which is the idea that instructors encourage and equip online adult learners to personalize their learning and interact with their peers using digital technology. Blackley and Sheffield argued that learners in the 21st century are from multiple generations and cannot be grouped into one generation of common learning characteristics. Therefore, online education educators have the added challenge of meeting the learning needs of each student, often without the benefit of real-time feedback (e.g., nonverbal language, immediate questions and answers). Deliberate instructor action, such as immediate feedback, is an essential component of adult education in a digital environment (Wlodkowski & Ginsberg, 2017). Other strategies that pertain to digital andragogy to enhance student learning and motivation in adult learners include establishing inclusion, developing positive attitudes, enhancing the meaning of the learning material, and propagating competence (Wlodkowski & Ginsberg, 2017). The physical separation

between students and instructors encountered in the online format might make these strategies challenging to incorporate to meet the needs of adult learners.

Summary

The adult learning theory defines how adult learners learn differently than children (Knowles, 1980; Knowles et al., 2015). Adult students in graduate programs are often from a wide range of age groups and have different roles in society. Therefore, it is reasonable to state that all adult learners are at various stages of self-directed learning (Knowles, 1980). Knowles et al. (2015) admitted that the andragogy model often places adults into one group without considering individual differences. Some students require minimal help from instructors, while others may require more support from educators to progress in their education (Arghode et al., 2017). The physical separation between students and instructors in the online learning format raises the concern if online instruction can be individualized enough to meet each students' learning needs in a way that allows them to be successful in the online delivery method. However, andragogy's postulations that adults' inclination to self-directed learning might indicate the modality may not be a significant factor in student success if course designs promote learners' ability to improve learning at their pace (Arghode et al., 2017). If principles of andragogy hold fast, the question arises if online education is more effective, less effective, or similar to face-to-face learning environments.

Minimal research exists in the literature that investigates online student outcomes in the allied and health sciences. Williams (2006) called for more investigation in these areas. Some researchers have begun to answer this call but agree more research is needed (He et al., 2020). Additionally, minimal research exists that investigates if online education effectively develops clinical skills. A significant gap in the literature exists that examines graduate student outcomes

in CSD between the two different educational delivery models. A review of the literature revealed minimal published studies investigating if online CSD graduate students obtain similar results in student outcomes as face-to-face students. This study will add to the literature on the adult learning theory by examining if the tenets of adult learning theorized by Knowles translate into student success in the online modality in the allied and health sciences fields.

Related Literature

When comparing outcomes between online and traditional education, it is essential to understand each learning modality. Face-to-face education typically occurs synchronously, and students attend class within physical proximity (Louis-Jean & Cenat, 2020). Online education, however, varies in its definitions. Singh and Thurman (2019) attempted to develop an updated description of online learning through their literature review. The most comprehensive definition they arrived at that encompasses all the different online models emerging in CSD graduate programs is that

Online education is defined as education being delivered in an online environment through the use of the internet for teaching and learning. This includes online learning on the part of the student that is not dependent on their physical or virtual co-location. The teaching content is delivered online, and the instructors develop teaching modules that enhance learning and interactivity in the synchronous or asynchronous environment (Singh & Thurman, 2019, p. 302).

CSD programs classified as online, or distance education, vary in structure. The key concepts of Sing and Thurman's definition are that online education programs might be completely asynchronous, or they could include a synchronous component. The primary differentiation between online and face-to-face is the physical location requirement, such as students learning

together in a physical classroom on a university campus. Other scholars have given similar definitions to online learning, including characteristics such as indirect contact between faculty and students (Milheim, 2011) or a physical separation between students and instructors (Larreamendy-Joerns & Leinhardt, 2006).

With varying online delivery models and ages of graduate students, the question emerges if online CSD graduate students' outcomes are similar to students attending face-to-face instruction. A literature review revealed outcomes often compared between the two educational formats in varying disciplines, including academic outcomes, degree persistence, and student perceptions related to perceived learning and sense of preparedness. The literature also includes research that explored how students' age is related to student outcomes, which is relevant to the tenant of self-directed learning embedded in the adult learning theory.

Academic Outcomes

For this literature review, the academic outcomes focused on include measurable results related to knowledge and performance. The specific academic outcomes investigated include knowledge acquisition and content mastery, students' perceived learning, performance and skills acquisition, students' sense of preparedness, and certification examination performance. These outcomes directly relate to critical areas for CSD graduate programs to ensure they provide an education that produces competent speech-language pathologists. These outcomes are also associated with the maintenance of universities' program accreditation through ASHA.

Knowledge Acquisition and Content Mastery

The literature includes studies that have investigated online versus face-to-face students' abilities to learn in each environment, and the question if online students learn as much as face-to-face students has yet to be conclusively answered (Callister & Love, 2016). Academic

outcomes considered in the research range from exam scores to course grades to overall grade point averages (GPA). The literature has revealed mixed results with no clear indication that one format is better than the other.

Studies exist that indicate face-to-face students fared better than online students for acquiring knowledge and mastering content. When considering assignment and course grades, some researchers concluded that grades were negatively affected by attending the online format (Bettinger et al., 2017; Francis et al., 2019; Garratt-Reed et al., 2016; Hurlbut, 2018; Smart & Saxton, 2016; Wilke et al., 2016). In addition, when considering students' overall GPA as they progressed through their degree, future course grades risked being negatively affected by attending some courses online (Bettinger et al., 2017). Online students may also struggle with higher-level thinking tasks as compared to their face-to-face counterparts (Dendir, 2019). For degrees that include clinical work, such as nursing, students' GPAs leaned toward being higher for face-to-face students (Cummings et al., 2019). Cummings et al.'s (2019) findings are significant when considering that CSD graduate degree programs include an extensive clinical component. While these studies indicated that in-person students fared better than online students, other studies have revealed the opposite result.

Some research studies reported better grades with distance learning (online) formats (Bacolod & Chaudhary, 2018; Dendir, 2019; Soffer & Nachmias, 2018). However, cheating, especially on exams, cannot be ruled out as a factor for better grades (Dendir, 2019). Even if online students only minimally outperformed their face-to-face counterparts, research has suggested that online students had the overall advantage (Markson, 2018). Older studies have also reported that online students outperformed face-to-face students in their area of knowledge acquisition (Burkhardt et al., 2008; Lim et al., 2008). Even though evidence exists to support

either face-to-face or online education as the more effective method of instruction, the literature also includes studies that concluded that each no one format had the advantage.

Additional studies found no statistically significant differences in outcomes between the two modalities related to knowledge acquisition and content mastery (Callister & Love, 2016, Cavanaugh & Jacquemin, 2015; CIPHER et al. 2019; Cummings et al., 2017; Girard et al., 2016; Hafeez et al., 2022; Hale, 2009; Markson, 2018; Pereira & Wahi, 2018; Stack, 2015). Specifically, assignments, tests, and course grades have been investigated and revealed to demonstrate similar results between online and face-to-face delivery methods (Abualadas, & Xu, 2023; Bergeler, & Read, 2021; Callister & Love, 2016, Cameron, 2013; Cavanaugh & Jacquemin, 2015; CIPHER et al. 2019; Cummings et al., 2017; Geng & McGinley 2021; Girard et al., 2016; Hale, 2009; Markson, 2018; Pereira & Wahi, 2018; Shu-Chen et al., 2018; Stack, 2015). When considering cumulative assessments at the course (final exam) and degree (capstone course) levels, studies exist that determined that there are no statistically significant differences between the two educational modalities (Girard et al., 2016; Stack, 2015). Research has also reported that face-to-face and online students mastered course content at a similar rate (Callister & Love, 2016) and gained equivalent knowledge in courses with a laboratory component (Miller et al., 2018). No statistically significant differences in overall GPAs between the two groups have also been reported (Cameron, 2013; Cavanaugh & Jacquemin, 2015; CIPHER et al., 2019). While objective measures are quantifiable indicators of knowledge acquisition and content mastery, students' perceived learning is an important consideration.

Students' Perceived Learning

As a subjective measure of academic outcomes, students' sense of perceived learning is considered an indicator of knowledge acquisition and involves the individual's judgment if

learning has occurred (Alqurashi, 2019). Various studies consistently reported that students believed more learning occurred in face-to-face courses than online courses (Dobbs et al., 2017; Hale et al., 2009; Kemp, 2020; Weldy, 2018). These findings were significant because some students preferred the online format (Weldy, 2018) or believed that the online design was more difficult (Dobbs et al., 2017). Contrarily, Smith et al. (2015) concluded that graduate students reported higher learning perceptions in the online delivery method. Once again, the literature reveals no conclusive evidence of which format produces better outcomes pertaining to students' perceived learning.

Even though results are inconclusive overall, substantial evidence exists in the literature that suggests that students earning their education in online and face-to-face formats have the potential to achieve compatible knowledge acquisition or content mastery results (Callister & Love, 2016, Cameron, 2013; Cavanaugh & Jacquemin, 2015; Cipher et al. 2019; Cummings et al., 2017; Girard et al., 2016; Hale, 2009; Markson, 2018; Miller et al., 2018; Pereira & Wahi, 2018; Shu-Chen et al., 2018; Stack, 2015). While caution is necessary when interpreting these studies because most studies cannot truly randomize the samples, the research suggests that adults could potentially self-direct their education to effectively gain knowledge and master content in an online environment. The next step would then be to determine if adults can effectively apply their new knowledge.

Performance and Skills Acquisition

Beyond simply mastering content emerges the requirement for students to have the ability to transfer their knowledge to application in real-world situations. Students' sense of preparedness and competency are critical for their confidence when entering the workforce. Certain professions require students to have the clinical skills to apply theoretical principles to

practice (McCutcheon et al., 2016). Once again, the literature revealed mixed results when comparing students' acquisition of skills in online versus traditional formats. Suggesting that in-person formats might develop better performance-based skills in students than in online environments, researchers reported that face-to-face students tended to have higher negotiation skills than online students (Callister & Love, 2016), and instructors tended to rate online students lower than their face-to-face peers in their field competencies (Wilke & Vinton, 2006). Additionally, face-to-face learning of more complex topics, such as medical topics (a component of the field of CSD) poor higher-order analytical skills (analysis, evaluation, and synthesis, was found to be a better learning experience than online (Abualadas, & Xu, 2023; Geng & McGinley 2021). Contrarily, Cummings et al. (2019) found that online students outperformed face-to-face students in field competencies, although age and work experience of online students may have played a factor in their findings.

On the other hand, other researchers found no statistically significant differences in the development of clinical or performance skills observed during activities, such as role-playing exercises (McCutcheon et al., 2015; Wilke et al., 2016) and by participant report (Kenzaka, 2022). Research suggests that online students have the potential to develop performance-based skills at the same competency as in-person students, although age and work experience should be considered as contributing factors to the success of online students' ability to develop performance skills (Cummings et al., 2019). Work experience especially aligns with the experience and real-life application of the learning process in Knowles' adult learning theory (Knowles, 1980). Students' perceptions of preparedness to perform their job responsibilities are also an indicator of the efficacy of online education.

Students' Sense of Preparedness

Moving from learning to producing is a significant transition in an adult's life. If institutions have applied the principles in the adult learning theory that adults need to immediately apply knowledge in real-world situations and learn by experience, then students should be adequately prepared to perform in their career field, no matter what format of education they received. Research supports this statement. While Ortega-Maldonado et al. (2017) found better grades and student satisfaction for face-to-face students, their study revealed that online students felt more competent than their face-to-face peers enrolled in the same course. Other studies support Ortega-Maldonado et al.'s conclusions that online students had a better sense of preparedness or levels of confidence than their face-to-face counterparts (Cipher et al., 2019; Cummings et al., 2019; Markson, 2018). Perhaps, this sense of preparedness is related to the need to self-direct their learning at a greater level than face-to-face students, supporting self-directed learning concepts postulated in the adult learning theory. Contradictory to studies that concluded that online students felt more prepared than their in-person peers (Cipher et al., 2019; Cummings et al., 2019; Markson, 2018; Ortega-Maldonado et al., 2017), other researchers reported that face-to-face students felt more confident in applying their knowledge in new situations (Bhattacharya et al., 2020) and perceived knowledge transfer was lower for online students (Wang et al., 2019)

Certification Examination Performance

Some careers require personnel to pass a certification examination to obtain a license to work in that field. For the field of speech-language pathology, aspiring clinicians must pass a certification examination (Praxis II in Speech Language Pathology) to become certified speech-language pathologists (American-Speech-Language-Association, n.d.-c). As a comprehensive test used for professional credentialing, the Praxis II exam in Speech Language Pathology has

become an essential measurement for program assessment (Baggs et al., 2015). This test allows aspiring clinicians to demonstrate knowledge related to content, pedagogy, and instruction (Educational Testing Service Praxis, n.d.-a). No discoverable literature exists that compares the pass or fail status on such exams between online and face-to-face students in CSD. In disciplines other than CSD, the literature revealed results that favored online education for increasing pass rates (Dolezel & McLeod, 2017) and results that favored face-to-face education for higher pass rates (Morgan, 2015). However, the literature has also reported no statistically significant difference in certification exam pass rates (Cameron, 2013; Cipher et al., 2019). Passing the certification examinations might directly relate to adults' ability to self-direct their studying and learning habits and not necessarily to the education modality format. Academic outcomes are essential pieces of information to assess the quality of education. However, investigating student persistence and degree completion is another critical outcome to compare between online and face-to-face educational formats.

