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The Relationship between Access to School Counseling and Students' Attainment and Persistence in Postsecondary and STEM Education Outcomes

Dana Brookover

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The Relationship between Access to School Counseling and Students' Attainment and
Persistence in Postsecondary and STEM Education Outcomes

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of
Philosophy in Education with a concentration in Counselor Education and Supervision at
Virginia Commonwealth University

by

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Abstract

THE RELATIONSHIP BETWEEN ACCESS TO SCHOOL COUNSELING AND STUDENTS' ATTAINMENT AND PERSISTENCE IN POSTSECONDARY AND STEM EDUCATION OUTCOMES

By Dana L. Brookover, Ph.D.

A dissertation submitted in partial requirements for the degree of Doctor of Philosophy in Education with a concentration in Counselor Education and Supervision at Virginia Commonwealth University.

Virginia Commonwealth University, 2020

Chair: Dr. Kaprea Johnson
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School counselors design and implement comprehensive school counseling programs to support students' academic, college and career, and personal/social development (ASCA, 2019). This includes the school counselor's important role in college readiness counseling and science, technology, engineering, and math (STEM) counseling (Falco, 2017; Gilfillan, 2018). The current study focused on the relationships between access to school counseling and students' long-term college readiness outcomes. Through a Social Cognitive Career Theory (SCCT; Lent et al., 1994) lens, two models to predict (1) college attainment and persistence and (2) STEM major attainment and persistence, were tested through logistic regression analyses. Additionally, this study also investigated how student demographic information is related to opportunity for college readiness counseling through access to school counseling, utilizing chi-square tests of independence and logistic regression analyses. A nationally representative sample (NCES, 2020a) provided data on school counseling access (i.e., school counselor caseload and school counselor percentage of time spent college readiness counseling), student-level variables (i.e., demographics, self-efficacy variables), and college and STEM-specific outcomes.

Findings indicate that school counselor percentage of time spent college readiness counseling, in addition to student socioeconomic status and identifying as multiracial, were predictive of college attainment and persistence, three years post-high school graduation. Students who had a school counselor who spent at least the national average of 21% or more time college readiness counseling had increased odds of persisting in higher education or attaining a degree. Results also indicated that school counselor percentage of time spent college readiness counseling, in addition to gender, Asian and Hispanic race and ethnicity identification, math self-efficacy, science self-efficacy, and high school STEM grade point average, were predictive of STEM major attainment and persistence. Students who had a school counselor who spent 21% or more time college readiness counseling had increased odds of persisting in a STEM major or attaining a STEM degree. Additionally, analyses suggested there are inequities in students' access to school counseling; results indicated differences in school counselor caseload and percentage of time spent college readiness counseling by students' SES, racial and ethnic identity, and first-generation status. The results of the current study offer practice, policy, and training implications for school counselors, counselor educators, and future researchers.

Chapter 1

INTRODUCTION

School counselors design and implement their comprehensive school counseling

programs to positively affect student learning and behavioral outcomes (Carey & Dimmitt,

2012). For instance, school counselors seek to promote and improve access to equitable college

opportunities for all students under the American School Counselor Association (ASCA)

National Model (ASCA, 2019). *The ASCA Mindsets & Behaviors for Student Success: K-12*

College- and Career Readiness for Every Student provides a framework for the knowledge, skills

and attitudes students need to achieve academic success, college and career readiness and

social/emotional development (ASCA, 2014). This document forms the basis for the standards

and learning objectives school counselors build their work on (ASCA, 2014). School counselors

play an integral role in their students' college readiness through providing college readiness

counseling (Gilfillan, 2018). This includes the important role school counselors perform in

providing college readiness counseling to educate students on the possibilities in science,

technology, engineering, and mathematics (STEM) at the college level (Schmidt et al., 2012).

Unfortunately, there are persisting inequities in postsecondary attainment and persistence

outcomes of students. Educational opportunity gaps exist and are widening for underserved

students in the United States, such as students of color, low-income students, and first-generation

students (FGS; Dyce et al., 2013). School counselors must address these opportunity gaps, as

postsecondary education leads to higher earnings, greater likelihood of employment, access to

health insurance, and a healthier lifestyle (Baum et al., 2013). Also, there are differences in

STEM major attainment and persistence by gender, race and ethnicity, socioeconomic status, and

FGS status (Chen, 2013). Statistics show the choice to enroll in a STEM postsecondary program

may also lead to higher pay (i.e., $60,000 median for STEM majors compared to $44,000 median for non-STEM majors) and the potential for positive job marketability given the projected growth in available positions (Cataldi et al., 2014; Vilorio, 2014). Ultimately, the opportunity for all interested students to attend college and pursue the major they are interested in is an equity, and social justice, issue. Hence, school counselors must seek to use transformative school counseling services, particularly college readiness counseling, to help all students meet their goals upon graduation.

Statement of the Problem and Literature Review Background

There are barriers to school counselors' ability to enact transformative college readiness counseling with students, including limited time, large caseloads, and limited knowledge on content specific to various majors and careers, such as STEM majors and careers (Hall et al., 2011; McKillip et al., 2012). Despite ASCA's declaration of appropriate and inappropriate duties for school counselors, school counselors in the United States are often tasked with job requirements that fall outside of the role of the school counselor (O'Connor, 2018). School counselors should address three main domains of student development: academic, career and college, and social and emotional development (ASCA, 2019). Additionally, school counselors are called to be leaders in the school system, working with schools, families, and community members to create positive school climates (ASCA, 2019). School counselors provide both direct and indirect services for students. Direct services in the realm of college readiness counseling include individual counseling, group counseling, classroom instruction, and large group programming in college and career readiness (ASCA, 2019). An example of an indirect service would be writing a letter of recommendation for a student's college application.

ASCA has supported the need for school counselors to spend at least 80 percent of their time in direct and indirect services with students (ASCA, 2017). However, the reality for many school counselors is starkly different than the ASCA time recommendations. School counselors often find themselves limited in their effectiveness because they are assigned administrative duties that have little to do with their role as a counselor (O'Connor, 2018). Research is important to support the appropriate allocation of school counselors' percentage of time for policy change. Research has thus far shown that college readiness counseling efforts can have a positive impact on student outcomes. For instance, research shows counselor contact regarding college planning and attendance was a significant predictor of postsecondary enrollment (Tang & Ng, 2019). Another study with Connecticut school counselors showed that college and career counseling services predicted 3% to 4% of the variance in total disciplinary incidents (Lapan et al., 2012). Research also shows populations who are underrepresented in higher education, such as FGS, identify their school counselors as the most helpful resource in their college planning process (Cholewa et al., 2015). Additionally, in a study of nearly 9,000 students, approximately 40 percent of participants listed their school counselors as a resource for postgraduate planning, and about 30 percent of participants identified their school counselors as the most helpful resource (Griffin et al., 2011). These statistics highlight the need for student accessibility to school counselors. However, longitudinal studies on postsecondary outcomes after high school graduation through a school counseling lens are lacking. Long-term term studies on school counseling intervention effectiveness are needed (Whiston et al., 2011).

Another important influence on a school counselor's propensity to engage in transformative school counseling work is caseload size (National Association for College Admission Counseling [NACAC] & ASCA, 2015). ASCA recommends a counselor to student

ratio of 250:1. However, the national average is a caseload of 482, and the state averages range from 200 in Vermont, to 924 in California; only three states meet the recommended 250 or less per counselor caseload (NACAC & ASCA, 2015). Research on caseloads shows positive student outcomes related to lowered school counseling caseload ratios. For instance, the previously mentioned study on Connecticut school counseling services showed that high schools with lower counseling ratios have statistically significant lower rates of student suspensions and fewer disciplinary incidents (Lapan et al., 2012). A study on a nationally representative sample showed smaller caseload numbers were significantly associated with higher student grade point average (GPA) and graduation rates (Goodman-Scott et al., 2018). Related to college readiness, research has found when controlling for student- and school-level characteristics, students in schools where counselors are responsible for advising many students (i.e., large caseload) were less likely to speak with a counselor about college, plan to attend college, take the SAT, and enroll in a four-year college (Woods & Domina, 2014). While the Woods and Domina (2014) study provides initial evidence in showing how large caseloads can impact student access to counseling service and postsecondary outcomes (i.e., plans to enroll and enrolling in a four-year college), again, more information is needed on how both caseload size and targeted college readiness counseling impact long-term student outcomes.

Finally, content specific knowledge is often needed to enable school counselors to support students in the pursuit of their college goals. Of interest is the call for school counselors to support marginalized students in their pursuit of postsecondary education and careers in STEM fields through targeted and research-based interventions. Employment in occupational roles related to science, technology, engineering, and mathematics (STEM) are projected to grow to more than nine million by the year 2022, which is an increase of over one million jobs since

2012 (Vilorio, 2014). Additionally, individuals who graduate with STEM degrees have higher average salaries than those with non-STEM degrees (Cataldi et al., 2014). Not all students have equitable STEM outcomes, as the representation of diverse groups of people in STEM fields and majors has been a longstanding concern in the United States (Dika & D'Amico, 2016). Longitudinal studies examined the impact of advanced pre-collegiate educational opportunities in STEM on STEM persistence and success (Wai et al., 2010), and STEM interest and quantitative ability fit from middle school to STEM major degree conferment (Le & Robbins, 2016). Emerging research is also developing on the school counselor's role on students' STEM self-efficacy (Falco, 2017; Falco & Summers, 2019; Mau & Li, 2018; Nikischer et al., 2016; Schmidt et al., 2012). However, what is missing is a longitudinal understanding of the unique contributions of various student characteristics and school counseling access in STEM outcomes. Social Cognitive Career Theory (SCCT) offers a career development theory focused on both individual and systemic factors (Lent et al., 1994). Hence, SCCT provides a fitting theoretical framework to study postsecondary and STEM postsecondary outcomes with high school students through a school counseling lens.