Degree Persistence

In addition to content mastery, as measured by passing scores on the certification examination, CSD graduate programs must maintain a certain percentage of graduation rates to maintain their accreditation (Council on Academic Accreditation, n.d.). The required standards of student graduation in programmed-defined time limits set by ASHA for graduate programs in CSD is a valid area to assess for differences between online and face-to-face programs. Beyond just investigating what the literature reveals for degree persistence between the two educational modalities, exploring students' perceptions of each program format is essential since those perceptions are highly correlated with degree completion.

Students' Perception or Satisfaction

Online students' satisfaction with their program is a significant factor in degree persistence (Yang et al., 2017). A review of the literature on student satisfaction or perception of the degree program revealed mixed results between online and traditional modalities. In their systematic review, McCutcheon et al. (2015) found that online students were more satisfied with their programs than face-to-face students in five of their investigated studies, and Cummings et al. (2019) concluded that online students rated their professors' accessibility, advising, and helpfulness more favorably than face-to-face students in the same program. Additional research also reported findings of overall more favorable student perceptions of, or the preference for, online courses than their in-person counterparts (Bergeler, & Read, 2021; Bhattacharya et al., 2020; Pereira & Wahi, 2018; Soffer & Nachmias, 2018). On the other hand, the literature includes findings that students had more positive experiences with the face-to-face format when considering their ability to learn and retain information (Weldy, 2018) and perceptions of the teaching methodologies used for instruction (Ortega-Maldonado et al., 2017). Additional studies also reported less favorable impressions of online instructional modalities overall as compared to face-to-face learning (Abualadas, & Xu; 2023; Baker, 2016; Geng & McGinley 2021; Tratnik et al., 2019).

To add to the mixed results found in the literature, research studies have reported no statistically significant differences in student perceptions or satisfaction (Arthur Baker & Unni, 2018; Shu-Chen et al., 2018). Studies exist in which researchers concluded that there was no statistically significant evidence in differences in student opinions of the rigor of the class between online and face-to-face formats (Cipher et al., 2019) or in attitudes or preferences between the two different educational formats (Arthur Baker & Unni, 2018; Garratt-Reed et al., 2016; Miller et al., 2020). Some researchers contended that the quality of the course design or instruction is

more impactful than the course format on students' perceptions (Garratt-Reed et al., 2016; Kemp, 2020).

Degree Completion

Online programs are often associated with high attrition rates (Garratt-Reed et al., 2016; Yang et al., 2017), and this assumption remains present in the health sciences (Gazza & Hunker, 2014). However, concerning persistence, the literature revealed mixed results. Some studies reported higher degree persistence for online students (Bacolod & Chaudhary, 2018; Bettinger et al., 2017; Morgan, 2015) who graduate on time, if not earlier than expected (Fisher et al., 2022). However, a considerable number of studies in the literature revealed that students who take only online courses have higher attrition rates than students who attend at least some courses face-to-face (Bacolod & Chaudhary, 2018; Bettinger et al., 2017; Francis et al., 2019; James et al., 2016; Morgan, 2015; Smart & Saxon, 2016). However, other researchers have reported no statistically significant difference in students' attrition rates due to the program format (Cipher et al., 2019; Soffer & Nachmias, 2018).

Even less information exists that examines degree persistence in CSD. A literature review revealed only one study that investigated student persistence in CSD master's degrees, finding that online students had significantly higher withdrawal rates (Patterson & McFadden, 2009). Principles of the adult learning theory suggest that adults' ability to self-direct their learning should reduce attrition rates in online programs. However, the mixed results in the literature suggest that online adult students still require support from universities as they struggle to balance work, life, and school responsibilities.

Post-Graduate Outcomes

Career goals are a significant factor in student persistence (Yang et al., 2017). CSD programs are measured by ASHA on the employment numbers of students after graduation to maintain their accreditation standards (Council on Academic Accreditation, n.d.). While investigating if there is a difference in employment after graduation between online and face-to-face educational modalities is not a focus of this study, it is vital to investigate student employment outcomes after graduation because it might directly impact a student's persistence to complete the degree program. If students learn that their education may not produce the results they imagine, they may fail to persist in their degree or choose to change the modality. On the other hand, if they learn that their current modality is met with equal outcomes after graduation as another, they are more likely to persist to graduation. Marketability, time to obtain employment after graduation, and job promotion are all outcomes that emerged in the literature pertaining to post-graduate outcomes.

Marketability. Research suggests that potential employers view online degrees less favorably than degrees earned in face-to-face formats (Curran et al., 2017; Deming et al., 2016; Grossman & Johnson, 2016). The literature includes findings that suggested that employers viewed online degrees less favorably than face-to-face programs, especially for new hires (Curran et al., 2017; Deming et al., 2016; Roberto & Johnson, 2019). Deming et al. (2016) concluded that these findings were especially true for job positions for candidates in health field positions that did not require certification. However, it is important to note that Deming and colleagues discovered no difference in callbacks for healthcare job postings that required additional competency measures, such as a certification exam. The field of speech-language pathology requires additional competency measures beyond earning a graduate degree, including

a certification examination. Therefore, the finding of Deming et al.'s study bodes well for students attending online CSD programs.

Time to obtain employment after graduation. ASHA measures CSD programs on the percentage of graduates employed in the field one year after graduation or attending further education in the field of speech-language pathology (Council on Academic Accreditation, n.d.). A review of the literature on other health science programs revealed similar findings to Deming et al.'s (2016) study that additional competency measures eliminate the differences in online versus face-to-face students' potential marketability. In their investigation of student outcomes for students enrolled in online and face-to-face masters of science in nursing, Cipher et al. (2019) found no statistically significant difference in time to employment between the groups. Since speech-language pathologists must pass a certification examination and complete additional certification requirements, job procurement might not be impacted by any negative views of online programs. Once employment is secured, job promotion potential between online and traditional students is a theme that emerged in the literature.

Job promotion. Despite finding that human service administrators viewed traditional graduate social work programs as superior to online programs, Curran et al. (2017) found that employers who had hired online degree graduates believed those students' education and clinical skills were as good as face-to-face students. This finding could imply that an online degree does not hinder job promotion. Researchers have supported this statement (Bacolod & Chaudhary, 2018; Roberto & Johnson, 2019). In clinically-based careers, job promotion is more likely to rest on job performance rather than the type of education. With research suggesting that clinical skills can be effectively taught in online programs (Cummings et al., 2019; McCutcheon et al., 2015; Wilke et al., 2016), job promotion opportunities may not be contingent on the degree type in

clinical-based professions. Research suggests that online education might have comparable post-graduation results to face-to-face instruction, facilitating students' persistence to complete their graduate degree in CSD.

Students' Age

The adult learning theory postulates that adult students are often at different stages in life, such as being single, married, working, raising children, or caring for elderly parents (Knowles, 1980; Knowles et al., 2015). Their current stage could impact their motivation for learning and, consequently, their ability to self-direct their learning (Knowles, 1980). Age is often considered a significant factor that affects what stage adults' students are in during their education. Before engaging in a discussion of what the literature revealed concerning age and student success between the online and face-to-face learning environments, it is necessary to understand that research studies often group students into two primary categories: traditional or nontraditional. While the literature sometimes includes other criteria to differentiate between traditional and nontraditional students, such as marital and work status (Chung et al., 2017), age will be the primary distinguishing factor between the two groups for this study. Research conducted on students considered as traditional or nontraditional has generally divided students into two age groups. Traditional students are typically regarded as students 24 years of age or younger (Gulley, 2020; Jones, 2019; Woods & Frogge, 2017). The nontraditional student is generally considered 25 years of age and older (Chen, 2017; Ellis, 2019; Iloh, 2019; Jones, 2019; Spitzer, 2000). The literature includes some studies that examined traditional and nontraditional students' ability to self-direct their learning, their academic outcomes, and their degree persistence.

Age and Self-directed Learning

Students' ability to self-direct their learning is critical for success in online learning (Zhu et al., 2020). However, as postulated by Knowles, adult learners are at varying levels in their ability to self-direct their learning (Knowles, 1980). Lin and Wang (2018) suggested that traditional students and nontraditional students have different motivations for learning, impacting their self-directed learning levels. Traditional students are more likely to have a performance-avoidance goal orientation, which is the desire to appear that they have the skills to be proficient in a course. On the other hand, nontraditional students are more likely to have a mastery approach goal orientation, which is the strong desire to learn the material and master academic tasks. Mastery-approach goal orientations usually have a positive association with self-regulated learning strategies (Lin & Wang, 2018). However, when considering nontraditional adult learners (25 or older), many educators assume they are independent and self-directed learners (Spies et al., 2015). Frustration then results when nontraditional learners are dependent on the instructor, sometimes due to their previously established learning habits (Spies et al., 2015). Both online and face-to-face instructors should attempt to discern where their students are along the self-directed continuum. They should modify their instructional strategies and not assume a one-size-fits-all approach. However, this may be more difficult to achieve in the online environment, which inherently requires learners to be more independent.

Age and Academic Outcomes

Nontraditional adult learners are more likely to attend strictly online classes due to life circumstances, such as available financial and time resources (Rabourn et al., 2018). However, institutions tend to cater toward traditional learners, creating obstacles for older students (Rabourn et al., 2018). On the other hand, online education lends itself to more self-directed learning, which may foster increased academic achievement among nontraditional students. The

literature remains inconclusive in this area. Some researchers reported that traditional students had the advantage over nontraditional students in online learning (Frances et al., 2019; Glazier et al., 2020), and online nontraditional students ranked their performance lower than their nontraditional face-to-face peers (Mather & Sarkans, 2018). Glazier et al. (2020) further concluded that older students' performance decreased the more hours they took online compared to younger students, especially for older males. However, other studies have reported contrary results suggesting that nontraditional adults were more likely to obtain higher grades in the online format compared to their nontraditional peers (Slover & Mandernach, 2018) and that nontraditional students generally outperformed traditional students in both the online and face-to-face instructional formats (Gregory & Lampley, 2016; Slover & Mandernach, 2018). Certification scores sampled in one study, which included statistically older students, were higher than the national average for the online course; although there was no significant difference between the online and face-to-face students included in the study (Hansen-Suchy, 2011). Considering traditional students, Slover and Mandernach (2018) concluded that they performed similarly in both formats. The literature includes studies that concluded that nontraditional adult learners were more academically engaged than their traditional peers (Rabourn et al., 2018), which might translate into higher academic outcomes.

Age and Degree Persistence

The literature has suggested that students categorized as nontraditional, based on age, have lower degree completion rates than traditional students (Ellis, 2019). Nontraditional students frequently have additional obligations that consume their time compared to younger students, and online classes afford students more flexibility to meet those obligations (Jobe et al., 2018). However, those conflicting responsibilities may outweigh the benefits of online learning's

flexibility, resulting in higher attrition rates (Jobe et al., 2018). It is valid to investigate if degree persistence differs between traditional and nontraditional students based on the learning format.

The literature, once again, reported conflicting findings. Some researchers concluded that age is a predictor of whether or not students persist in their education to degree completion. Studies have concluded that adult learners had higher withdrawal rates (Francis et al., 2019; Knestrick, 2016), suggesting that other obligations interfered with completing such a rigorous degree (Knestrick, 2016). Additionally, Rabourn et al. (2018) reported that nontraditional adults were more likely to have begun their degree at another institution, suggesting higher attrition rates, even though they may have returned to finish their degree later.

However, further research reported that older students in the health sciences had lower withdrawal rates in the online format (Barbera et al., 2020; Cochran et al., 2014). Reporting similar findings, Wladis et al. (2015) investigated student withdrawals at the course level, potentially applied to the broader category of degree completion. They discovered that younger students were more likely to withdraw from the online courses than younger students attending the same classes in person. Still, other studies reported that age was not a factor in attrition rates in the online modality (Patterson & McFadden, 2009), although traditional students in the face-to-face learning modality were the least likely to withdraw overall (Gregory & Lampley, 2016). As online education expands to include more diverse age ranges, future research is warranted to investigate whether age plays a role in degree persistence.

Age and Student Perceptions

The flexibility and ability to balance competing obligations afforded by online education are appealing to many students, especially for older adults (Mather & Sarkans, 2018). Despite these benefits, students' perceptions of their performance in the online modality are not always

positive, although differences in perceptions are sometimes more prevalent with nontraditional students than traditional students (Mather & Sarkans, 2018). Considering students' perceptions of learning, some researchers discovered mixed results on students' perceptions (Dobbs et al., 2017). Dobbs et al. (2017) reported that students' views differed on which format was more effective, depending on if they had taken a previous online course. Statistically significant differences increased in number as the student's age increased for students who had not previously taken an online class. Interestingly, older students who had not previously taken an online course believed less learning occurred in the online format than the similar face-to-face course. Those who had previously taken an online course generally perceived that learning in the online delivery method was equivalent to learning in the face-to-face environment. Another study concluded that nontraditional learners tended to have positive perceptions of the online learning environment related to teacher practices and interactions with others, even though they reported fewer interactions with others and less sense of support from their campuses than their traditional-aged peers (Rabourn et al., 2018). One study reported that, while most students believed that more learning occurred in face-to-face classes, the traditional students outnumbered the nontraditional students in that sentiment (Barnes, 2017). A common theme is that nontraditional adults feel online learning is equivalent to face-to-face learning (at least once they have experience completing online courses), perhaps related to their higher self-directed learning skills.