Theoretical Framework

Social Cognitive Career Theory (SCCT) was developed from Albert Bandura's (1986) Social Cognitive Theory to create a unifying theory of career and academic interest, choice, and performance (Lent et. al., 1994). SCCT covers three interrelated concepts within career development: (a) how academic and career interests develop, (b) how people make educational and career choices, and (c) how academic and career success is obtained (Lent, 2005). The theory incorporates a variety of person, contextual, and behavior variables and offers central mechanisms and paths through which the variables impact career development (Lent & Brown,

1996). At the core of SCCT is Bandura's (1986) triadic reciprocal model of causality, which stipulates person attributes (i.e., internal cognitive and affective states), external environmental factors (e.g., access to school counseling and college planning resources), and overt behavior all operate in an interactive manner (Lent & Brown, 2006).

Within the person attributes in SCCT, there are three variables that guide individual behavior. They are: self-efficacy beliefs, outcome expectations, and personal goals. Self-efficacy is an individual's belief in their ability to influence and control the events of their life to obtain desired performances (Bandura, 1994). As an example, when students believe they can achieve desired results in science through their abilities and actions, this is considered high science self-efficacy. College self-efficacy refers to their belief that they can graduate college. There are multiple ways to build self-efficacy, including (a) personal performance accomplishments, (b) vicarious learning, (c) social persuasion, and (d) physiological states and reactions (Bandura, 2008; Lent & Brown, 1996). Outcome expectations are the "beliefs about the consequences or the outcomes of performing particular behaviors" (Lent & Brown, 1996, p. 312). Personal goals are one's intention of engaging in an activity or producing an outcome (Lent & Brown, 1996).

SCCT accounts for the cyclical nature of making a career choice, through accounting for people receiving information from contextual influences that fuel feedback loops (Lent, 2005). These external influences can be contextual supports or barriers (Lent et al., 2000). It is also important to note that one's perception of barriers moderates the relationship between interests and career choices (Brown & Lent, 1996). Hence, underrepresented and underserved students' perceptions of barriers in obtaining a college degree or a STEM degree can impact career choice and development. Moreover, other external environmental, person attributes, and behaviors interact in this feedback loop as well. Feedback loops are contained within the interest (i.e., self-

efficacy and outcome expectations), choice (i.e., goals, actions, and experiences trying to obtain goals), and performance models (performance attainments relate to educational success and persistence) of SCCT framework (Lent, 2005).

Related to the current study, SCCT emphasizes human agency in career choice and development, but also acknowledges the influences of an array of personal and environmental influences in this process (Lent, 2005). For example, sociostructural barriers and supports can strengthen or weaken agency in career development (Lent, 2005). Self-efficacy and outcome expectations are of utmost importance in the SCCT model, and form continuously within the context of gender, race and ethnicity, and socioeconomic status, among other qualities of individuals and environments (Lent, 2005). Thus, SCCT can account for external factors (e.g., school counseling access) and individual characteristics (e.g., demographics and self-efficacy) within long-term career development formation. School counseling research has utilized SCCT as a framework for college and career counseling work with students (Gibbons & Shoffner, 2004; Mau & Li, 2018; Parikh-Foxx et al., 2020). Additionally, research has found that self-efficacy, a core SCCT tenet, is an important pathway to students' academic persistence and STEM major persistence (Graham et al., 2013; Lent et al., 2016; Vuong et al., 2010). This leads to the current study, which built upon previous SCCT school counseling and postsecondary and STEM attainment and persistence studies, to investigate the long-term impacts of school counseling access in relation to student characteristics on these outcomes.

Purpose Statement

The purpose of the current study was to examine the relationships between and contributions of school counselor caseload, school counselor percentage of time spent college readiness counseling, and student characteristics on postsecondary and STEM major attainment

and persistence. School counselors can and should support traditionally underrepresented students in their pursuit of postsecondary education and careers in STEM fields through targeted, research-based interventions (Mau & Li, 2018). However, without a congruent model connected to a nationally representative sample and longitudinal outcomes, school counselors are missing important data to inform and support their programming decisions and advocacy efforts. Research has shown school counselors make a difference in the college readiness of their students (Gilfillan, 2018; Mau & Li, 2018). A better understanding of the factors and characteristics that contribute to positive postsecondary and STEM attainment and persistence will further enable their ability to intentionally develop their programming and advocate for their roles (Whiston et al., 2011). This study contributes to the literature by providing information about the long-term effects of school counseling access on high school student college readiness using a national longitudinal dataset.

Research Questions

While preliminary research has supported percentage of time spent on counseling services and appropriate caseload ratios are related to positive student outcomes (Griffin et al., 2011; Lapan et al., 2012; Tang & Ng, 2019), and school counselors can address STEM career development with students (Schmidt et al., 2012), more information and research is needed on how school counselor ratios and percentage of time spent on college readiness counseling influence long-term educational outcomes (Whiston et al., 2011). This dissertation study explored how school counseling access is related to postsecondary and STEM attainment and persistence, using a nationally representative sample, The High School Longitudinal Study 2009 (HSLS:09; NCES, 2020a). The specific research questions and hypothesis are:

RQ1. Is there a relationship between percentage of time spent college readiness counseling and student first-generation status, race/ethnicity, sex, and socioeconomic status?

H_0: There is no significant relationship between percentage of time spent college readiness counseling and student first-generation status, race/ethnicity, sex, and socioeconomic status.

H_a: There is a significant relationship between percentage of time spent college readiness counseling and student first-generation status, race/ethnicity, sex, and socioeconomic status.

RQ2. Is there a relationship between school counselor caseload and student first-generation status, race/ethnicity, sex, and socioeconomic status?

H_0: There is no significant relationship between school counselor caseload and student first-generation status, race/ethnicity, sex, and socioeconomic status.

H_a: There is a significant relationship between school counselor caseload and student first-generation status, race/ethnicity, sex, and socioeconomic status.

RQ3. Does school counselor caseload and percentage of time spent college readiness counseling predict student college attainment and persistence?

H_0: There will be no effect on college attainment and persistence related to school counselor caseload and percentage of time spent counseling.

H_a: There will be an effect on college attainment and persistence related to school counselor caseload and percentage of time spent counseling.

H_b: Smaller school counselor caseload and higher percentage of time spent counseling will increase a student's odds of attainment and persistence in college.

RQ4. Does school counselor caseload and percentage of time spent college readiness counseling predict STEM major attainment and persistence?

> H_0: There will be no effect on STEM major attainment and persistence related to school counselor caseload and percentage of time spent counseling.
>
> H_a: There will be an effect on STEM major attainment and persistence related to school counselor caseload and percentage of time spent counseling.
>
> H_b: Lower school counselor counseling ratios and higher percentage of time spent counseling will increase a student's odds of attainment and persistence in college.

Methodology

This study utilized multivariate quantitative research design, both cross-sectional and longitudinal, to answer the research questions. A quantitative design provided a numerical understanding of how school counseling access contributes to the attainment and persistence of students into postsecondary education and STEM major education. This study followed the process of secondary analysis of existing data (Cheng & Phillips, 2014). The existing dataset is the High School Longitudinal Study of 2009 (HSLS:09), developed by the National Center for Education Statistics (NCES, 2020a). The HSLS:09 dataset was appropriate to address the research questions, given its inclusion of school counseling variables, student variables, and postsecondary outcome variables. The dataset also contains a nationally representative sample (NCES, 2020a). The HSLS:09 dataset followed a sample of high school students throughout their secondary education career into postsecondary years (NCES, 2020b).

First, I completed data cleaning, assumptions testing, and preliminary analyses. To investigate research questions one, I performed four chi-square tests of independence. Then, four logistic regressions were run to investigate research question two. Next, to examine research

questions three and four, I also ran two logistic regression analyses. A longitudinal study was warranted to understand how student characteristics and school counseling access impact outcomes starting in high school and through postsecondary endeavors, as there are several school counseling outcome research studies that assess postsecondary enrollment outcomes but not further than one year into a student's postsecondary educational career (Poynton & Lapan, 2017; Tang & Ng, 2019; Woods & Domina, 2014). I used this design to assess the long-term impact of access to school counseling college readiness services on college and STEM major attainment and persistence (Whiston et al., 2011).

Chapter Conclusion

The United Nations Universal Declaration of Human Rights asserts equal access to higher education is a human right (United Nations, 1948). Yet, postsecondary educational outcomes, including postsecondary and STEM major attainment and persistence, are unequal based on differing group status, such as race, sex, socioeconomic status and FGS status (Chen, 2013). The American School Counselor Association (ASCA, 2019) emphasizes the role of the school counselor in working to ensure equitable postsecondary opportunities and outcomes for all students. Through the lens of SCCT (Lent et. al., 1994), this study explored how both student characteristics and school counseling access influence STEM postsecondary educational outcomes. The findings provided information on how school counselors are supporting and can better support underrepresented groups' postsecondary aspirations and endeavors. I examined the pieces that are more likely to predict college and STEM major attainment and persistence, with the hopes to increase the areas that can be impacted through policy, intervention, programming, and training. The following sections in this proposed dissertation include four chapters. Chapter Two contains a review of the literature on school counseling access and college readiness

counseling, an overview of the literature on school counseling access and STEM, an explanation of the theoretical framework of the proposed study, and gaps in the literature in relation to the proposed study. Chapter Three details the proposed design, procedures, and statistical analyses to investigate the research questions. Chapter Four presents the results of the analyses. Finally, Chapter Five contains the discussion of the results.