Summary

Student enrollment in online master's degree programs in communication sciences and disorders is increasing in numbers. Like numerous other degrees, the online format provides educational opportunities that might have been previously unavailable to some adults. There are

existing perceptions that online education is inferior to face-to-face education (Curran et al., 2017; Deming et al., 2016). However, some research suggests that online education might be as effective as, if not better than, traditional education in various student outcomes. Studies on academic outcomes exist that favor each modality (Bettinger et al., 2017; Wilke et al., 2016; Cummings et al., 2019; Markson, 2018; Bacolod & Chaudhary, 2018), with many studies finding negligible differences between the two formats (Callister & Love, 2016; Cavanaugh et al., 2015; CIPHER et al., 2019; Girard et al., 2016; Stack, 2015). Some research suggests that persistence might be a struggle for online students (Bacolod & Chaudhary, 2018; Bettinger et al., 2017; James et al., 2016; Morgan, 2015), some showing online modalities might have an advantage for degree persistence (Bacolod & Chaudhary, 2018; Bettinger et al., 2017; Morgan, 2015), and others suggesting there is no difference between the two formats (CIPHER et al., 2019; Soffer & Nachmias, 2018).

Knowles postulated his ideas for andragogy long before online education became a viable and widespread means of education. The online model does not always account for the different characteristics that students bring to the learning environment. Knowles admitted that adults' different needs were essential factors in their ability to self-direct their learning (Knowles, 1980). When considering that Knowles postulated that adults become more self-directed learners as they advanced in years (Allen, 2016), additional research could help modernize the adult learning theory to online education. The need is especially vital for newer disciplines to the online educational model and those with minimal research found in the literature, such as the allied or health sciences. For fields with minimal research, it is valid to compare student outcomes between the two formats.

With a shortage of speech-language pathologists in the workforce, the online model might provide aspiring clinicians opportunities to earn their master's degree in CSD while balancing other life obligations. CSD online master's degree programs are limited and in the early stages of development. Therefore, a gap in the literature exists that investigates student outcomes between online and face-to-face graduate students. A review of the literature revealed that minimal studies have examined the outcomes of students enrolled in online CSD master's programs. This study investigated student outcomes in both modalities. Beginning with investigating outcomes required for universities to establish or maintain their program's accreditation with ASHA is an important starting point. This study aimed to discover if online CSD graduate students have similar outcomes to face-to-face students related to graduation rates, certification examination pass rates, and certification examination scores. With minimal research investigating these student outcomes, this study adds valuable information to the literature and provides a starting point for additional research. Additionally, this study adds information to the literature on the adult learning theory, or andragogy, and how it applies to online learning in the allied and health science fields.

CHAPTER THREE: METHODS

Overview

The purpose of this quantitative causal-comparative, predictive correlational study is to investigate the relationship between the educational modality (online versus face-to-face) and age category on CSD graduate students' performance on the national certification examination and degree completion rates in program-defined timelines. Chapter three begins by introducing the design of the study, including complete definitions of all variables. The research questions and null hypotheses follow. The participants and setting, instrumentation, procedures, and data analysis plans are presented.

Design

This nonexperimental quantitative study will include both causal-comparative and predictive correlation research designs. Nonexperimental research involves investigating previously formed groups rather than the researcher creating the groups (Sriram, 2017), and the researcher cannot manipulate the independent variable (Warner, 2013). For this study, the independent variables will not be manipulated by the researcher. The groups will be formed before the study because students previously chose to earn their graduate degree in CSD in either a face-to-face or an online program. Causal-comparative research examines the differences between the independent and dependent variables from previously established groups (Umstead & Mayton, 2018), and *ex post facto* research occurs after the fact (Gall et al., 2007). This study's independent variables will be categorical, a factor of this research design (Gall et al., 2007). Correlational research determines the degree of relationships between two or more variables (Gall et al., 2007; Seeram, 2019). According to Grove et al. (2014), predictive correlational research is concerned with predicting the level of the dependent variable based on the values of

the independent variable (as cited in Seeram, 2019). The predictive correlational research design allows for categorical variables (Gall et al., 2007; Warner, 2013). The data for this study will consist of information gathered about students who were previously enrolled in a master's degree in communication sciences and disorders.

The independent/predictor variables for both research designs will be the educational format and age category. The educational format will be categorized as either online or face-to-face. Online education consists of learning not bound to a physical location, and teaching content is delivered through the internet in asynchronous or synchronous contexts (Sing & Thurman, 2019). Face-to-face learning occurs within physical proximity, such as the classroom (Louis-Jean & Cenat, 2020). Students' age will be categorized into one of three age groups at the time of their enrollment, which includes students 24 years of age and younger (Jinkens, 2009; Justice & Dornan, 2001), students between the ages of 25 and 34 (Heretick & Tanguma, 2020; Morris & Rust, 2020), and students who are 35 years or older (Gulley, 2020; National Center for Education Statistics, 2015; Spitzer, 2000).

The dependent variable for the causal-comparative research design are students' scores on the national certification examination, the Praxis II Examination in Speech-Language Pathology. The Praxis II Examination in Speech-Language Pathology is a standardized test that clinicians must pass to become certified speech-language pathologists (American-Speech-Language-Hearing Association, n.d.-b). Students obtain a score between 100 and 200, with 162 considered a passing score (Educational Testing Service, n.d.-b). The criterion variables for the predictive correlational design will be students' success status of reaching at least the minimum required score deemed acceptable by ASHA and degree completion rates in program-defined timelines,

measured in calendar years, or the time it takes a student to meet all the curriculum requirements for graduation (Kappe & Van Der Flier, 2012; Yue et al., 2017).

Research Questions

RQ1: Is there a statistically significant difference in national certification examination scores for communication sciences and disorders graduate students based on the educational format (online versus face-to-face) and age category?

RQ2: How accurately can success on the national certification examination on the first attempt be predicted from a linear combination, for communication sciences and disorders graduate students based on the educational format (online versus face-to-face) and age category?

RQ3: How accurately can degree completion in program-defined timelines be predicted from a linear combination of communication sciences and disorders graduate students' educational format (online versus face-to-face) and age category?

Hypotheses

The null hypotheses for this study are:

H₀1: There is no statistically significant difference on the national certification examination for communication sciences and disorders graduate students' scores based on the educational format (online versus face-to-face) and age category, as shown by student scores on the Praxis II Exam in Speech-Language Pathology.

H₀2: There will be no significant predictive relationship between the criterion variable, the success outcome on the national certification examination for communication sciences and disorders graduate students on the first attempt, and the linear combination of educational modality (online and face-to-face) and age category, as shown by student performance on the Praxis II Exam in Speech-Language Pathology.

H₀₃: There will be no significant predictive relationship between the criterion variable, degree completion in the program-defined completion timeline, and the linear combination of educational modality (online and face-to-face) and age category.

Participants and Setting

The following section will discuss the participants and setting of this study. Specific information relating to the population and participants is included. The setting is also described.

Population

This study's population included graduate-level, adult students previously enrolled in either an online or face-to-face CSD master's degree program. Student data was obtained as a convenience sample from one university in the midwestern United States.

Participants

The sample size was 181 participants, which exceeds the required minimum of 144 for a two-way ANOVA with 3 groups when assuming a medium effect size with statistical power of .7 and alpha level, $\alpha = .05$ (Gall et al., 2007, p. 145). Each group consisted of approximately the same number of participants to keep the group sizes similar. The sample included students from one university that offers both an online learning program and a face-to-face CSD master's programs located throughout the United States from each of the 2017-2018, 2018-2019, 2019-2020, and 2021-2022 academic years. The sample was categorized by educational modality and age category to create nominal levels of measurement for the chosen statistical analyses.

Students were categorized into groups based on the educational format (online learning or face-to-face) that they were enrolled in to earn their CSD graduate degree. The Online program offered most of their learning experiences remotely and may have included both asynchronous and synchronous learning experiences (Sing & Thurman, 2019). The face-to-face programs

offered instruction primarily through in-person instruction in a traditional classroom (Louis-Jean & Cenat, 2020). The sample included 98 online students and 83 face-to-face students.

When considering age categories, researchers have commonly divided students into two age groups: traditional and nontraditional. Research has classified traditional students as 23 and younger (Spitzer, 2000), with some researchers grouping 24-year-old students in the traditional groups (Jinkens, 2009; Justice & Dornan, 2001). Many studies categorized nontraditional students as 25 years of age and older (Spitzer, 2012; Gulley, 2020). When considering an advanced degree, it might be appropriate to expand age groups further, especially when considering andragogy's theoretical concepts. Research exists that considered various age groups, including 26-49, over 35, and over 50 (Heretick, & Tanguma, 2020; Morris & Rust, 2020). The National Center for Education Statistics (2015) further separates student age groups in their statistical reports into smaller units until the final category of 35 years and older. With guidance from the literature and considering that students in this study were enrolled in a graduate program (which assumes previous higher education), this study's sample was broken down into three primary age groups. The sample consisted of 8 students 24 years of age or younger, 42 students between the ages of 25-34 years of age, and 48 students 35 years of age or older at the time of enrollment from online programs. The sample also consisted of 60 students 24 years of age or younger, 20 students between the ages of 25-34 years of age, and 03 students 35 years of age or older at the time of enrollment from face-to-face programs.

Setting

The setting included graduate students who were previously enrolled in a master's program in Communication Sciences and Disorders from one university in the midwestern

United States. Students were either enrolled in an online program or a face-to-face program within the same university.

Instrumentation

The instrument used to assess the dependent variable for the first and second hypotheses was the Praxis II Examination in Speech-Language Pathology (American-Speech-Language-Hearing Association, n.d.-c). This instrument was used in numerous studies (Baggs et al., 2015; Boles, 2018; Kjølgaard & Guarino, 2012). According to Boles (2018), the Praxis series examinations provide a testing tool to help support states' licensing and certification processes.

To ensure validity, the Praxis series examinations are developed using the rigorous guidelines outlined in the *Standards for Educational and Psychological Testing* (American Psychological Association, 2014). The validity of the test is determined by various aspects and is based on the degree that the evidence supports the interpretation of the scores for their intended use. The *Standards for Educational and Psychological Testing* used the term validity to refer to distinct types of validity and did not utilize traditional terms such as content or predictive validity (American Psychological Association, 2014). The Praxis series examinations' validity is determined by evidence gathered on the multiple constructs as explained by the American Psychological Association (2014). One source is the evidence based on test content. Test content can be interpreted logically or empirically to assess if the tested items and test scores are relevant to the content domain (e.g., occupation standards). Another source utilized to determine validity is the evidence based on response process. This construct is concerned with the theoretical and empirical analyses of the cognitive processes required of the test takers and if they are related to the purpose of the test. Evidence based on the internal structure of the test is another construct utilized for test validity. It involves inspecting if the test items relate to the construct that is the

basis for the test scores' interpretation. Another source examined to assess validity is the evidence based on relations to other variables. This construct considers the test scores' relationship to external variables, such as the criteria that the test is meant to predict (e.g., performance criteria). It includes convergent and discriminant evidence, test-criterion relationships, and validity generalization. Finally, the construct of the evidence for validity and consequences of testing is considered. This concept uses evidence to assess the soundness of the proposed interpretation of the test items for their projected use and any unintended consequence of the tests that could be positive (e.g., improved student motivation to learn the material) or negative (e.g., different outcomes for different groups such as age, race, or gender). The Praxis Series examinations' internal consistency reliability is calculated using Kuder and Richardson's (1937) formula, KR 20 (as cited in Educational Testing Service, 2020). The Praxis examination for Speech-Language Pathology is considered reliable, with a KR 20 Cronbach's alpha reliability coefficient of .845 (Educational Testing Service, 2020).

Specifically, for the Praxis II Examination in Speech-Language Pathology, a panel of experts meets every 5-7 years to examine the current roles and expected knowledge base of speech-language pathologists based on input from various stakeholders in the field (Boles. 2018). The exam consists of 132 selected-response questions that assess: (1) foundational knowledge and professional practices (approximately 44 questions); (2) screening, assessment, evaluation, and diagnosis (approximately 44 questions); and (3) planning, implementation, and evaluation of treatment (approximately 44 questions). The selected-response questions require test-takers to choose from a list of choices. The test scores are reported on a scale from 100 to 200, and ASHA sets the passing score at 162 (Educational Testing Service, n.d.-b). Permission will be obtained to use this instrument. The second hypothesis will be tested through archival data from the

participating universities on whether students completed their degree in the program's specified completion timelines.

Procedures

Institutional Review Board (IRB) approval was secured (See Appendix A). After IRB approval was granted, research agreements were established with the participating university for the use and release of detailed student information, including students' age category, certification examination score, and degree completion timeframe (See Appendix B). Data was gathered from the participating university. All student data from the university in the study was entered into an excel database. The excel database was password protected to ensure confidentiality. All students for which data was provided were included in the study. The data from the participants was entered into the SPSS statistical software. Students' age were entered as a 0 for under 25 years of age, a 1 for 25-34 years of age, and 3 for 35 years of age or older. For the dependent variables, students' exact numerical scores on the Praxis Speech Language Pathology certification exam were entered. Students were assigned a 0 for success on the Praxis II examination (a score of 162 or above) or a 1 for not successful on the Praxis II exam (a score of 161 or below). Finally, students' degree completion time in the program-specified completion timeframe was entered as 0 if the student completed the program in the specified timeframe and a 1 if the student did not complete the program in the specified timeframe. The data was analyzed, interpreted, and reported as it relates to the research questions and hypotheses. Participants' information was kept confidential through password-protected files and anonymous numbers assigned to each participants' data during the analysis.

Data Analysis

To investigate hypothesis one, whether the students' educational modality and age category impact their scores on the national certification examination, a two-way analysis of variance (ANOVA) was conducted because there are two categorical independent variables and a continuous dependent variable. An ANOVA determines if a statistically significant difference exists between the means of two or more groups on a dependent variable (Gall et al., 2007; Warner, 2013), and a two-way ANOVA compares the means between groups when there is more than one categorical independent variable (Laerd Statistics, 2017-a). Following the assumptions of a one-way ANOVA, the assumptions of a two-way ANOVA require that: (1) the dependent variable be quantitative at the interval or ratio (continuous) level of measurement, (2) the two independent variables will be categorical, (3) the data be normally distributed with no extreme outliers, (4) the variance approximately equal across groups, and (5) the samples be independent of each other (Warner, 2013; Laerd statistics, n.d.-a). The data used to test this hypothesis was at the interval level of measurement since there is no absolute zero on the Praxis II examination in Speech Language Pathology (Warner, 2013), fulfilling the first assumption that the dependent variable is continuous at an interval or ratio level of measurement. The independent variables were categorical, which meets the criteria of the second assumption. Considering the third assumption of a two-way ANOVA that requires data to be normally distributed, and the Kolmogorov-Smirnov was also used to examine normality (Warner, 2013). A Box and Whiskers plot to inspect for outliers will be examined (Warner, 2013). The fourth assumption that the variance should be relatively equal across groups will be assessed using a Levene test (Warner, 2013). The effect size was reported using eta square (η^2) with a 0.05 alpha level. The sample groups were independent of each other since students either attended an online or face-to-face graduate program, satisfying the fifth assumption of a Two-way ANOVA.

The data for hypotheses two and three, success status on the national certification examination and degree completion in program-defined timelines, was analyzed using the logistic regression model because the criterion variable is dichotomous. Logistic regression can analyze data when the dependent variable is dichotomous (Warner, 2013). There are seven assumptions to logistic regression (Laerd Statistics, n.d.-b). This study met the first four assumptions of this design which include: (1) a dichotomous criterion variable, (2) one or more independent variables that can be continuous or nominal (nominal for this study), (3) no relationship between the observations in each category of the dependent variable and each category of the independent variables, and (4) a sample larger than 15 cases per independent variable ((Laerd Statistics, n.d.-b). The fifth assumption is that there is a linear relationship between a continuous independent variable and the logit transformation of the dependent variable (Laerd Statistics, n.d.-b). This assumption was not relevant to this study since the independent variables are nominal. The sixth assumption is that multicollinearity is not present if there are two or more independent variables (Laerd Statistics, n.d.-b). Multicollinearity is the degree of correlation between the predictor (independent) variables, with a high correlation suggesting that one variable is completely predictable from another variable (Laerd Statistics, 2017-b; Warner, 2013). An inspection of the correlation coefficients and the tolerance/variance inflation factor (VIF) values can detect multicollinearity (Laerd Statistics, n.d.-b). Since the variables are categorical, the seventh assumption of no outliers was not relevant to this study, but Casewise Diagnostics was inspected (Laerd Statistics, n.d.-b). The Omnibus Tests of Model Coefficients and the Hosmer and Lemeshow tests inspected how well the model fits the data. Cox and Snell's R^2 and the Nagelkerke R^2 tests was used to evaluate the variance in the dependent variable. The effect size was reported using the Wald test (χ^2) with a 0.05 alpha level.

The logs odds (B coefficients) and odds ratio, [Exp (B)], were also reported. Since two tests of significance were conducted, a Bonferroni correction was needed to guard against type I error. The alpha level was calculated to be: $0.05/2 = .025$, rounded to .03 (Warner, 2013).

CHAPTER FOUR: FINDINGS

Overview

The purpose of this study was to investigate the relationship between the educational modality (online versus face-to-face) and age category on CSD graduate student's performance on the national certification examination and degree completion rates in program-defined timelines. The independent variables were educational modality and age category. The dependent variables were ratio (praxis exam scores) and dichotomous (exam pass or fail/not taken and degree completion in program-defined timelines). A Two-ANOVA was used to test the first null hypothesis and a logistic regression was used to test the second and third null hypotheses. The Findings section includes the research questions, the null hypotheses, data screening, descriptive statistics, assumption testing, and results.

Research Questions

RQ1: Is there a statistically significant difference in national certification examination scores for communication sciences and disorders graduate students based on the educational format (online versus face-to-face) and age category?

RQ2: How accurately can success on the national certification examination on the first attempt be predicted from a linear combination, for communication sciences and disorders graduate students based on the educational format (online versus face-to-face) and age category?

RQ3: How accurately can degree completion in program-defined timelines be predicted from a linear combination of communication sciences and disorders graduate students' educational format (online versus face-to-face) and age category?

Null Hypotheses

H₀1: There is no statistically significant difference on the national certification examination for communication sciences and disorders graduate students' scores based on the educational format (online versus face-to-face) and age category, as shown by student scores on the Praxis II Exam in Speech-Language Pathology.

H₀2: There will be no significant predictive relationship between the criterion variable, the success outcome on the national certification examination for communication sciences and disorders graduate students on the first attempt, and the linear combination of educational modality (online and face-to-face) and age category, as shown by student performance on the Praxis II Exam in Speech-Language Pathology.

H₀3: There will be no significant predictive relationship between the criterion variable, degree completion in the program-defined completion timeline, and the linear combination of educational modality (online and face-to-face) and age category.

Descriptive Statistics

For each group, descriptive statistics were obtained on the dependent variables (Praxis score, pass or fail/not attempted, and graduation within program defined timelines). Descriptive statistics are found in Table 1.

Table 1*Descriptive Statistics*

Dependent Variable: Praxis Score

Educational Modality	Age Category	<i>n</i>	<i>M</i>	<i>SD</i>
F2F	< 25	60	181.68	7.094
	25-34	20	180.20	9.123
	>34	3	176.67	4.933
	Total	83	181.14	7.566
Online	< 25	8	179.00	5.529
	25-34	42	178.21	9.033
	>34	48	182.10	8.533
	Total	98	180.18	8.695
Total	< 25	68	181.37	6.947
	25-34	62	178.85	9.035
	>34	51	181.78	8.432
	Total	181	180.62	8.188

Results

(H₀₁): There is no statistically significant difference on the national certification examination for communication sciences and disorders graduate students' scores based on the educational format (online versus face-to-face) and age category, as shown by student scores on the Praxis II Exam in Speech-Language Pathology.

Data Screening

Data screening was conducted on each group's dependent variable. The researchers scanned for data entry errors and inconsistencies. No data errors or inconsistencies were identified. Box and whiskers plots were used to detect outliers in the dependent variable. No outliers were detected. See Figure 1 for box and whisker plots.

Figure 1

Box and whisker plot (Face- to-Face; Age Category <25)

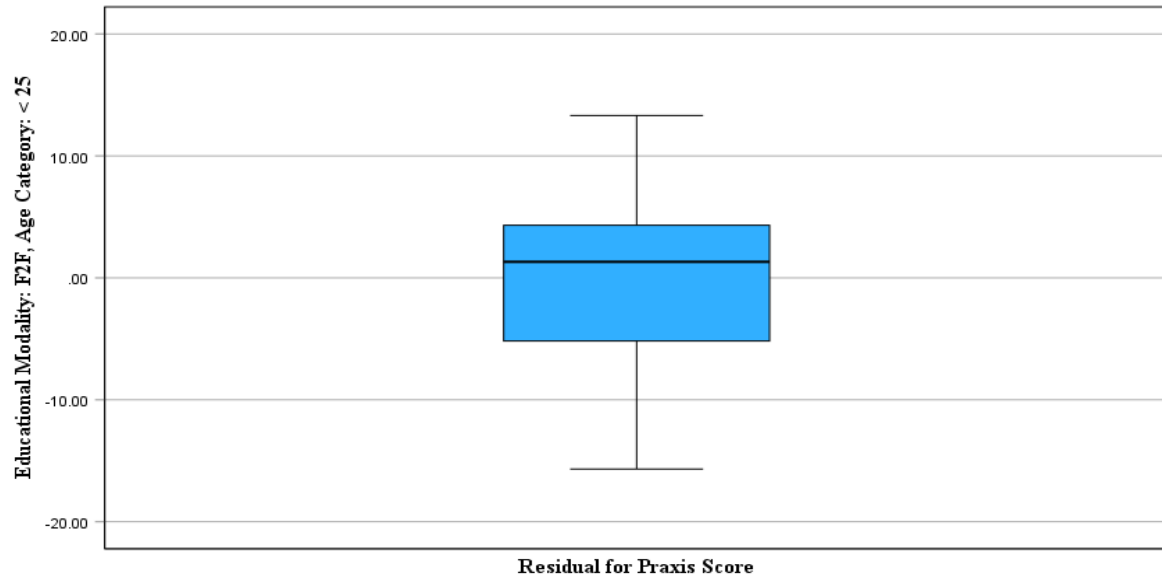


Figure 2

Box and whisker plot (Face- to-Face; Age Category 25-34)

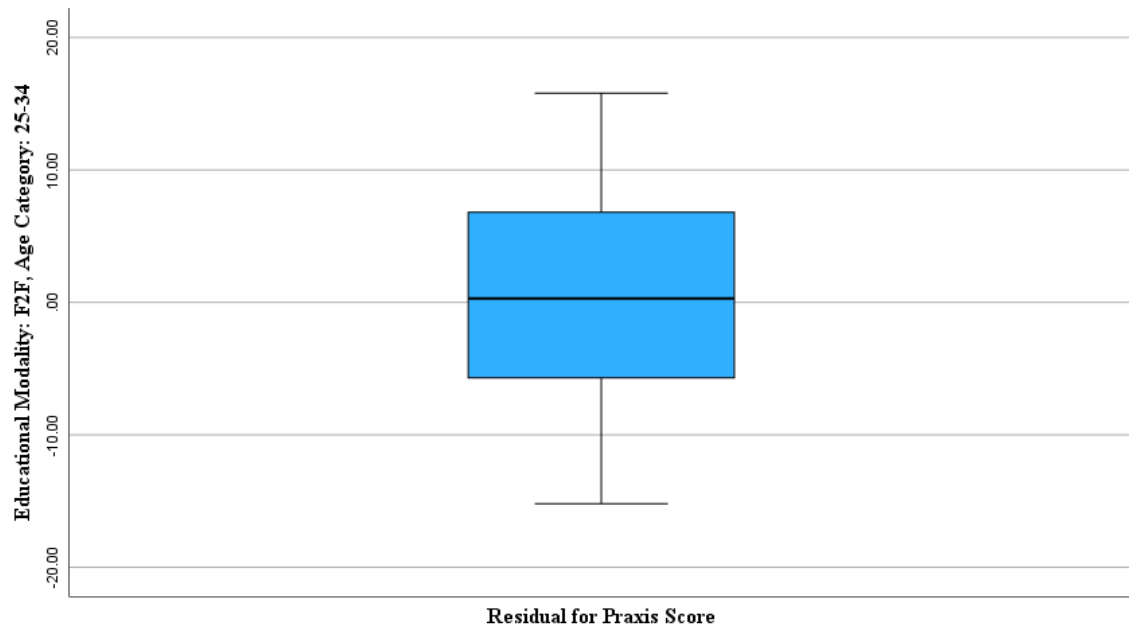


Figure 3
Box and whisker plot (Face-to-Face; Age Category >35)

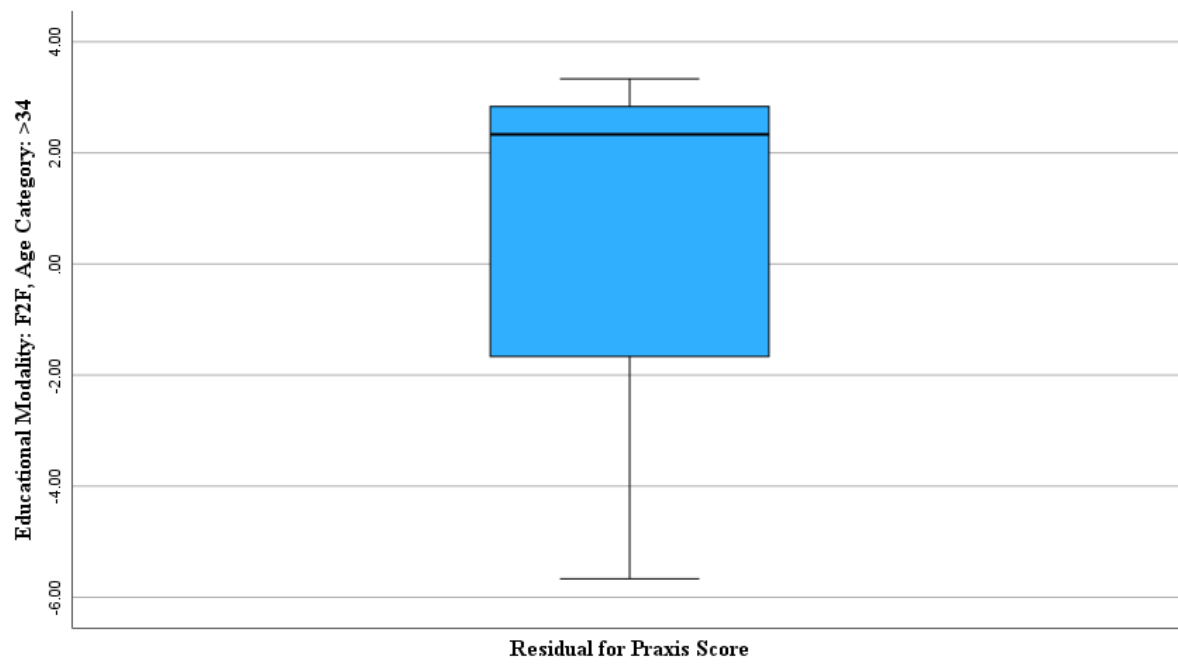


Figure 4
Box and whisker plot (Online; Age Category >35)