Chapter 2

LITERATURE REVIEW

Chapter Two provides an overview on the literature related to college attainment and persistence, STEM (i.e., science, technology, engineering, and mathematics) major attainment and persistence, and school counseling access related to college readiness counseling and STEM interventions. First, a succinct summary of the statistics on students' college attainment and persistence by demographics and other student characteristics is discussed. Following is a presentation of literature on school counseling access and college readiness counseling. The next section is a succinct summary of the research on STEM attainment and persistence, followed by an overview of the literature on school counseling access and STEM. Then, the theoretical framework of the proposed study, Social Cognitive Career Theory (SCCT) is expanded in relation to the proposed study (Lent et al., 1994). Gaps in the study variables are presented. Finally, a chapter summary and a list of defined operational variables concludes Chapter Two.

Comprehensive school counseling programs (CSCP) are comprehensive in scope, focus on prevention, and are developmental in nature (ASCA, 2017). CSCP allow for school counselors to focus on students' academic, career, and social/emotional needs; this includes college readiness as well as specific career development, such as STEM initiatives (ASCA, 2017). It is important to note that policy has an impact on school counselors' ability to effectively work with students on college readiness and STEM initiatives, as high caseload numbers and non-counseling duties inhibit their ability to work directly with students through CSCP (Pham & Keenan, 2011). Education policies at large are not bias free and are inequitable (Noltemeyer et al., 2012); despite research showing the benefits of CSCP for students, there are indications of large implementation gaps between which schools deliver a CSCP (Lapan et al.,

2012). College and career readiness are key outcome targets of school systems across the United States (United States Department of Education, 2010); STEM initiatives are also a national priority (National Science and Technology Council, 2018). It is worth noting that there are increasing efforts to integrate creativity (i.e., arts) into STEM education and change the term to STEAM (Conradty & Bogner, 2018). However, this proposed project focuses on STEM, due to the focus on STEM majors in the utilized HSLS:09 dataset, as well as because the existing, but scant, school counseling research available is on STEM but not STEAM.

The postsecondary education system can work as both a solution and mechanism for social mobility, but also as a problem by cultivating disadvantages through unequal access to opportunities (Wolniak et al., 2016). Through an understanding of how students, particularly underserved students, benefit from access to school counseling through CSCP, counseling research, practice, and policy can focus priorities on how to best promote equitable postsecondary outcomes. Therefore, the purpose of the current study was to examine the relationships between and contributions of school counselor caseload, school counselor percentage of time spent college counseling, and student characteristics on postsecondary and STEM major attainment and persistence.

College Enrollment, Persistence, and Attainment

The overall college enrollment rate has increased over the last two decades, from 35 percent of 18 to 24-year-olds in 2000 enrolled, to 41 percent in 2018 (NCES, 2020c). The immediate college enrollment rate, meaning students who enroll in college the fall following their senior year, was 69 percent in 2018, which was a six percent increase from the year 2000, but not a statistically significant change (NCES, 2020d). The immediate college enrollment rate for men and women do not statistically differ (i.e., 67% and 71%, respectively); however, both

the overall and immediate college enrollment rates continue to exhibit disparities in race, ethnicity, and socioeconomic status (Cahalan et al., 2019; NCES, 2020c; NCES, 2020d). In terms of immediate college enrollment after high school, enrollment rates for White students was higher than the rate for Black students every year since 2000 except 2010. The enrollment rate of White students was higher than the rate for Hispanic students from 2000 through 2010, but not measurably different between 2011 and 2017, however, the gap has since become significant again in 2018 (NCES, 2020d). Black and Hispanic students only showed significant differences in enrollment rates in three of the 18 years; the enrollment rate was higher for Black students in 2000, but lower than Hispanic students in 2015-2016 (NCES, 2020d). The immediate college enrollment rate for Asian students was higher than for Black and Hispanic students in every year since 2003, and was higher than the rate for White students in every year since 2004 (NCES, 2020d). Additionally, college enrollment rates have increased for White and Hispanic students, but not Black or Asian students, since 2000 (NCES, 2020d).

Socioeconomic status (SES) of students also provides information on who does and does not have equitable access to higher education. In 2017, approximately 78% of 18- to 24- year-olds from the highest family income quartile (i.e., a composite of father's/guardian's education, mother's/guardian's education, family income, father's/guardian's occupational prestige score, and mother's/guardian's occupational prestige score) enrolled in postsecondary education compared with 48 percent of those in the lowest family income quartile (Cahalan et al., 2019). For reference, the lowest quartile is family income data less than $42,056, and the highest quartile is $133,299 and above (Cahalan et al., 2019). The inclusion of the parent educational level is important, as FGS also matriculate into college at a lower rate than their peers: 72% compared to 93%, respectively (Cataldi et al., 2018). Clearly, all students are not entering

postsecondary education at the same rates, and these opportunity gaps will continue unless the education system, including school counselors, can actively support those students who are underserved. Also, of interest is the status of student college attainment.

College Persistence and Attainment

It is necessary to look beyond enrollment in postsecondary education to consider the rates of students who persist to graduate with a 2- or 4-year degree (i.e., associates or bachelor's degree). The college attainment and persistence rates in the United States, unfortunately, also show disparities in educational opportunity. For example, low-income and FGS are twice as likely to leave postsecondary education (i.e., two year or four year) without attaining a degree within three years of enrolling, compared to students who were neither low-income nor FGS (Cahalan et al., 2019). Cahalan and colleagues (2019) note the estimated bachelor's degree attainment rates differ significantly by family income quartile; with 62% of students in the highest quartile earning a bachelor's degree by the age of 24 in 2017, compared to only 13% in the lowest quartile (Cahalan et al., 2019).

When examining who graduated with a bachelor's degree within six years of enrolling in college, the disparities remain and are growing: bachelor's degree completion rates were approximately 33 percentage points lower for students in the lowest income quartile than those in the highest income quartile for 1995-96 and 2003-04 enrollees, compared to the 25 percentage points gap for those who first enrolled in 1989-90 (Cahalan et al., 2019). Again, FGS status influences college persistence and attainment. Statistics show students who are low-income and first-generation graduate with a bachelor's degree within six years of enrolling at the lowest rates (41%), compared to students who are low-income and not first-generation (56%), or neither (73%; Cahalan et al., 2019).

While the rates of Black and Hispanic students earning a degree has increased since 1980, students from these racial and ethnic groups continue to be underrepresented relative to their representation in the general population in 2017 (Cahalan et al., 2019). In 2017, Black students were 11% and 13% of bachelor's and associate degree recipients, respectively, compared to representing 14% of the overall 18-24 population in the United States (Cahalan et al., 2019). Hispanic students were 14% and 21% of bachelor's and associate degree recipients, respectively, compared to representing 22% of the overall 18-24 population in the United States (Cahalan et al., 2019). American Indian and Alaskan Native students were underrepresented in bachelor's degree attainment (.5%) and about equal in associate's degree attainment (.9%) compared to the general population distribution of one percent (Cahalan et al., 2019). The distribution of associate's and bachelor's degrees showed that Asian, multiracial, and White degree recipients were overrepresented compared to the general population (Cahalan et al., 2019). Finally, women have higher six-year graduation rates than men (63% versus 57%; NCES, 2019).

Self-efficacy and College Enrollment and Persistence

Self-efficacy is an important factor to consider when exploring student enrollment, persistence, and attainment in postsecondary endeavors. Self-efficacy is one's belief in the ability to influence and control events to obtain desired performances (Bandura, 1994). Self-efficacy is content-specific in that it corresponds to specific cognitive areas, but it has also been argued that through its mediating processes, self-efficacy is more than just the reflection of content specific ability (Chemers et al., 2001). These mediating processes fall under the realms of cognitive processes (e.g., calm and thoughtful approaches to problem solving, planning, self-regulation), motivational processes (e.g., goal setting and positive expectations), and affective processes

(e.g., seeing challenges rather than threats; Chemers et al., 2001). Different areas of self-efficacy have been explored in relation to college student outcomes. For example, Chemers and colleagues (2001) found academic self-efficacy predicted college academic performance and adjustment directly and through mediating affective processes. Other studies have also supported the connection between high levels of academic self-efficacy and college performance (Hsieh et al., 2007).

College self-efficacy is a person's belief in their ability to successfully engage in college-related behaviors (Gore et al., 2006). College self-efficacy is related to persistence in college, and less associated with college grade point average (Baier et al., 2016; Brady-Amoon & Fuertes, 2011). In a longitudinal study with approximately 400 undergraduate students, a regression analysis indicated college self-efficacy (i.e., in the course domain) was associated with increased odds of persistence, after controlling for gender, FGS status, and high school GPA (Wright et al., 2013). Vuong and colleagues (2010) reported similar findings. They found that college self-efficacy was a positive and significant predictor of college persistence, and while there were differences in college self-efficacy levels by ethnicity (directionality was not further explored), there were no differences by FGS status. Other research has shown no demographic differences in college self-efficacy by race, gender, or FGS status (Brady-Amoon & Fuertes, 2011).

It appears that self-efficacy and college self-efficacy is widely applicable to all college students and an important area to target for increasing persistence in college. College self-efficacy can begin forming before enrollment, and is often referred to as "college-going self-efficacy." Within college-going self-efficacy, students hold beliefs about their: attendance, concerns about finances, abilities, decision-making, family responsibilities, life skills, and

general feelings about starting and persisting in college (Gibbons & Borders, 2010). Research assessing college-going self-efficacy in high school Latinx students found that their GPA was the largest predictor of college-going self-efficacy scores, and parental support was also an important component (Berbery & O'Brien, 2018). College readiness begins in PK-12 education, and those working within education systems (e.g., school counselors) must seek to build students' knowledge, skills, and self-efficacy which lead to success in their higher education endeavors, as well as remove barriers, including lack of social capital (United States Department of Education, 2010). School counselors are in a unique position to address college readiness and self-efficacy through college readiness counseling efforts, and support all students to persist and attain their higher education goals. The next section will explore how this is and is not happening in the United States.