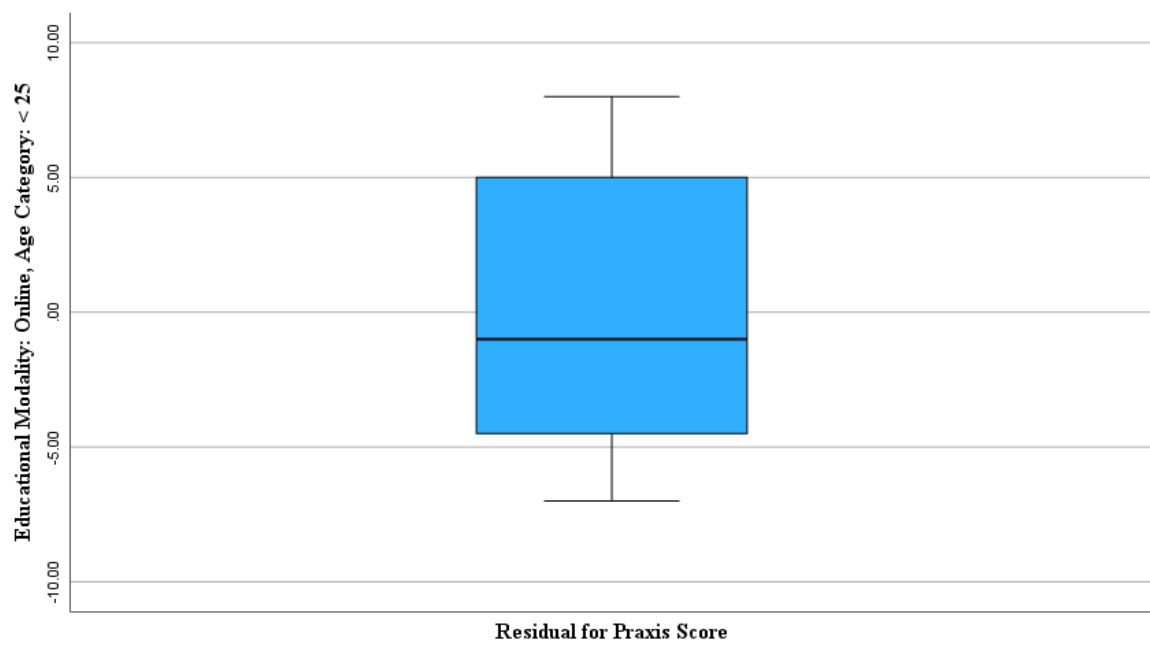


Figure 5
Box and whisker plot (Online; Age Category <25)

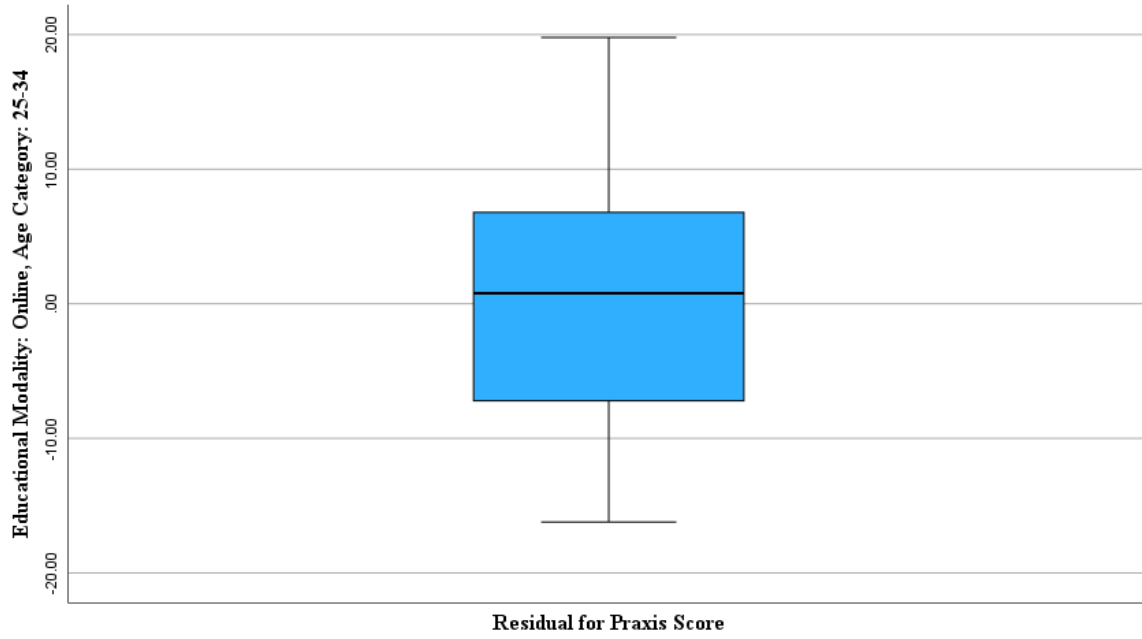
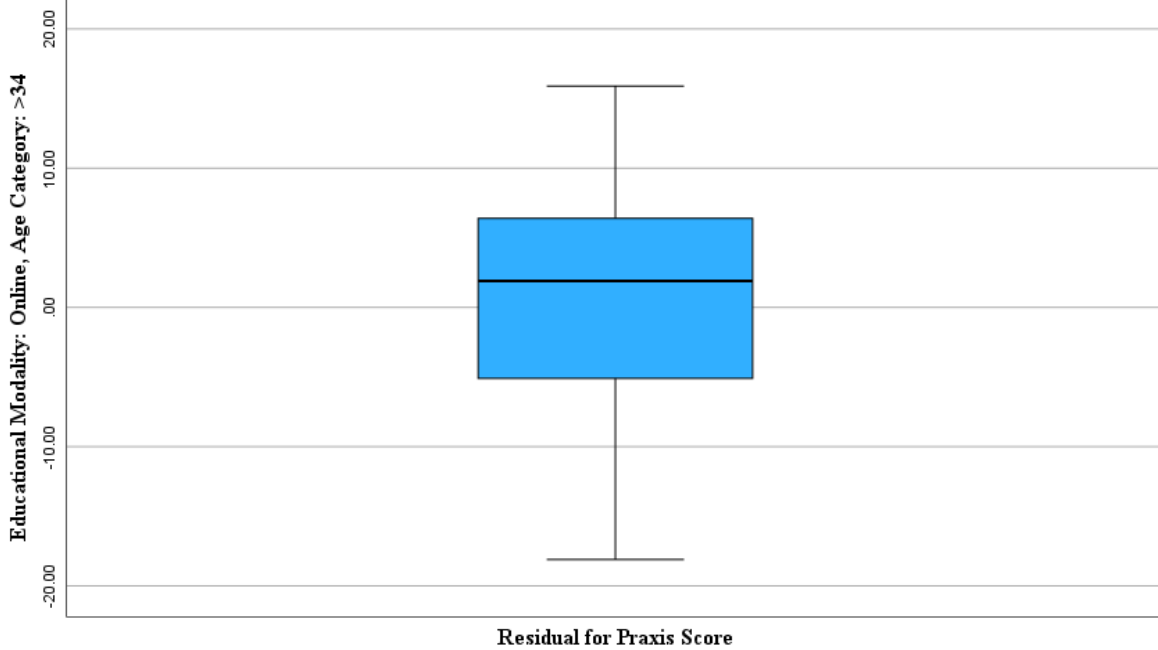


Figure 6
Box and whisker plot (Online; Age Category 25-34)



Assumptions

A Two-Way Analysis of Variance (ANOVA) was used to test the null hypothesis. The ANOVA required that the assumptions of normality and the homogeneity of variance are met. Normality was examined using a Kolmogorov-Smirnov test. The Kolmogorov-Smirnov was used because the sample size was more than 50. One value was missing due to a smaller sample size (F2F >3) in that category. No other violations of normality were found. Due to the missing value in the Kolmogorov-Smirnov test, the Shapiro-Wilke test was used. See Table 2 for Tests of Normality.

Table 2

Tests of Normality

Educational Modality			Kolmogorov-Smirnov ^a			Shapiro-Wilk		
			Statistic	<i>df</i>	Sig.	Statistic	<i>df</i>	Sig.
F2F	< 25	Residual for Praxis Score	0.095	60	.200*	0.977	60	0.311
	25-34	Residual for Praxis Score	0.109	20	.200*	0.963	20	0.607
	>34	Residual for Praxis Score	0.349	3		<u>0.832</u>	3	0.194
Online	< 25	Residual for Praxis Score	0.141	8	.200*	0.944	8	0.647
	25-34	Residual for Praxis Score	0.075	42	.200*	0.979	42	0.626
	>34	Residual for Praxis Score	0.112	48	0.174	0.967	48	0.194

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Assumption of Homogeneity of Variance

The assumption of homogeneity of variance was examined using Levene's test. No violation was found where $p = .223$. The assumption of homogeneity of variance was met.

Results for Null Hypothesis One

A two-way ANOVA was used to test the null hypothesis regarding the praxis exam scores based on students' educational modality and age category. The null hypothesis was not rejected at a 95% confidence level where $F(2, 175) = 1.119$, $p = .329$, $\eta_p^2 = .013$. The effect size was small. See Table 3 for Tests of Between-Subjects Effects.

Table 3

Tests of Between-Subjects Effects

Dependent Variable: Praxis Exam Scores

Source	Type III Sum of Squares	<i>df</i>	<i>M</i>	<i>F</i>	Sig.	Partial Eta Squared
Corrected Model	488.052 ^a	5	97.610	1.475	0.200	0.040
Intercept	2039524.214	1	2039524.214	30820.759	0.000	0.994
Educational Modality	1.037	1	1.037	0.016	0.901	0.000
Age Category	24.333	2	12.167	0.184	0.832	0.002
Educational Modality * Age Category	148.049	2	74.025	1.119	0.329	0.013
Error	11580.401	175	66.174			
Total	5917219.000	181				
Corrected Total	12068.453	180				

a. R Squared = .040 (Adjusted R Squared = .013)

(H₀₂): There will be no significant predictive relationship between the criterion variable, the success outcome on the national certification examination for communication sciences and disorders graduate students on the first attempt, and the linear combination of educational

modality (online and face-to-face) and age category, as shown by student performance on the Praxis II Exam in Speech-Language Pathology.

Data Screening

The researcher sorted the data and scanned for inconsistencies on each variable. No data errors or inconsistencies were identified. Extreme outliers are points that do not fit the regression model well. Casewise diagnostics were used to examine extreme outliers, which are cases with standardized residuals greater than 2.5. Two outliers were identified, as indicated in Table 4 with standardized residuals of 2.921 and 2.988, which were kept in the analysis.

Table 4

Casewise List^b

Case	Selected Status ^a	Observed Pass - Fail	Predicted	Predicted Group	Temporary Variable		
					Resid	ZResid	SResid
7	S	F**	0.015	P	0.985	8.109	2.921
127	S	F**	0.012	P	0.988	9.012	2.988

a. S = Selected, U = Unselected cases, and ** = Misclassified cases.

b. Cases with studentized residuals greater than 2.000 are listed.

Assumption Testing

Assumption of Linearity

Linearity was not conducted because all variables were categorical.

Assumption of the Absence of Multicollinearity

A Variance Inflation Factor (VIF) test was conducted to ensure the absence of multicollinearity. This test was run because if an independent variable (x) is highly correlated with another independent variable (x), they essentially provide the same information about the dependent variable. If the Variance Inflation Factor (VIF) is too high (greater than 10), then multicollinearity is present. Acceptable values are between 1 and 5. The absence of

multicollinearity was met between the variables in this study. See Table 5 for collinearity statistics.

Table 5

Collinearity Statistics

Model		Collinearity Statistics	
		Tolerance	VIF
1	Educational Modality	0.539	1.857
	Age Category	0.539	1.857

a. Dependent Variable: Pass_Fail

Results of Null Hypothesis Two

A binary logistic regression was conducted to determine if a passing or failing score on/not attempting the Praxis II exam can be predicted from a combination of educational modality and age category for graduate students in graduate program in Communication Sciences and Disorders (Speech-Language Pathology). The null hypothesis was not rejected. The logistic regression model was not statistically significant, $\chi^2(3) = .823, p = .663$ as seen in Table 6.

Table 6

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	0.823	2	0.663
	Block	0.823	2	0.663
	Model	0.823	2	0.663

The model explained 4% (Nagelkerke R^2) of the variance in graduation status as shown in Table 7.

Table 7*Model Summary*

Step	-2 Log likelihood	Cox & Snell R ²	Nagelkerke R ²
1	21.198 ^a	0.005	0.040

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.

and correctly classified 98.9% of cases, sensitivity was 100%, specificity was 0%, in Table 8.

The positive predictive value was 98.9% and the negative predictive value was 0%.

Table 8f*Classification Table^{a,b}*

		Predicted			
		Pass	Fail		
Observed	Pass_Fail	Pass	Fail/Not Attempted	Percentage Correct	
		Fail/Not Attempted	Pass		
Step 0	Pass_Fail	Pass	180	0	100.0
		Fail/Not Attempted	2	0	0.0
Overall Percentage					98.9

a. Constant is included in the model.

b. The cut value is .500

None of the independent variables were statistically significant as shown in Table 9.

Table 9*Variables in the Equation*

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step	Educational Modality	0.932	1.772	0.276	1	0.599	2.539	0.079	81.915
1 ^a	Age Category	-1.143	1.323	0.746	1	0.388	0.319	0.024	4.263
	Constant	-4.186	1.017	16.944	1	0.000	0.015		

a. Variable(s) entered on step 1: Educational Modality, Age Category.

(H₀₃): There will be no significant predictive relationship between the criterion variable, degree completion in the program-defined completion timeline, and the linear combination of educational modality (online and face-to-face) and age category.

Data Screening

The researcher sorted the data and scanned for inconsistencies on each variable. No data errors or inconsistencies were identified. Extreme outliers are points that do not fit the regression model well. Casewise diagnostics were used to examine for extreme outliers, which are cases with standardized residuals greater than 2.5. Eight outliers were identified, as indicated in Table 10 with standardized residuals ranging between 2.262 and 2.859, which were kept in the analysis.

Table 10

Casewise List^b

Case	Selected Status ^a	Observed Degree Completion in Program-Defined Timelines	Predicted	Predicted Group	Temporary Variable		
					Resid	ZResid	SResid
7	S	N**	0.018	Y	0.982	7.476	2.859
65	S	N**	0.035	Y	0.965	5.239	2.614
127	S	N**	0.041	Y	0.959	4.806	2.540
128	S	N**	0.041	Y	0.959	4.806	2.540
169	S	N**	0.081	Y	0.919	3.369	2.262
173	S	N**	0.081	Y	0.919	3.369	2.262
176	S	N**	0.081	Y	0.919	3.369	2.262
186	S	N**	0.081	Y	0.919	3.369	2.262

a. S = Selected, U = Unselected cases, and ** = Misclassified cases.

b. Cases with studentized residuals greater than 2.000 are listed.

Assumption Testing

Assumption of Linearity

Linearity was not conducted because all variables were categorical.

Assumption of the Absence of Multicollinearity

A VIF test was conducted to ensure the absence of multicollinearity. This test was run because if an independent variable (x) is highly correlated with another independent variable (x), they essentially provide the same information about the dependent variable. If the VIF is too high (greater than 10), then multicollinearity is present. Acceptable values are between 1 and 5. The absence of multicollinearity was met between the variables in this study. See Table 11 for collinearity statistics.

Table 11

Collinearity Statistics

Model	Collinearity Statistics	
	Tolerance	VIF
1 Educational Modality	0.532	1.881
Age Category	0.532	1.881

a. Dependent Variable: Degree Completion in

Program-Defined Timelines

Results of Hypothesis 3

A binary logistic regression was conducted to determine if a passing or failing score on or not attempting on Praxis II exam can be predicted from a combination of educational modality and age category for graduate students in graduate program in Communication Sciences and Disorders (Speech-Language Pathology). The null hypothesis was not rejected. The logistic regression model was not statistically significant, $\chi^2(3) = 2.842, p = .241$ as seen in Table 12.

Table 12

Omnibus Tests of Model Coefficients

	Chi-square	df	Sig.
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Step 1	Step	2.842	2	0.241
	Block	2.842	2	0.241
	Model	2.842	2	0.241

The model explained 5% (Nagelkerke R^2) of the variance in degree completion as shown in Table 13.

Table 13

Model Summary

Step	-2 Log likelihood	Cox & Snell R^2	Nagelkerke R^2
1	63.149 ^a	0.015	0.051

and correctly classified 95.7% of cases, sensitivity was 100%, specificity was 0%, in Table 14.

The positive predictive value was 95.7% and the negative predictive value was 0%.

Table 14

Classification Table^a

Observed		Predicted			
		Degree Completion in Program-Defined Timelines		Percentage Correct	
		Yes	No		
Step 1	Degree Completion in Program-Defined Timelines	Yes	178	0	100.0
		No	8	0	0.0
Overall Percentage					95.7

a. The cut value is .500

None of the independent variables were statistically significant as shown in Table 15.

Table 15

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Educational Modality	0.172	1.081	0.025	1	0.873	1.188	0.143	9.897
	Age Category	0.711	0.634	1.257	1	0.262	2.036	0.588	7.053
	Constant	-4.023	0.797	25.466	1	0.000	0.018		

a. Variable(s) entered on step 1: Educational Modality, Age Category.

CHAPTER FIVE: CONCLUSIONS

Overview

The purpose of chapter five is to explore the findings of this study. A discussion on the results of the statistical analyses used to investigate all three research questions to draw conclusions is included. This chapter begins with a analysis of the findings including their relationship to the adult learning theory and prior research studies. Following the analysis, the implications and limitations of the study are considered and suggestions for future research are recommended.

Discussion

The purpose of this quantitative causal-comparative, predictive correlational study was to investigate the relationship between the educational modality (online versus face-to-face) and age category on CSD graduate students' performance on the national certification examination and degree completion rates in program-defined timelines. A discussion of each research question will examine the findings of this study. A discussion is included on how the results of this study relates to the adult learning theory (andragogy) and prior related studies.

Results of Hypothesis One

H₀₁: There is no statistically significant difference on the national certification examination for communication sciences and disorders graduate students' scores based on the educational format (online versus face-to-face) and age category, as shown by student scores on the Praxis II Exam in Speech-Language Pathology.

A two-way ANOVA test investigated if there was statistically significant relationship between CSD graduate students' educational modality (online and face-to-face) and age category on their scores on the praxis exam. The results of the two-way ANOVA analysis failed to reject

the null hypothesis. There was no statistically significant difference discovered between online and face-to face students on their Praxis II exam score. Additionally, age category related to educational modality showed no significant relationship to students' scores on the certification exam. Limited studies exist in literature that specifically exam national certification examinations, and none were discovered in the CSD field. However, studies exist for other degrees that favored exams scores for online education students (Dolezal & McLeod, 2017) and others that favored face-to-face education students (Morgan, 2015). However, the results of this study support the findings of researchers that found no statistically significant difference in certification exam scores (Cameron, 2013; Cipher et al., 2019) related to educational modality and age category.

Examination of the descriptive statistics indicated that nontraditional students were more likely to attend the online educational modality than their traditional peers, who were more likely to choose the face-to-face format. This supports the findings of Rabourn et al. (2018) that nontraditional adult learners are more likely to attend online classes. Based on the fourth principle of andragogy, Readiness to Learn, the finding that more nontraditional students chose the online format suggests that life situations play a large role in their choice (Knowles 1980; Knowles et al., 2015). The necessity of possible increased responsibilities in the nontraditional student category (work, family, etc..) lend to the concept that online students are proficient self-directed learners (Knowles, 1980; Knowles et al., 2015). The result of this hypothesis suggests that online students have adequate adult learning strategies as postulated by Knowles including readiness to learn, orientation to learning, and motivation to perform successfully on the national examination. Experience may also enhance their success (Knowles, 1980). It should be noted that online traditional students (under 25) also statistically experienced the same level of success

in the distance education format as their face-to-face peers and as their nontraditional counterparts in this study.

While this study did not exam academic outcomes related to grades, the ability to obtain scores on the national examination that are not statistically different, suggests that the acquisition of knowledge was similar between both educational modalities and age categories, which contradicts studies that found an advantage for traditional online learners (Frances et al., 2019; Glazier et al., 2020; Mather & Sarkans, 2018) and those that found an advantage for nontraditional online and face-to-face learners (Slover & Mandernach, 2018; Gregory & Lampley, 2016; Hansen-Suchy, 2011). However, the results of this study did support the findings of Sloever and Mandernach (2018) that traditional students perform similarly in both educational formats. Based on the analysis of this question, both online and face-to-face CSD graduate studies appear to have a statistically equal advantage of obtaining similar scores on the Praxis II. It can be inferred from these results that students who have adequate skills of the various principles of andragogy can find success in taking a certification examination outside of the factors of online education and age.

Results of Hypothesis Two

H₀2: There will be no significant predictive relationship between the criterion variable, the success outcome on the national certification examination for communication sciences and disorders graduate students on the first attempt, and the linear combination of educational modality (online and face-to-face) and age category, as shown by student performance on the Praxis II Exam in Speech-Language Pathology

A logistic regression investigated whether the likelihood of passing or failing/not attempting the Praxis Exam could be predicted based on educational modality and age category.

The logistic regression failed to reject the null hypothesis. Outliers that were detected for the students who did not pass or take the praxis exam because the majority of students passed the examination. Therefore, the outliers were included in the study. While the first hypothesis did not find a statistically significant difference in scores, it did not evaluate if those scores were passing, failing, or if the student did not attempt the Praxis exam, with the latter two resulting in an inability to obtain certification through ASHA.

Once again, the researcher failed to reject the null, lending support to the tenants of adult learning theory, primarily indicating that adult learners can be successful in various learning environments if the adult learner possess at least some of the principles of andragogy (Knowles et al., 2015). One primary influencing factor is the role that experience plays in student success. Knowles (1980) recommended that experiential learning and practical application be a part of adult learning. Students in communication sciences and disorders programs must obtain 400-hour clock hours of clinical experience in various real-world settings (e.g., schools, medical settings) no matter what modality of education they attend for their master's degree (ASHA, n.d.-b). These clinical hours provide experiences that help students learn, understand, and retain information found on the national certification examination.

Supporting the results of the first hypothesis, the results of the second hypothesis found that there is no statistically significant difference in the chance of a student passing their certification exam based on educational format and age category. While the literature remains mixed on which educational modality leads to better outcomes (Callister & Love, 2016), the results of this study support findings of previous researchers who found no statistically significant difference, as related to knowledge acquisition and content mastery (Abualadas, & Xu, 2023; Callister & Love, 2016; Cameron, 2013; Cavanaugh & Jacquemin, 2015; CIPHER et al.

2019; Cummings et al., 2017; Geng & McGinley 2021; Girard et al., 2016; Hafeez et al., 2022; Hale, 2009; Markson, 2018; Pereira & Wahi, 2018; Shu-Chen et al., 2018; Stack, 2015). Specific to certification examination pass and or fail ratings, this study contradicts studies that found online students had the advantage (Dolezel & McLead, 2017) or that face-to-face students had the advantage (Morgan, 2015).

Results of Hypothesis Three

H₀₃: There will be no significant predictive relationship between the criterion variable, degree completion in the program-defined completion timeline, and the linear combination of educational modality (online and face-to-face) and age category.

A logistic regression test investigated the results of whether the likelihood of students finishing their degree in program-defined timelines can be predicted based on educational modality and age category. The researcher failed to reject the null hypothesis. When the statistical analysis was conducted, outliers that were detected were students who did not complete their degree in program-defined timelines. These outliers appeared because, once again, most students in the study completed their degree within the time allotted by their program.

Perhaps the greatest tenant for student success in degree completion is based on andragogy's principle of motivation. For adults, Knowles (1980) described education as a tool for adults to solve problems or receive a perceived value or return. For the field of speech-language pathology, a clinician with their master's degree has more autonomy and responsibility than speech-language pathologist assistants who must be supervised by a certified speech-language pathologist and who have restrictions on their job duties (e.g., they cannot diagnose clients or interpret evaluation data). As a result, speech-language pathologists are highly sought

after and typically earn more money and have more opportunities to find employment that meets their needs (e.g., part-time work) than professionals in the field that do not have their master's and subsequent certification and state license. According to ASHA (2022), there are shortages of SLPs with many employers reporting more job openings than job seekers. The high demand for certified speech-language pathologists makes this a career that often motivates students to finish their degree.

The results of this study suggest that neither the educational modality nor age category significantly impacted degree persistence. According to Yang et al., (2017), students' satisfaction with their program fosters retention. Once again, the literature includes studies that favor online education for satisfaction (Bergeler, & Read, 2021; McCutcheon et al., 2015; Cumming et al., 2019; Bhattacharya et al., 2020, Pereira & Wahi, 2018; Sofeer & Nachmias, 2018) and others that favor face-to-face for satisfaction (Abualadas, & Xu, 2023; Baker 2016; Geng & McGinley 2021; Weldy, 2018; Ortega-Maldonado et al., 2017; Tratnki et al., 2019). However, the findings of this study might suggest student satisfaction between the two educational formats may not be that different (although more research would be needed) thus supporting previous researchers conclusions that there are no statistically significant differences in perceptions of students (Arthur Baker & Unni, 2018; Ciper et al., 2019; Garratt-Reed et al., 2016; Miller et al., 2020; Shu-Cen et al., 2018).