College Readiness Counseling and School Counseling Access

The *American School Counselor Association (ASCA) National Model* designates school counselors as professionals who promote equitable college and career opportunities for students (ASCA, 2019). Hence, providing college readiness counseling is an important role within the school counselor's repertoire. College readiness counseling is a part of the career development domain, which has long been a part of a CSCP (Savitz-Romer, 2012). College readiness counseling is focused on not just matriculation into postsecondary education, but also success in postsecondary endeavors (i.e., attainment of a degree; Savitz-Romer, 2012). College readiness counseling involves developmentally appropriate counseling which engages students in: (a) creating postsecondary goals and expectations; (b) building an awareness of interests and abilities; and (c) receiving information (i.e., general and specific) and support for their college access and success (Savitz-Romer, 2012). The NACAC notes college readiness counseling

activities include: (a) encouraging students to pursue the most challenging curriculum that results in enhanced postsecondary educational options; (b) identifying and satisfying student requirements for college access; and (c) assisting students in navigating financial aid, college choices, and components of college applications and admissions (Clinedinst & Koranteng, 2017). Other college readiness counseling tasks include reducing student anxiety around the process, admission essay assistance, writing excellent letters of recommendation, and creating and maintaining professional networks with admission officers (McDonough, 2005). School counselors can also assist in creating a college-going culture in schools (Gilfillan, 2018).

The College Board (2010) also provides a list of components in college readiness counseling. These are called the Eight Components of College and Career Readiness Counseling, and were designed to provide a systemic approach to college readiness counseling for school counselors in K-12 settings, with an equity and cultural competence focus (College Board, 2010). The components are: (a) college aspirations; (b) academic planning for college and career readiness; (c) enrichment and extracurricular engagement; (d) college and career exploration and selection processes; (e) college and career assessments; (f) college affordability planning; (g) college and career admission processes; and (h) transition from high school graduation to college enrollment (College Board, 2010). The Council for Accreditation of Counseling and Related Programs (CACREP, 2015) also provides justification for the enactment of college readiness counseling by school counselors, through standards for the training of school counselors. These college readiness counseling training standards include: G.3.g. "Strategies to facilitate school and postsecondary transitions" and G.3.k. "Strategies to promote equity in student achievement and college access" (CACREP, 2015). College readiness counseling is supported by CACREP, a prominent force in the preparation of school counselors, and organizations and researchers

support the inclusion of college readiness counseling within CSCP. The question then becomes, how do students benefit from, and which students benefit from, college readiness counseling?

Benefits of College Readiness Counseling

A study showed 40 percent of students reported their high school counselor as a resource for their college planning, and 30 percent of students identified their school counselor as the most helpful resource for their planning (Griffin et al., 2011). One would then assume student report and statistical data both support the positive impact of college readiness counseling on college enrollment, persistence, and attainment. Quantitative research has shown the effectiveness of college readiness counseling for all students (Dunlop-Velez, 2016). Using the nationally representative dataset of students from the High School Longitudinal Study (HSLS:09; NCES, 2020a), Dunlop-Velez (2016) found intriguing and promising results regarding high school counseling context and postsecondary enrollment. For instance, high school students who meet one-on-one with a school counselor are statistically more likely to complete their Free Application for Federal Student Aid (FAFSA), attend college, and attend a 4-year college (Dunlop-Velez, 2016). Also related to postsecondary enrollment was the experience of a student speaking to a school counselor about college in the ninth grade, which illustrates how important early college readiness counseling intervention can be (Dunlop-Velez, 2016). In a study using retrospective data from senior exit surveys in conjunction with National Student Clearinghouse information through five years post the sample's graduation, Tang and Ng (2019) wanted to examine which types of counselor contact influence postsecondary enrollment. The types of contact included (a) contact related to attendance; (b) contact related to college planning/scholarship support (i.e., college readiness counseling); (c) contact related to concerns about grades; and (d) contact related to goal setting. Results showed counselor contact regarding

college planning (i.e., college readiness counseling) and attendance had significant group differences by student enrollment at least once in a postsecondary institution within five years of high school graduation (Tang & Ng, 2019).

Further evidence of the importance of college counseling was provided by The College Board Advocacy & Policy Center through utilizing NCES School and Staffing Survey data, because the results showed that an additional counselor causes a 10-percentage point increase in four-year college-going rates for students (Hurwitz & Howell, 2013). A longitudinal look at postsecondary outcomes provides support for college counseling's impact on persistence in college. Poynton and Lapan (2017) conducted a study with approximately 400 students and found that students who met with their high school counselors for assistance in creating direction (i.e., college and career exploration) and who had a personalized relationship with their school counselors were more likely to persist in college a year after enrollment. They also reported students who met more often with the school counselor for assistance with applying to college and creating direction were more likely to persist into college in their second year of college (Poynton & Lapan, 2017).

College counseling is not only helpful for all students, it may be especially important for students underrepresented in higher education (i.e., FGS, students of color, students from low socioeconomic backgrounds; Gilfillan, 2018). Within the nationally representative HSLS:09 dataset, FGS, compared to their peers, were 2.48 times more likely to self-report their school counselors as the most helpful resource in their college planning process (Cholewa et al., 2015). The Cholewa and colleagues (2015) study also discovered African American students were 1.85 times more likely than White students to list their school counselors as the most influential source of information about post-secondary education. Using the 2002 Educational Longitudinal

Study database, Bryan and colleagues (2009) reported African American and female students were more likely to contact the school counselor for college information, and students in high-poverty were less likely. In another study using the same dataset, lower income students reaped advantages in college planning efforts (i.e., applying to one or two or more colleges) if they had meaningful interactions (i.e., college counseling) with their school counselors (Bryan et al., 2011). There are many benefits for students due to college counseling; however, students need access to counseling to obtain these benefits.

School Counseling Access

School counseling access for the proposed study is a student having a school counselor with the ASCA recommended school counseling ratio (i.e., 250:1) and that spends at least the national average of percentage of time spent college readiness counseling (i.e., 21%). Research has shown that U.S. high school counselors spend an average of 21.3% of their time on college readiness counseling (Clinedinst & Koranteng, 2017), but it is important to note that this percentage differs greatly between schools with different characteristics. Public high school counselors spent 20% of their time, and private school counselors spent 31% of their time, on college readiness counseling in 2016 (Clinedinst & Koranteng, 2017). As enrollment in a school increases, the percentage of time spent college readiness counseling decreases (Clinedinst & Koranteng, 2017). In a school where 0 to 25% of students are eligible for free and reduced lunch, 23.9% of school counselor time is spent in college readiness counseling, as opposed to 17.4% of time in schools where 76 to 100% of students are eligible (Clinedinst & Koranteng, 2017).

School counseling ratio also influences a school counselor's distribution of time spent in college readiness counseling. The percentage of time spent college readiness counseling hovers between 19.4% and 22.8% for counseling ratios between 100 or fewer and over 500 (Clinedinst

& Koranteng, 2017). The number of school counselors in a school has shown statistically significant positive effects on students applying to two or more colleges (Bryan et al., 2011). The number of school counselors in a school is important, because the school counselor ratio of a school is calculated by dividing the total number of school counselors by the total number of students (Blake, 2020). Smaller caseloads have been associated with school counselors spending more than half their time on college readiness counseling (Engberg & Gilbert, 2014). Further, smaller caseloads show improved college outcomes, including higher rates of four-year college enrollment (Engberg & Gilbert, 2014; Hurwitz & Howell, 2014). This holds true for first-generation college bound students, even when not for the general student population in one study; a one percent decrease in school counseling ratios for FGS was associated with a 0.4 percent increase in the odds of enrolling in a 4-year college in a sample of over 1,000 students (Pham & Keenan, 2011). Larger caseloads relate to students being less likely to speak with a counselor about college, plan to attend college, take the SAT, and enroll in a four-year college (Woods & Domina, 2014).

College readiness counseling and school counseling access are related to positive student postsecondary education outcomes, at least initial college enrollment and first-year retention, as evidenced by multiple research studies. Once a student enrolls in college, their course of study (i.e., major) plays a large role in their college experience. Their course of study is also an important component of the college planning process that school counselors assist with, like choosing a school that offers your major. A course of study worthy of further exploration in regards to school counseling is STEM, given the sustained need for an increased workforce to fill the STEM positions, and the potential for students to have job security and high pay upon graduation (Cataldi et al., 2014; Vilorio, 2014).