Specific to retention and completion of degrees, this study contradicts the studies that once again favor online education (Bacolod & Chaudhary, 2018; Bettinger et al., 2017; Morgan, 2015) and studies that favored rather face-to-face education ((Bacolod & Chaudhary, 2018; Bettinger et al., 2017; Francis et al., 201; James et al., 2016; Morgan, 2015; Smart & Saxon, 2016). Rather, this study supports researchers who found no statistically significant differences

between the two types of education formats (Cipher et al., 2019; Soffer & Nachmias, 2018). Only one study pertaining specifically to degree persistence in CSD was found. The results of this hypothesis contradicted Patterson & McFadden's (2019) findings that online students had significantly higher withdrawal rates. However, while this study did not find any statistically significant differences, it should be noted that visual inspection of the data did indicate that more online students did not complete their degree in program-defined timelines than their face-to-face peers, thus indirectly supporting Patterson and McFadden's findings.

As in the first and second hypotheses, the results of this study indicated that age category did not appear to have a statistically significant interaction with degree completion based on educational modality, supporting some researchers conclusion that age was not a factor (Patterson & McFadden, 2019). Once again, visual inspection of the data revealed that only nontraditional students, with the majority in the over 35 category, did not complete their degree within the preset timelines. All the traditional students completed their degrees within time guidelines, no matter the format. This finding supports the claims of some researchers that traditional students had the advantage (Francis et al., 2019; Gregory & Lampley, 2016; Knestrick, 2016; Rabourn et al., 2018).

Implications

The results of this study suggest that online education in graduate CSD programs has the potential to produce statistically similar results as face-to-face education with age category not being a major factor related to success. Since this study examined one school that had both an online and a face-to-face model, a conclusion could be drawn that the design of the program, such as the curriculum and instruction, may be more of a factor than the educational modality and a student's age. This idea adds to the literature to support the conclusions of previous

researchers who found no statistically significant differences in student satisfaction or perceptions, which they attributed to the quality of course design and instruction as more impactful than the course format (Garratt-Reed et al., 2016; Kemp, 2020). Additionally, findings of previous studies that concluded that include experiential learning opportunities, as postulated by the adult learning theory (Knowles, 1980), resulted in similar outcomes between the two education modalities (McCutcheon et al., 2015; Cummings et al., 2019; Wilke et al., 2016) are supported by the results of this study due to the clinical requirements of a degree in the field of CSD. The researcher concludes that the extensive requirements of ASHA for clinical learning experiences helps support the transfer of knowledge to practice, no matter the educational modality.

For programs considering the implementation of an online program in CSD, this study provides encouraging results to support the continued consideration of establishing online programs. This is especially important as COVID-19 exposed students to a new possibility of obtaining an education. The online model provides an opportunity for graduate students to balance their work, life, and school balance in a way that may be more difficult or infeasible when attending a face-to-face program, especially for nontraditional students or students that do not live near a university offering a master's degree in CSD. Online education is also important for institutions to consider based on a recent statistic from the National Student Clearinghouse Research Center (2022) that indicated a steep decline in undergraduate college enrollment in the aftermath of COVID-19. While the decline stabilized for the fall of 2022 to pre-pandemic numbers, it is important to note that there has been a trend of decline in enrollment even before the pandemic. Less undergraduate students enrolling in higher education will domino into less graduate student enrollment. Less students earning their graduate degree will increase shortages

of SLPs in the field. Finally, a concern that the increase in online education will develop a two-tiered system which places one group of students at disadvantage, those who can attend brick-and mortar schools versus those who only option in online education, (Lierate, 2015) are reduced because, based on the results of this study, students have an equal opportunity to receive a quality education.

The results of this study provide stakeholders and decision-makers with a positive view of online educational models in CSD for both traditional and nontraditional students. This study's findings provide valuable information for stakeholders considering implementing an online program. The results of this study might help alleviate the legitimate concerns of institutions for their online graduate programs to have the equal opportunity to meet the high standards of ASHA and CAA for program accreditation. More time and resources could then be allocated toward the design of the program and ensuring quality instruction rather than extensive time debating whether to offer an online program, face-to-face program, or both. Additionally, the results of this study could encourage current institutions offering both modalities to assess the outcomes between the two educational formats to make conclusions about the efficacy of their already established programs.

For students, the results of this study suggest that they would have the potential to achieve similar outcomes no matter the educational modality or student's age category. This information may provide valuable insight for potential students when choosing an instructional format. Some students may choose an online program because of the convenience but do so with hesitation. Additionally, some students may not consider an online program for fear of a lower quality of education even though an online model may be a better fit for their personal situation. Rather than focusing solely on the educational modality as the main deciding factor, students

could confidently place more emphasis on the quality of the program related to curriculum, instruction, and professional faculty and staff over their concerns of their chance of completing their degree based on the delivery format.

A final implication that applies to all stakeholders (institutions with existing programs, institution developing or considering an online program, and students choosing which program is the best fit) is that there are limited spaces available for students to attend graduate school. According to ASHA (n.d.-f), there is a capacity range of 26 to 32 students that programs can accommodate within each start of a cohort. This limited number translated into an average acceptance rate of only 39.0% into a graduate program in the field of CSD for the 2019-2020 year. This percentage is an increase over the last decade. However, some years within the last decade had significantly lower acceptance rate with the lowest at a 15.7% acceptance rate. It would be interesting to investigate if the dramatic increase for the year 2020 was due to more online programs becoming available, allowing for more student capacity; or if this number is due to a decline in students applying for graduate school or students meeting the minimum qualifications for acceptance. The limited acceptance percentage into graduate school contributes to the shortage of SLPs. With job growth projected in this profession to be 21% over the next few decades (ASHA, 2022), institutions might want to use the results of this study to help support their consideration and design of implementing an online program in CSD to help fill the critical need for SLPs. Spending more time focusing on the design, instructional methods, and implementation of new technology might be more beneficial toward influencing the success of an online program versus considering whether online education is an effective educational model.

Limitations

While the results of this study are encouraging for the online educational model in CSD, limitations exist. The causal-comparative and correlation design of the study meant that independent variable could not be controlled by the researcher. Groups were formed prior to the study. Therefore, only inferences can be made about the relationship between the independent and dependent variables (Gall et al. 2007).

Another limitation was that the data was taken from one university which acts as a threat to the external validity of the results. It would be difficult to generalize the results of this study to online and face-to-face programs across all institutions. There are many geographic areas that have not been researched that most likely have different demographics and diversity of students. This threat to the external validity of the study not only applies to programs with both online and face-to-face programs but also programs that are choosing to only offer the online model.

Other limitations of this study may impact the internal validity of the study. One threat is that Praxis scores are not directly reported to graduate programs from the testing agency. Therefore, the praxis scores are based on student reports. In collecting the data, the researcher discovered that some programs do not even collect this data. They only collected the information of whether the student passed or failed the Praxis exam, which is reported to CAA. It was interesting to the researcher of this study that universities would not find value in collecting that data. It allows for more specific data on trends, not just the pass or fail numbers, but if scores are improving or worsening. Another threat to the internal validity of the study is that the data collected included years prior to pandemic and after the most intense portion of the pandemic. The year 2020 was omitted because many students were not able to finish their graduate program in program-defined timelines due to restrictions in clinical placements, which impacted their

ability to earn their required clinical hours. In addition, the sudden shift to online education with no time for preparation may have impacted Praxis II scores. For the years investigated, the results of the study indicated no significant difference between pre-pandemic and post-pandemic student outcomes. However, that may be a limitation because so many other factors could impact student outcomes beyond the educational modality or age category.

Recommendations for Future Research

A search of the literature revealed no studies that investigate student outcomes in CSD based on accreditation standards set from by CAA. As more online graduate degrees the field of communication sciences and disorders begin to emerge, future research is warranted. Future suggested research on these outcomes, additional accreditation standards, and additional information not related to accreditations are recommended in the following section. Future research should include both quantitative and qualitative measures to provide multiple perspectives.

- Compare the outcomes of online and fac-to-face students for programs that have already implemented both educational formats. If a significant discrepancy is noted, programs may want to inspect differences in curriculum, instructional styles, student engagement, student demographics, and so forth to determine if other factors may influence student outcomes.
- Conduct similar studies with a more diverse sample. These studies could investigate the same outcomes and include programs that offer both online and face-to-face programs and explore outcomes between universities that offer either online or face-to-face but not both formats.

- Complete similar studies that add the third CAA accreditation requirement measure which investigates how many former students are employed in the field or obtaining a higher education degree in the field (i.e., a doctorate degree) one year after graduation.
- Investigate different demographics such as gender, ethnicity, race, and so forth.
- Examine other academic information such as grades, GPA, comprehensive exam performances, clinical skills, and so forth between the two educational modalities.
- Analyze student satisfaction between the two modalities. This study would be excellent as a mixed-method study.
- Study student perceptions such as perceived learning, rigor of program, and sense of preparedness. This type of study would also be an excellent mixed-method study.
- Investigate clinical preceptor (supervisor) perceptions during clinical practicums of online students or between online and face-to-face students if they have supervised students from both educational formats, also a potential mixed-method study.
- Examine education personnel's (e.g., professors, instructors) perceptions of students based on multiple data sets, especially if they teach or have taught both educational formats. For example, a study could investigate tenants of the adult learning theory such as motivation, readiness to learn, self-directed learning skills and so forth. Additionally other areas could be assessed including, but not limited to, clinical skills, critical thinking skills, interpersonal skills, and interprofessional skills.
 - Probe employer perceptions across multiple practicing areas of the field (e.g., school, medical) of how well-prepared the recent graduates appear to be to practice as entry-level professionals across multiple skills-sets such as knowledge, clinical skills, values, interpersonal skills, interprofessional skills, critical thinking, and so forth.

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APPENDIX or APPENDICES**Appendix A**

Date: 3-14-2022

IRB #: IRB-FY21-22-484

Title: ONLINE VERSUS FACE-TO-FACE COMMUNICATION SCIENCES AND DISORDERS
GRADUATE STUDENT OUTCOMES: A COMPARISON STUDY Creation Date: 11-29-2021

End Date:

Status: **Approved**

Principal Investigator: Nicole Oglevee

Review Board: Research Ethics

Office Sponsor:

Study History

Submission Type	Initial	Review Type	Exempt	Decision	Exempt
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Key Study Contacts

Member	Laura Mansfield	Role	Co-Principal Investigator	Contact	[REDACTED]
Member	Nicole Oglevee	Role	Principal Investigator	Contact	[REDACTED]
Member	Nicole Oglevee	Role	Primary Contact	Contact	[REDACTED]

Initial Submission

Application for the Use of Human Research Participants

Before proceeding to the IRB application, please review and acknowledge the below information:

Administrative Withdrawal Notice

This section describes the IRB's administrative withdrawal policy. Please review this section carefully.

Your study may be administratively withdrawn if any of the following conditions are met:

- Inactive for greater than 60 days and less than 10% of the app has been completed
- Duplicate submissions
- Upon request of the PI (or faculty sponsor for student submissions)

Inactive for 90 days or more (does not apply to conditional approvals, the IRB will contact PI prior to withdrawal)

*required

✓ I have read and understand the above information.

Study Submission & Certification

This section describes how to submit and certify your application. Please review this section carefully. Failure to understand this process may cause delays.

Submission

- Once you click complete submission, all study personnel will need to certify the submission before it is sent to the IRB for review.

Instructions for submitting and certifying an application are available in the IRB's Cayuse How-tos document.

Certification

- Your study has not been successfully submitted to the IRB office until it has been certified by all study personnel.
- If you do not receive a “submission received by the IRB office” email, your study has not been received.

Please check your junk folder before contacting the IRB.

*required

- ✓ I have read and understand the above information.

Moving through the Cayuse Stages

In Cayuse, your IRB submission will move through different stages. We have provided a quick overview of each stage below.

In Draft

- The In Draft stage means that the study is with the study team (you). In this stage, the study team can make edits to the application.

When the IRB returns a submission to the study team, the submission will move back to the In-Draft stage to allow for editing.

Awaiting Authorization

- Each time a study is submitted, it will move from In-Draft to Awaiting Authorization.

During this stage, the submission must be certified by all study personnel listed on the application (PI, Co-PI, Faculty Sponsor). This ensures that every member of the study team is satisfied with the edits.

- Please note, the IRB has not received your submission until all study personnel have clicked “certify” on the submission details page.

Pre-Review

- When your application is submitted and certified by all study personnel, your study will move into the Pre-Review stage. Pre-Review means the IRB has received your submission. The majority of the IRB review occurs during the Pre-Review stage.

Once received, an IRB analyst will conduct a cursory review of your application to ensure we have all the information and documents necessary to complete a preliminary review. This cursory review usually occurs within 3 business days of receipt.

- If additional information or documents are needed
 - to facilitate our review, your submission will be returned to you
 - to request these changes. Your study will be assigned to an analyst once it is ready for review. Preliminary and any subsequent reviews may take 15–20 business days to complete depending on the IRB's current workload.
-

Under Review

- Studies will only move into the “Under Review” stage when the analyst has completed his or her review and the study is ready for IRB approval.
-

*required

- ✓ I have read and understand the above information.

Finding Help

The IRB has several resources available to assist you with the application process. Please review the below information, or contact our office if you need assistance.

Help Button Text (?)

- Some questions within the application may have help
- text available.

Please click on the question mark to the right of these questions to find additional guidance.