STEM Enrollment, Attainment, and Persistence

STEM attainment and persistence is an emerging topic in the career development and counseling field, but with differing opinions on what constitutes the "STEM crisis" (Xue & Larson, 2015). Some researchers are indicating that the demand for STEM workers in the United States will not be met, due to lack of qualified and interested individuals to step into these positions. For example, STEM majors constitute just 16.2% of all awarded bachelor's degrees in the United States (Cataldi et al., 2014; Falco, 2017). Another viewpoint emphasizes that it is important to note that the STEM market is a heterogenous one, and research has indicated that there are both shortages and surpluses of STEM workers, depending on the particular job market segment (Xue & Larson, 2015). Still, whether there are shortages in a particular STEM segment or not, the data is clear that there is a "STEM crisis" in terms of inequities in who is matriculating into STEM majors and who is persisting (National Science Foundation [NSF], 2019). A study of 71,405 students in seven Mid-western colleges showed that significantly more men (36.1%) than women (25.7%) students declared a STEM major their freshmen year (Mau, 2016). The same study showed that significantly more Asian (49.6%) or White (31.1%) students than Black (25.0%) or Hispanic (26.7%) students in the sample declared a STEM major (Mau, 2016). Research has shown students' intent to enroll as a STEM major in college already varies by populations as early as the ninth grade (Mau & Li, 2018). Utilizing the HSLS:09 dataset (NCES, 2020a), the results indicated female students were less likely than male students, and minority racial group students were less likely than White students to aspire to STEM careers (Mau & Li, 2018). Students SES status also predicted STEM career aspirations, in that a student with higher SES was more likely to aspire to a STEM career. These findings remained

significant in the model even when controlling for one another and student and parent educational expectations, as well as parent involvement (Mau & Li, 2018).

Regarding persistence, when students who enter STEM majors end-up switching their majors to non-STEM fields, their academics may suffer relative to their peers in other programs, and there is also the potential to drop out of college without even earning a degree (Sithole et al., 2017). A NCES report estimates that between 2003 and 2009, 48% of bachelor's degree students and 69% of associate degree students who had entered STEM majors left within several years by either changing their major (i.e., approximately 50%) or exiting college without earning a degree (Chen, 2013). There are a variety of factors influencing why a student may exit a STEM major, including pre-college academic preparation (e.g., GPA, highest level of math course taken), performance in college, performance in STEM classes, and financial ability to pay for college, to name a few (Chen, 2013).

Looking at bachelor's degree STEM major enrollees, more women (36%) than men (26%) left by switching to a non-STEM major; however, more men (24%) than women (14%) left their STEM major by dropping out of college (Chen, 2013). In terms of race and ethnicity, Asian students left being a STEM major by dropping out of college at the lowest rate (10%), and students of other racial and ethnic groups ranged between 20-29% in their STEM and college attrition rate (Chen, 2013). There was just one measurable difference in switching from a STEM major to a non-STEM major by race and ethnicity, and that was proportionally fewer Asian students (22.6%) than Black (36%) students switched out of being a STEM major (Chen, 2013). In terms of FGS status, there was no measurable difference between FGS and their peers in switching out of a STEM major to a non-STEM major, but FGS were more likely to leave STEM major by college attrition, at approximately 30 percent compared to approximately 16 percent

(Chen, 2013). In a different study of $n = 702$ students, those students who were first-generation college goers in STEM fields had significantly stronger intent to not complete their degree (Xu, 2015). Finally, students in the two lowest quartiles of income level (i.e., SES) were more likely to drop out of STEM major (21.6% and 29.2%) and college than their peers in the highest quartile (15.4%), but switching majors from STEM to non-STEM did not vary statistically significantly by income level (Chen, 2013).

However, other research is showing the great growths in traditionally underrepresented students persisting in STEM majors in college. For instance, underrepresented minority women (i.e., Black or African American, Hispanic or Latino, and American Indian or Alaska Native students) have nearly doubled in the share of earning science and engineering degrees between 1995 and 2014, from 7.8% to 12.6% at the bachelor's level (NSF, 2019). The rates of underrepresented minority men earning their bachelor's degree in science and engineering degrees has also been steadily increasing in that time, from 6% to 9% (NSF, 2019). The NSF reports women have reached parity with men in earning bachelor's degrees in science and engineering, despite their continued underrepresentation in the workforce; women earned just over half (54.8%) of bachelor's degrees in science and engineering awarded in 2016 (NSF, 2019). However, Mau (2016) reported that in the sample of over 17,000 students, a smaller percentage of female and minority students completed their STEM degree in 5 years than their counterparts. So, although research has shown improvement of STEM enrollment and degree completion of female and minority students, these students continue to be underrepresented in STEM postsecondary education (Mau, 2016).

There are multiple potential reasons for the opportunity gaps in STEM higher education, leading to less matriculation into a STEM major and more attrition, including that young people

are not engaged in higher-level STEM coursework in high school, the time it takes to complete STEM programs and lack of financial ability to do so, and attitudinal factors, such as motivation and confidence (Chen, 2013). There may also be a lack of support and encouragement, and a direct discouragement from educators for underrepresented minorities and women to engage in STEM coursework, starting in adolescence (Grossman & Porsche, 2014). Self-efficacy is also a factor to consider when researching STEM attainment and persistence.

Self-efficacy and STEM

Research has found that self-efficacy is an important pathway to students' STEM major persistence (Lent et al., 2016; Rittmayer & Beier, 2009). Researchers have investigated various types of self-efficacy within STEM persistence and attainment, including college, math, science, and STEM self-efficacy. STEM self-efficacy is an individual's belief in their ability to perform in STEM endeavors; it includes confidence and self-assurance in completing STEM related activities (Brown et al., 2016; Rittmayer & Beier, 2009). Math self-efficacy is domain specific for confidence in math abilities, and science self-efficacy is domain specific for confidence in science abilities. STEM self-efficacy contributes to STEM academic performance and persistence beyond ability and previous achievement, because the confidence in one's ability to succeed motivates individuals to succeed (Rittmayer & Beier, 2009).

Within their model of social cognitive predictors of engineering students' ($n = 908$) academic persistence, Lent and colleagues (2016) found students' engineering and college self-efficacy significantly predicted persistence and intended persistence in the engineering major in a positive direction. Further, self-efficacy also mediated other important influences on persistence, such as positive affect. A longitudinal study of engineering major persistence sought to test Lent and colleagues' (2016) SCCT academic persistence model, and their results supported the

applicability of SCCT's academic persistence model to Latinx and White engineering students, and women and men, through accounting for the relations from past academic performance, engineering self-efficacy, and engineering goals over time to engineering major persistence (Lee et al., 2015). Another study assessed how science self-efficacy, amongst other variables, differed between STEM persisters (i.e., students who reported pursuing a STEM major in high school and were still doing so in their third year of college) and STEM switchers (i.e., those who were no longer doing so in their third year of college) in a sample of 28, 390 students. Results found STEM majors who switched had lower science self-efficacy ratings than those who persisted in their major (Shaw & Barbuti, 2010).

Various components of STEM self-efficacy already begin influencing STEM goals and, hence, outcomes, even before college matriculation. For instance, Mau and Li (2018), using the HSLS:09 (NCES, 2020a) in logistic regression analysis, discovered that in the ninth grade, students with higher math self-efficacy and science self-efficacy were more likely to have a STEM career expectation and aspirations, and this significant effect held when controlling for student race, gender, SES status, and various school factors. Developmentally, students in high school are formulating their goals for college and future careers. The disparities within matriculation and high attrition rates of underrepresented students in STEM majors is an equity issue in educational opportunity. School counselors can use targeted research interventions (i.e., college counseling) to support students' STEM aspirations and STEM self-efficacy (Mau & Li, 2018). The next section will explore school counseling research regarding STEM and STEM interventions as part of their college counseling efforts.

STEM and School Counseling Access

School counselors have an important role in providing counseling to educate students and their families on the possibilities in STEM at the high school and college level (Schmidt et al., 2012; Shillingford et al., 2018). However, school counseling STEM intervention is a relatively new area of research. Conceptual models have been provided for school counselors for their work with students regarding STEM education and careers. For instance, Falco (2017) provides a review of research on student STEM engagement, utilizing a SCCT framework, with the goal of helping school counselors better support STEM career development for all students, and especially those from underrepresented groups. The article provides a review of relevant issues that are likely to influence the development of student's STEM career self-efficacy (i.e., prior accomplishments, vicarious learning, emotional arousal, verbal persuasion) and then connects these to suggestions for school counselors to support math and science achievement, improve self-efficacy and outcome expectations, and address systemic barriers to STEM success (Falco, 2017).

For example, school counselors can encourage students to take advanced-level math and science courses, can provide classroom instruction on the benefits of engaging in STEM, and to improve self-efficacy can organize a peer mentoring program or conduct small group counseling on relevant skills (Falco, 2017). The article also calls for school counselors to ensure balanced gender and racial ethnic ratios in STEM classes. Interestingly, caseload and school counselor percentages of time distribution are not discussed as systemic barriers for underrepresented groups, although research has shown underrepresented students are less likely to expect postsecondary information and less likely to participate in small group counseling, but more likely to view their school counselors as helpful (Dockery & McKelvey, 2008).

Similarly, Schmidt and colleagues (2012) provide suggestions for school counselors to "expand their repertoire" through STEM-focused career development. Key impact areas include (a) academic and career counseling, and (b) leadership and advocacy (Schmidt et al., 2012). During academic and career counseling, school counselors should intentionally work to integrate STEM knowledge into student goal setting, encourage high STEM aspirations with students, and encourage higher level coursework for all students. In terms of leadership and advocacy, school counselors can advocate to increase the number of underrepresented students in STEM courses, and involve parents in academic and career planning. The researchers acknowledge how school climate and the large administrative demands (i.e., inappropriate duties) placed on school counselors may restrict their ability to engage in career-related and STEM course discussions with students (Schmidt et al., 2012). However, there is no data to understand the long-term impacts of this barrier, and how their suggested key impact areas influence student outcomes.

School counseling interventions have shown promising results in promoting STEM self-efficacy (Falco & Summers, 2019). The researchers detailed the results of a career group intervention that incorporated the four sources of self-efficacy and addressed perceived career barriers, with the goals of improving the career decision self-efficacy and STEM self-efficacy for adolescent girls (Falco & Summers, 2019). In terms of the four sources of self-efficacy, values clarifications, "growth mindset," celebration of mastery experiences, and role models were all incorporated into the group counseling intervention. Additionally, the facilitator provided verbal persuasion and STEM specific occupational information (Falco & Summers, 2019). Results showed significantly different improvements in career decision making self-efficacy and STEM efficacy from before the group to three months post-intervention. The results of this intervention are promising, especially as it is one of the few empirical studies on self-efficacy counseling

interventions and STEM career outcomes with adolescents, and the sample was all female with half of the sample identifying as Latina (Falco & Summers, 2019).

It follows that to engage in college counseling that can effectively bolster students' STEM aspirations, there needs to be access to school counseling services for students. Nikischer and colleagues (2016) conducted an ethnographic investigation of school counselors' roles in the STEM pipeline at two schools with very different school counseling departments. The first school serves mostly low-income, underrepresented minority students, and the counseling department does not have adequate support (i.e., employees) and is mostly reactive as opposed to preventive and comprehensive in nature. This leaves little room for advising students on STEM college counseling. Of the second school's student population, less than ten percent are on free and reduced lunch or are an underrepresented minority. While the latter school's counselors focus on encouraging students into STEM courses more than the former, school counselors at both schools lack the time and resources to focus on STEM major and program advising during college counseling due to their heavy workloads, inappropriate duties, and lack of STEM knowledge (Nikischer et al., 2016). Given the potential for high school STEM interventions to make a great impact in student's STEM self-efficacy and education outcomes, the inability of school counselors to provide college counseling, and specifically STEM-focused college counseling, is troubling (Falco & Summers, 2019). To move forward in advocating for school counseling access to promote student outcomes in both college readiness and the STEM pipeline, a theory-driven, longitudinal approach to investigating the impact of school counseling access on these outcomes is needed. Given the importance of considering student characteristics, environmental inputs, and self-efficacy in college and STEM matriculation, attainment, and persistence, SCCT serves as a logical base for the theoretical framework for this investigation.

Theoretical Framework for Current Study

SCCT (Lent et al., 1994) is a widely researched and utilized vocational psychology theory, meaning it is a theory that explains how people make academic decisions and career pursuits (Lee et al., 2015). It was originally anchored in Albert Bandura's Social Cognitive Theory (Bandura, 1986). Of importance in SCCT, is what Bandura termed "triadic reciprocality" which recognizes the mutual and interacting influences between individuals, their behavior, and their environments (Bandura, 1986, Lent et al., 1994). This bidirectionality is influenced by personal attributes, external environmental factors, and overt behavior (Lent et al., 1994). Social Cognitive Theory emphasizes the situational and domain-specific nature of behavior (Lent et al., 1994). From that, SCCT highlights three sociocognitive mechanisms derived within Social Cognitive Theory: self-efficacy beliefs, outcome expectations, and goal representations (Lent et al., 1994). Self-efficacy is perhaps the most researched of the mechanisms, due to its predictive power related to academic and career performance (Lent et al., 1994). Self-efficacy also is seen as generally more influential than outcome expectations, and as influencing goal representations (Lent & Brown, 1996).

Lent and colleagues (1994) proposed SCCT as a theoretical model that integrates conceptually related constructs in career development, more fully explains outcomes common to several existing career theories, and accounts for the relationship between seemingly unrelated constructs. This means that SCCT provides a conceptual framework for researchers and practitioners to understand and explain (a) how career and academic interests develop; (b) the processes and mechanisms by which career-relevant choices are made; and (c) how performance outcomes are achieved (Lent et al., 1994). SCCT is a fitting theoretical framework for the proposed study given that it can encapsulate the interrelations between cognitive, behavioral, and

environmental factors that influence career and education related interests, choices, and performance behaviors (Lee et al., 2015). The focus on high school students and outcomes through the traditional college age in the proposed study is also fitting, as it's posited that while career development is a process which can span across one's life, it is probably the most fluid up through late adolescence and early adulthood (Lent et al., 1994).

There are multiple segmental models within SCCT. The three original models are vocational interest, occupational choice, and career-related performance (Lent & Brown, 1996). There is also the career satisfaction/wellbeing model, and the career self-management model (Lent & Brown, 2008; Lent & Brown, 2013). Of interest for the proposed study is the career-related performance model. The career-related performance model also applies to academic performance, and it covers two aspects of career performance: (a) attainment or success of work tasks and (b) persistence, despite obstacles (Lent & Brown, 1996). The career-related performance model is aligned with the outcome variables in the proposed study, which are college and STEM attainment and persistence. Career performance is influenced by several factors, including ability, self-efficacy, outcome expectations, and performance goals (Lent & Brown, 1996). The model emphasizes that the sociocultural context is important in career-related performance, and the structure of opportunity (e.g., socioeconomic status, education access, social support), socialization of gender roles, and other societal and family norms influence abilities, self-efficacy, outcome expectations, and goals (Lent & Brown, 1996). It is also important to note that while self-efficacy is important, it is not a substitute for ability in career-related performance (Lent & Brown, 1996). All the models, while segmented and able to be studied separately, are also interlocking. Figure 1 illustrates the interlocking segment models of SCCT, and the related components of the theory. As the large number of paths indicate, the

reciprocal processes within SCCT provide many avenues for studying career and academic

development.

Figure 1
SCCT Model
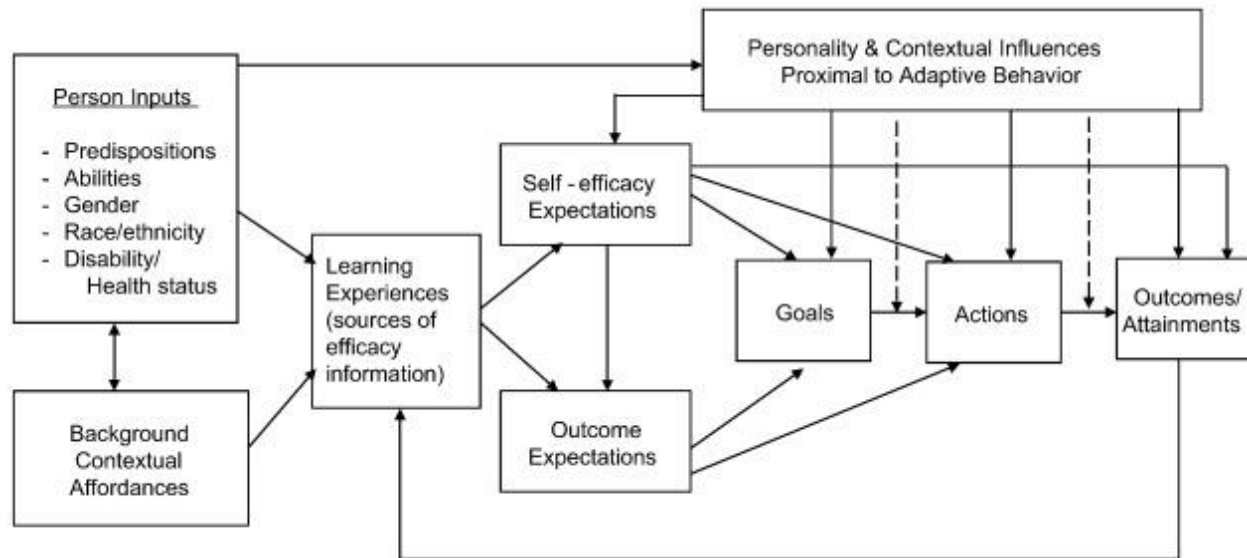
Note. SCCT = Social Cognitive Career Theory. This figure demonstrates SCCT constructs.
Reprinted from the *Journal of Vocational Behavior, 45*(1), Lent, Brown, & Hackett, Toward a
unifying social cognitive theory of career and academic interest, choice, and performance.,
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SCCT provides information on how to understand students' career and education-related

choices through an understanding of self-efficacy and its relation to behavior and decision

making (Falco, 2017). Self-efficacy refers to what an individual believes they "can" do, not what

they "will" do (Lent & Brown, 2006). For the current study, the college self-efficacy variable

measured a student's belief that they can graduate college, no matter what their actual plans.

Self-efficacy is assumed to exert direct effects on activity goals and choices (Lent et al., 1994).

As presented in this literature review, self-efficacy has been widely explored in the literature on

college and STEM attainment and persistence (Baier et al., 2016; Lent et al., 2016; Rittmayer &

Beier, 2009; Wright et al., 2013). There are several categories of self-efficacy (Lent & Brown,

2006); the current study focused on two types of content-specific self-efficacy and one type of

task-specific self-efficacy. The content-specific self-efficacy included as variables were math self-efficacy and science self-efficacy; the task-specific self-efficacy was college self-efficacy.

Perceived barriers in career and education development may negatively impact social-cognitive variables (e.g., self-efficacy), and perceived barriers related to gender, ethnicity, and SES may impact students even if they have had previous mastery experiences (Falco, 2017). Hence, related to college and STEM attainment and persistence, it reasons that demographics such as gender, race and ethnicity, SES, and FGS status should be considered when analyzing career and education outcome studies. These demographic characteristics are referred to as "person inputs" (e.g., gender, race/ethnicity) and "background environmental characteristics" (e.g., parent education status, socioeconomic status) within SCCT (Lent & Brown, 2006). Even with the influence of person inputs and background environmental characteristics, self-efficacy is a dynamic attribute, and can be built (Lent et al., 1994; Lent & Brown, 2006).