Need Help? Visit our website, www.liberty.edu/irb, to find:

- Cayuse How-Tos
- FAQs
- Supporting document templates

Contact Us:

- irb@liberty.edu
- 434-592-5530
- Office Hours: M-F; 8:00AM-4:30PM

*required

I have read and understand the above information.

*required

Acknowledgement

Please acknowledge that you have reviewed and understand the above information. You can refer back to this information at any time.

I acknowledge that I have read and understand the above information. Take me to the IRB



application.

Project Information

*required

What type of project are you seeking approval for?

Please make the appropriate selection below.

Research

- Research is any undertaking in which a faculty member, staff member, or student collects information on living humans as part of a planned, designed activity with the intent of contributing relevant information to a body of knowledge within a discipline.
-

✓ Archival or Secondary Data Use Research ONLY

- Archival data is information previously collected for a purpose other than the proposed research. Examples include student grades and patient medical records.
 - Secondary data is data that was previously collected for the purpose of research. For example, a researcher may choose to utilize survey data that was collected as part of an earlier study.
-

Doctor of Nursing Practice (DNP) Scholarly Project

- This option is specific to doctor of nursing practice (DNP) students' evidence-based practice scholarly projects.
-

Doctor of Ministry (DMin) Project

- This option is specific to Doctor of Ministry (DMin) student projects.
-

*required

Please indicate the primary purpose of this project:

Why is this project being proposed?

Doctoral Research

*Note: Students must enter themselves as PI and their faculty sponsor under Faculty Sponsor.

*required

Have you passed your dissertation proposal defense?

Doctoral candidates may not submit their project for IRB review until they have successfully passed their proposal defense.

Yes

No

N/A

Masters Research

Undergraduate Research

Faculty or Staff Research

Class Project

Other

Study Personnel

Please fill in all associated personnel below.

Please note: All study personnel must complete CITI training prior to receiving IRB approval. The IRB will accept either of the following CITI courses: "Social & Behavioral Researchers" or "Biomedical & Health Science Researchers."

- [IRB](#)
- [Training Information CITI Training Website](#)

*required

Primary Contact

The individual who will receive and respond to communication from the IRB should be listed as the primary contact. For student projects, the primary contact will be the student researcher(s). For faculty projects, the primary contact may be the researcher or a student(s), administrative assistant, etc. assisting the faculty member. The same

individual may be listed as the primary contact and the principal investigator.

Name: Nicole Oglevee

Organization: Graduate Education

Address: 1971 University Blvd , Lynchburg, VA 24515-0000

Phone: 3252801118

Email: ncoglevee@liberty.edu

*required

Principal Investigator (PI)

The principal investigator (PI) is the individual who will conduct the research or serve as the lead researcher on a project involving more than one investigator. For theses or dissertations, the student should be listed as PI.

Name: Nicole Oglevee

Organization: Graduate Education

Address: 1971 University Blvd , Lynchburg, VA 24515-0000

Phone: 3252801118

Email: ncoglevee@liberty.edu Co-

Investigator(s)

Co-investigators are researchers who serve alongside the principal investigator and share in the data collection and analysis tasks.

*required

Faculty Sponsor

Projects with students serving as the PI must list a faculty sponsor, typically a dissertation or thesis chairperson/mentor.

Name: Laura Mansfield

Organization: Graduate Education

Address: 1971 University Blvd , Lynchburg, VA 24515-0000

Phone: 4345822000

Email: [REDACTED]

*required

Will the research team include any non-affiliated, non-LU co-investigators?

For example, faculty from other institutions without Liberty University login credentials. Note: These individuals will not be able to access the IRB application in Cayuse, however, the information provided below allows the LU IRB to verify the training and credentials of all associated study personnel. Yes

No

Conflicts of Interest

This section will obtain information about potential conflicts of interest.

*required

Do you or any study personnel hold a position of influence or academic/professional authority over the participants?

For example, are you the participants supervisor, pastor, therapist, teacher, principal, or district/school administrator? Yes

No

*required

Do you or any study personnel have a financial conflict of interest?

For example, do you or an immediate family member receive income or other payments, own investments in, or have a relationship with a non-profit organization that could benefit from this research? Yes

No

Funding Information

This section will request additional information about any funding sources.

*required

Is your project funded?

Yes

No

Study Dates

Please provide your estimated study dates.

*required

Start Date

01-04-2021

*required

End Date

06-30-2021

Use of Liberty University Participants

Please make the appropriate selection below:

*required

I do not plan to use LU students, staff, and/or faculty as participants.

✓

- Note: Use of LU students, faculty, or staff also includes the use of any existing data.

I plan to use a single LU department or group.

- You will need to submit proof of permission from the department chair, coach, or dean to use LU personnel from a single department.

I plan to use multiple LU departments or groups.

- If you are including faculty, students, or staff from multiple departments or groups (i.e., all sophomores or LU Online) and you have received documentation of permission, please attach it to your application. Otherwise, the IRB will seek administrative approval on your behalf.

*required

Purpose

Please provide additional details about the purpose of this project.

Write an original, brief, non-technical description of the purpose of your project.

Include in your description your research hypothesis/question, a narrative that explains the major constructs of your study, and how the data will advance your research hypothesis or question. This section should be easy to read for someone not familiar with your academic discipline.

The purpose of this research is to investigate the relationship between the educational modality (online versus face-to-face) and age category on communication sciences and disorders graduate students' performance on three measurable outcomes, including certification examination outcomes and degree completion in program-defined timelines. The research questions ask if graduate students' educational modality and age category impact their score on the national certification examination, their success status (meeting the minimum required points defined by the American-Speech-Language-Hearing Association) on the certification examination, and their completion of their degrees in program-defined timelines. Archival data will be collected on students previously enrolled in master's degree programs in communication sciences and disorder for the 2017, 2018, and 2019 academic years to investigate any relationships. The data will compare students' educationally modality and age category and students' performance on these three measurable outcomes. This study will add to the literature on the efficacy of online education in the allied and health sciences fields and, specifically, for the field of Communication Sciences and Disorders.

Investigational Methods

Please indicate whether your project involves any of the following:

*required

Does this project involve the use of an investigational new drug (IND) or an approved drug for an unapproved Use?

Yes

No

*required

Does this project involve the use of an investigational medical device (IDE) or an approved medical device for an unapproved Use?

Yes

No

Archival Data

Use of Archival Data

This section will collect additional information about your proposed use of archival data.

*required

Please provide a description of the archival data and/or documents you plan to use/collect.

For example, what data fields are included in the dataset? What original instruments were used to obtain the archival data? What documents will you be requesting? The archival data will include information from the 2017, 2018, and 2019 calendar years.

- Students' age at the time they began their master's degree in Communication Sciences and Disorder (CSD) OR their birthdate and the date they started their master's degree in Communication Sciences and Disorder
- Students' scores on the Praxis II Examination in Speech-Language Pathology the first time they took the test.
- Students' status on whether or not they completed their master's degree in Communication Sciences and Disorders in program-defined timelines

*required

Please describe your intended use of the archival data.

For example, how does use of the data relate to your study purpose? What are you hoping to discover by using and interpreting this data?

The data will be analyzed to determine if students' educational modality (online versus face-to-face) and age category (24 and younger, 35-34, and 35 and older) are related to their performance on the national certification examination and degree completion in program-defined timelines. I hope to determine if online master's programs in communication science and disorders have similar or dissimilar outcomes as face-to-face programs since no to minimal research investigates this topic, even though online CSD programs continue to grow in number.

*required

Please name the organization(s) from which you are seeking archival data.

The data will be obtained from various Universities willing to participate. *required

Please describe the steps you will take to secure the archival data.

For example, where will the data be stored and who will have access to it?

The data will be stored on password protected computer that only the researcher has access to.

*required

Where is the archival data located/housed?

For example, is the data publicly available (e.g., government website) or privately held (e.g., a private corporation or firm)?

The data is publicly available (i.e., anyone can obtain access).

✓ The data is privately held (i.e., permission/special access is required to obtain the data).

*required

How will you obtain access to the data?

For example, an organizational representative with regular access will provide the data to you. Describe the process required for obtaining access to the data.

The researcher will obtain permission from the appropriate personnel at participating universities. A representative from the participating universities will provide the data. The representative will send the information in a spreadsheet via email to the researcher. The researcher's email is password protected. Students' identifying information will not be included except their age OR birthdate and the

date they started their degree to determine which age category to code students.

*required

Will you receive the raw data stripped of identifying information?

For example, will the data be free of any names, addresses, phone numbers, email addresses, student IDs, medical record numbers, social security numbers, birth dates, etc.?

Yes

No

*required

Describe what data will remain identifiable and why such information will not be removed.

Students' birthdate may remain to determine which age category to code students.

Birthdate will depend on how each participating university wishes to supply the data (e.g., do they want to report the age of the student at the time they began the program or allow the researcher to figure out the age).

*required

Can the names or identities of the participants be deduced from the raw data?

Yes

No

*required

Please place your initials in the box.

I will not attempt to deduce the identity of the participants in this project.

NCO

Documentation & Permissions for Archival Data

The below attachment buttons should be used to provide additional information about your archival data use.

Please submit any data forms, templates, or collection sheets that will be used in association with the archival data for this study.

For example, if you will provide/use an Excel spreadsheet to to receive or organize the data, please attach the document here. [dissertation data collection sheet.xlsx](#) [dissertation organization sheet.xlsx](#)

Please submit documentation of permission to access/use the archival data.

This documentation should state the following:

1. You have permission to access/use the data.
2. Whether the data will be stripped of any private, identifiable information prior to you receiving it.

[Permission Request.docx](#) Sample documents: [Permission Request](#) , [Permission](#)
[Letter](#)
[Permission-Response.docx](#)

Attachments

Human Subjects Training Documentation

Note: This upload is only required for non-affiliated, non-LU personnel. If you are affiliated with LU, we are able to view your CITI training report.

Sample documents: [CITI Program Website](#)

External Investigator Agreement

Note: This upload is only required for non-affiliated, non-LU personnel. If you are affiliated with LU, you are able to provide certification within the Cayuse system.

Proof of Permission to Use LU Participants, Data, or Groups

Note: If you are not using LU participants, data, or groups, you do not need to include an attachment here.

DNP Permission

Note: If you are not in the Doctor of Nursing Practice Program (School of Nursing), you do not need to include an attachment here.

Sample documents: [Permission Request](#) , [Permission Letter](#)

Screening

Note: If your study does not involve a screening instrument, you will not need to provide an attachment here.

Recruitment

Note: If you are strictly using archival data, you may not need to include an attachment here.

[Recruitment Letter.docx](#) Sample documents: [Recruitment \(Letter/Email\)](#) , [Recruitment \(Follow-up\)](#) ,
[Recruitment \(Flyer\)](#) , [Recruitment \(Social Media\)](#) , [Recruitment \(Verbal\)](#)

Parental Consent

Note: If your study does not involve minors, you will not need to provide an attachment here. Sample documents: [Consent \(Parental\)](#)

Archival Data Forms, Templates, or Collection Sheets

Note: If you are not using archival data, you will not need to provide an attachment here.

[dissertation data collection](#)

[sheet.xlsx dissertation](#)

[organization sheet.xlsx](#)

Archival Data Permission

Note: If you are not using archival data, you will not need to provide an attachment here.

[Permission Request.docx](#) Sample documents: [Permission Request](#) , [Permission Letter](#)

[Permission-Response.docx](#)

Data Collection Instruments

Note: If you are strictly using archival data, you may not need to provide an attachment here.

Site Permission

Note: If you do not require external permission(s) to conduct your study, you may not need to provide an attachment here.

[Permission Request.docx](#) Sample documents: [Permission Request](#) , [Permission Letter](#)
[Permission-Response.docx](#)

Child Assent

Note: If your study does not involve minors, you will not need to provide an attachment here. Sample documents: [Child Assent](#)

Consent Templates

Note: If you are strictly using archival data, you may not need to provide an attachment here.

Sample documents: [Consent](#) , [Consent \(Medical\)](#) , [Consent \(Blood Draw\)](#)

Debriefing

Note: If your study does not involve deception, you will not need to provide an attachment here.

Sample documents: [Debriefing](#)

GDPR Consent

Note: If your study does not involve European Union (EU) residents, you will not need to provide an attachment here.

Sample documents: [Consent \(GDPR\)](#) , [Data Transfer Agreement \(GDPR\)](#)

Appendix B

Permission Response Letter

Please provide this document on official letterhead or copy and paste it into an email. Email to [REDACTED]

Dear Nicole Shears:

After careful review of your research proposal entitled “*Online Versus Face-to-face Communication Sciences and Disorders Graduate Students Outcomes: A Comparison Study.*” [I/we] have decided to grant you permission to receive and utilize graduate students’ archival data pertaining to their educational modality, age at the time they began the program (or birthdate and the start of degree program date), their Praxis II Examination in Speech-Language Pathology, and their status on completing their degree in program-defined timelines for the 2017, 2018, 2019 calendar years for your research study.

Check the following boxes, as applicable:

[The requested data WILL BE STRIPPED of all identifying information before it is provided to the researcher.]

[The requested data WILL NOT BE STRIPPED of identifying information before it is provided to the researcher.]

[Retain the below option if desired.]

[[I/We] are requesting a copy of the results upon study completion and/or publication.]

Sincerely,

[Official’s Name]

[Official’s Title]

[Official’s Company/Organization]