Within the SCCT framework, four means through which to increase self-efficacy are (a) personal performance accomplishments, (b) vicarious learning, (c) social persuasion, and (d) physiological states and reactions (Bandura, 2008; Lent & Brown, 1996). Proximal environmental influences, also known as contextual supports and barriers, are also an important component of SCCT, and can be a potential source of increasing self-efficacy (Lent & Brown, 2006). One proximal environmental influence, and a focus in the current study, is school counseling access. College readiness counseling interventions can target all four means to increase student self-efficacy (Lent & Brown, 1996). When school counselors engage in transformative college readiness counseling with their students, they are providing social persuasion to the student, through encouraging the student to set and reach goals. Additionally, they may function to affect physiological states and reactions, through alleviating anxiety

connected to the college application and admission process. School counselors can also provide vicarious learning opportunities to students, through sharing their own experiences with college readiness, taking students on college tours, or having STEM representatives come and speak to students about STEM careers. Finally, they can assist students in course planning to gain opportunities to mastery experiences, and remind students of their abilities and past accomplishments to encourage their realization of personal performance accomplishments.

When SCCT was described by its creators as a "segmental" theory, they meant that rather than a grand, sweeping theory of career and academic development, researchers and practitioners can utilize different segments of the theory in modeling behavior (Lent et al., 1994). SCCT's five interconnected models are often studied in isolation from one another, but researchers also combine the elements of the models into more integrated units; for example, interest, satisfaction, and persistence related to pursuing a STEM major (Lent et al., 2016). Following Lent and colleagues' (1994) guidance, various components of SCCT were explored in the current study. The student characteristics, referred to as *person inputs* and *background environmental influences* included in the analysis were FGS status, sex, socioeconomic status, and race/ethnicity. The inclusion of these specific characteristics is supported based on previous research on college and STEM outcomes, as detailed in this literature review (Cahalan et al., 2019; Chen, 2013). Again, the proximal environmental influence under investigation was school counseling access (i.e., school counselor caseload and percentage of time spent college readiness counseling). Student self-efficacy (i.e., college, math, and science), and learning experiences (i.e., high school GPA) formed the basis of investigating the outcomes of the current study, which were college and STEM attainment and persistence. Outcomes are referred to as performance domains and attainments in SCCT (Lent & Brown, 2006).

See Figure 2 for an illustration of the SCCT influenced theoretical framework for the current dissertation study. The squares are the variables in the study and the stadiums are the SCCT concepts and terms. The white shapes were used in both regression analyses in research questions three and four, the blue shapes were used only in the analysis of the college attainment and persistence outcome, and the yellow shapes were used only in the analysis of the STEM major attainment and persistence outcome. The lines indicate the hypothesized reciprocal connections between variables, based on SCCT research (Lent & Brown, 2013).

Figure 2

Theoretical Framework for Current Study
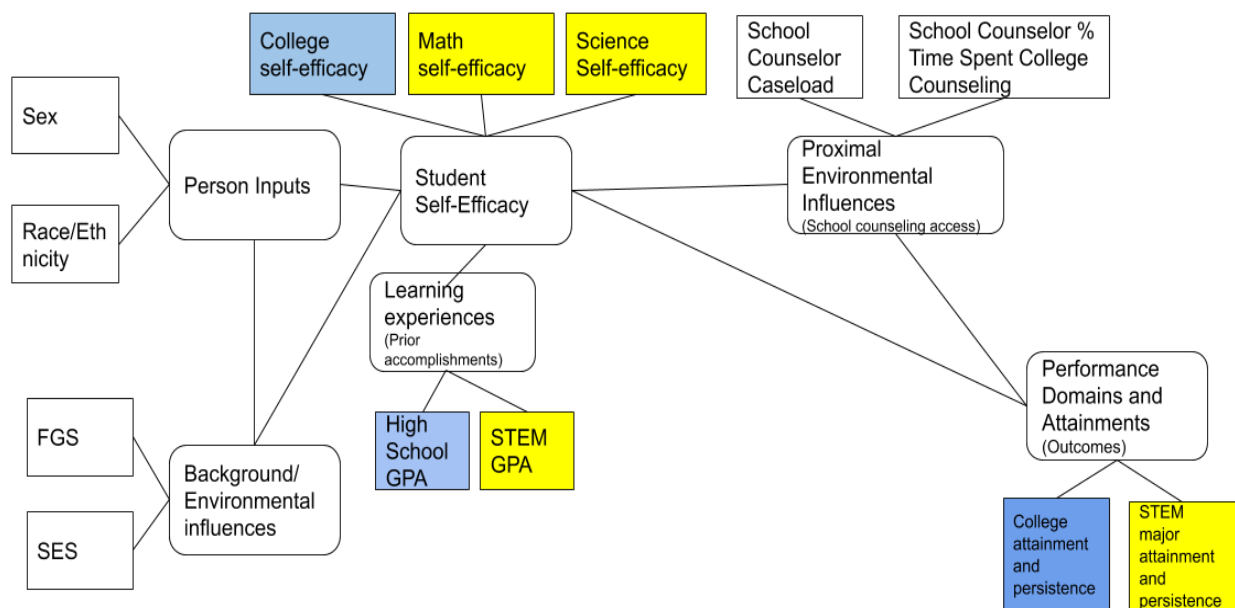
While SCCT has been utilized as a theoretical framework in many research studies on college and STEM performance domains and attainments, there is a need for a SCCT based-model that connects how school counseling access is related to multiple inputs in college, as well as STEM, attainment and persistence in a nationally representative sample. The gaps in the literature on the study variables are further explained in the following section.

Gaps in Literature on Study Variables

Chapter 2 thus far outlines existing research on college and STEM major attainment and persistence, related to school counseling access, often through a SCCT lens. However, there are gaps in the literature on study variables, which are explored in the current study and have implications for school counseling, counselor education, and future research. One gap in the research exists in the connection between the school counseling access variables of interest in the study (i.e., school counselor caseload and percentage of time spent college readiness counseling) and longitudinal college student outcomes. For instance, Dunlop Velez (2016) assessed several variables related to counseling context and their connection to matriculation into college. The variables included the proportion of counselors' time spent on college preparation (i.e., percentage of time spent college counseling) and the different types of help offered by the school to aid students in selecting colleges and securing financial aid (Dunlop Velez, 2016). However, the author did not account for school counselor caseload, and only had data on college enrollment, rather than attainment and persistence.

Another study did find an increased two-and four-year college enrollment rate of students for up to five years post-high school graduation related to school counselor contacts, but, again, this study did not assess how school counselor caseload affects post-secondary student outcomes, and Tang and Ng (2019) suggested future research do so. Additionally, this example of a longitudinal outcomes study did not utilize a nationally representative sample and instead focused only on one urban school district (Tang & Ng, 2019); therefore, a nationally representative study of longitudinal post-secondary outcomes in connection to school counseling access is needed (Poynton & Lapan, 2017). Additionally, most school counseling post-secondary outcome studies did not delve into analyses of specific majors and areas of study outcomes

related to school counseling access, including STEM major attainment and persistence. Further,

exploration on school counseling access by student FGS status, race/ethnicity, sex, and

socioeconomic status will provide policymakers and school administrators information for

discerning allocation of school counselors (Hurwitz & Howell, 2013).

While the review of pertinent literature on STEM conceptual studies and existing short-

term STEM outcome studies in school counseling is informative and promising (Falco, 2017;

Falco & Summers, 2019), there are no longitudinal outcome studies from high school through

college to support the long-term implications of STEM self-efficacy, school counseling access,

and STEM attainment and persistence. Further, Mau & Li (2018) specifically call for future

research investigating what contributes to the attrition, especially among female and minority

students, in STEM beyond the ninth grade. The current study furthers their research on student

and school environment factors that contribute to STEM attrition up to three years post-high

school. In short, while prior research has highlighted the importance of school counselors

working with students in STEM career planning and STEM self-efficacy, little is known about

how a SCCT based model of multiple inputs and school counseling access is related to

longitudinal STEM outcomes in a nationally representative sample (Falco, 2017; Falco &

Summers, 2019; Mau & Li, 2018; Nikischer et al., 2016; Schmidt et al., 2012).

In summary, after a review of existing literature in college and STEM matriculation and

persistence in relation to school counseling there are gaps in the literature. The current study

provides novel information on student and school counseling factors to support theoretical

grounding of SCCT on college and STEM major attainment and persistence, which will inform

school counseling interventions. Additionally, the use of a longitudinal study and logistic

regression analyses to support a model of student factors and school counseling factors in

predicting college and STEM major attainment and persistence outcomes is a novel methodological approach in the school counseling literature.

Chapter Conclusion

Existing research has explored the concepts of college and STEM major attainment and persistence, often through the lens of SCCT with an emphasis on sociocultural context (e.g., student characteristics and contextual barriers and supports) and self-efficacy. Emerging research literature also has supported the impact of school counseling access on student college and STEM readiness and outcomes. However, there is still a need for outcome research on access to school counseling and its relation to college and STEM outcomes with a nationally representative sample, using a comprehensive theoretical framework, to increase generalizability of these prior findings. This will support advocacy efforts for students and the school counseling profession and guide school counselors in tailoring their college readiness counseling services with students. Chapter three will outline the methodology of the current study.

Operational Definitions of Variables

College attainment and persistence- A student who has matriculated into college (i.e., two year or four year) and is currently enrolled, or who has graduated from college earning a degree or certificate, is said to have achieved college attainment and persistence. For the current study, college attainment and persistence is measured three years post-high school graduation.

School counseling access- A student's ability to access school counseling, as measured by the percentage of time the student's counselor spends college readiness counseling, and the school counseling caseload of the student's school counselor.

Percentage of time spent college readiness counseling- The amount of time, in a percentage, that a school counseling department reports a school counselor spends on college

readiness counseling with students. This includes assisting students with college readiness, selection, and applications, in individual, group, or classroom settings, or in school-wide programming efforts.

School counselor caseload- The number of students on a school counselor's caseload as reported by the school counseling department; also measured as the ratio of number of students per one school counselor. For example, the ASCA recommended school counseling caseload is 250:1, or a school counseling caseload of 250 per one school counselor.

Self-efficacy- An individual's belief in their ability to influence and control the events of their life to obtain desired performances (Bandura, 1994)

College self-efficacy- A student's belief in their ability to attend and graduate from college. This is assessed by a student's response on a Likert scale to the question, ""Whatever your plans, do you think you have the ability to complete a Bachelor's degree?" (NCES, 2020a).

Math self-efficacy- A student's belief in their ability to be successful at math related tasks. The information is assessed through a scale consisting of four items (e.g., "I can do an excellent job on math tests"; NCES, 2020a).

Science self-efficacy- A student's belief in their ability to be successful at science related tasks. This information is assessed through a scale consisting of four items (e.g., "I can master skills in science courses"; NCES, 202a).

STEM major attainment and persistence- A student who has declared a STEM (i.e., science, technology, engineering, and mathematics) major and is currently enrolled, or who has graduated from college earning a STEM degree or certificate, is said to have achieved STEM attainment and persistence. For the current study, STEM major attainment and persistence is measured three years post-high school graduation.

Chapter 3

METHODOLOGY

Chapter Three provides an overview of the methodology for the current study. First, I explain the research design of the study, including the research questions and the participants. Then, I specify the data collection methods I utilized, followed by the variables and constructs chosen for the study through the lens of Social Cognitive Career Theory (SCCT; Lent et al., 1994). Next, I outline the data analysis procedures, including how I engaged in data cleaning and preliminary analysis. The final section details the rationale, assumptions, and process for utilizing chi-square tests of independence and logistic regressions to explore the research questions. Limitations and a chapter summary conclude.

Research Design

A quantitative, multivariate, cross-sectional and longitudinal research design was utilized for the current study. A quantitative design provided a numerical understanding of what contributes to the opportunities in college and STEM attainment and persistence for students. This provided a more complete and detailed description of the phenomenon under investigation, as both college and STEM major attainment and persistence are complex matters in which individuals generate many behaviors and respond in varied, although related, ways (Meyers et al., 2016). A longitudinal study was also warranted to understand how school counseling access impacts outcomes starting in high school and through postsecondary endeavors. The use of a nationally representative dataset provided generalizability to the findings for students in the United States. Thus, the current study sought to answer the call to assess the long-term impact of access to comprehensive school counseling programs (Whiston et al., 2011).

Research Questions

RQ1. Is there a relationship between percentage of time spent college readiness counseling and student first-generation status, race/ethnicity, sex, and socioeconomic status?

H_0: There is no significant relationship between percentage of time spent college readiness counseling and student first-generation status, race/ethnicity, sex, and socioeconomic status.

H_a: There is a significant relationship between percentage of time spent college readiness counseling and student first-generation status, race/ethnicity, sex, and socioeconomic status.

RQ2. Is there a relationship between school counselor caseload and student first-generation status, race/ethnicity, sex, and socioeconomic status?

H_0: There is no significant relationship between school counselor caseload and student first-generation status, race/ethnicity, sex, and socioeconomic status.

H_a: There is a significant relationship between school counselor caseload and student first-generation status, race/ethnicity, sex, and socioeconomic status.

RQ3. Does school counselor caseload and percentage of time spent college readiness counseling predict student college attainment and persistence?

H_0: There will be no effect on college attainment and persistence related to school counselor caseload and percentage of time spent counseling.

H_a: There will be an effect on college attainment and persistence related to school counselor caseload and percentage of time spent counseling.

H_b: Smaller school counselor caseload and higher percentage of time spent counseling will increase a student's odds of attainment and persistence in college.

RQ4. Does school counselor caseload and percentage of time spent college readiness counseling predict STEM major attainment and persistence?

> H_0: There will be no effect on STEM major attainment and persistence related to school counselor caseload and percentage of time spent counseling.
>
> H_a: There will be an effect on STEM major attainment and persistence related to school counselor caseload and percentage of time spent counseling.
>
> H_b: Lower school counselor counseling ratios and higher percentage of time spent counseling will increase a student's odds of attainment and persistence in college.

Participants and Sampling

The current research study followed a sample of high school students throughout their secondary and postsecondary years, to investigate college and STEM attainment and persistence outcomes of the United States adolescent population (NCES, 2020b). The High School Longitudinal Study of 2009 (HSLS:09) is a nationally representative, longitudinal study of over 23,000 ninth graders from 944 schools (NCES, 2020b). More specifically, the study is representative of fall semester ninth-graders, in schools with a ninth and an eleventh grade, in the fall of 2009 when the initial survey was administered (Ingels & Dalton, 2013). The study had a first follow-up survey with student participants in 2012 and a second follow-up in 2016; there was also a brief 2013 update survey to collect information on sample members' status regarding high school completion, postsecondary applications and enrollment, financial aid applications and offers, and employment (Duprey et al., 2018). It is an appropriate dataset and sample, given its inclusion of student variables, school counseling variables, and variables on postsecondary outcomes. Approximately 900 high school counselors were surveyed for the study to provide information on their school counseling departments, including school counselor caseload and

percentage of time spent college readiness counseling. School counselors in the study were not randomly selected, rather they were either the lead counselor or the counselor deemed most knowledgeable about the ninth graders at the time of the baseline data collection (Ingels & Dalton, 2013).

In the base-year survey of HSLS:09, students were sampled through a two-stage process. Stratified random sampling and school recruitment resulted in the identification and contacting of 1,889 eligible schools in the first stage. A total of 944 of these schools participated in the study, resulting in a 56 percent weighted school response rate (Ingels & Dalton, 2013). The second stage was to randomly sample students from school rosters, which resulted in 25,206 students deemed eligible for the questionnaire/assessment and able to complete it; 21,444 completed the survey which is an 85.7% weighted response rate. Of the 21,184 students who were eligible to complete the first-follow questionnaire/assessment, 20,594 did, resulting in an 82% weighted response rate (Ingels & Dalton, 2013). In 2013, out of the potential 25,167 participants who were eligible for both the brief questionnaire and transcript collection, the response rate was 70.2%, or 25,167 students (Duprey et al., 2018). Finally, for the second-follow up in 2016, 17,335 out of 25,123 eligible students completed the questionnaire/assessments, which is a 67.9% weighted response rate (Duprey et al., 2018). Of those 17,335, there is data on college and STEM attainment and persistence for approximately 10,000 students to be included in the analysis.

G*Power 3 (Faul et al., 2007) was utilized to determine the sample size needed for the desired power in the regression analyses. An a-priori sample size for the logistic regression analyses confirmed with the desired power of 0.8, significance level at .05, an odds ratio of 2.67, two-tailed test, and a R^2 value of 0.2, the recommended minimum sample size of 64 is reached.

Similar research on the school counseling contact and enrollment in postsecondary education

showed a R^2 value approaching 0.3 (Tang & Ng, 2019). An effect size of 0.3 is considered a

medium to large effect by Cohen's (1988) standards, and is aligned with a meta-analysis on the

effect sizes of school counseling outcome research (Whiston et al., 2011). An a-priori sample

size for the chi-square tests of independence analysis confirmed with the desired power of 0.8,

significance level at .05, the recommended minimum sample size of 121 in each group is met.

Next, in terms of recruitment, the NCES detailed their sampling methods in their user

manual, but recruitment strategies at the school level for the baseline collection were not further

detailed (Ingels & Dalton, 2013). Recruitment for the first-follow up at the school level began in

January 2011 and continued until May 2012 (Ingels et al., 2013). At this stage, recruitment was a

two-step process of notifying school districts and securing continued cooperation from schools,

through mailed letters and contact with the school principal (Ingels et al., 2013). When students

from the baseline were still enrolled at the base-year school, schools provided the student's

current grade level in addition to family contact information; if the student was no longer

enrolled there, the school provided information on why the student left (Ingels et al., 2013). If at

least four students transferred to the same school that was not included in the base-year HSLS:09

sample, the school was contacted to participate, and out of 14 schools identified, eight

participated in the first follow-up (Ingels et al., 2013). To recruit for the second-follow up survey

(i.e., the 2016 questionnaire), beginning in August 2015, a panel maintenance activity was

conducted to confirm and update sample members' contact information (Duprey et al., 2018).

After batch tracing efforts, a panel maintenance mailing was sent to sample members and

parents, asking them to provide updated contact information and including a $10 incentive offer,

payable to the sample member (Duprey et al., 2018). Multiple recruitment methods were used for

the second-follow up survey, including phone calls, hard copy mailing, and emails (Duprey et al., 2018). Description of other incentives offered throughout the longitudinal study is provided in the HSLS:09 dataset user manual. They included school-level incentives of science magazine subscriptions and Staples gift cards, and there were various participant level incentives that were contingent on results of algorithmic data (Dalton et al., 2018; Ingels et al., 2013).

Data Collection

Cheng and Phillips' (2014) steps for secondary analysis of existing data guided the data collection procedures for the current study. There are two approaches to secondary analysis of existing data: the research-question driven approach and the data driven approach (Cheng & Phillips, 2014). The current study is an example of a research-question driven approach, in which I had an a priori question in mind and then looked for suitable datasets to address the question (Cheng & Phillips, 2014). In this case, the aforementioned HSLS:09 dataset was selected as the existing data source, given its longitudinal nature, nationally representative sample, and inclusion of student variables, school counseling variables, and postsecondary and STEM outcome variables (NCES, 2020a). The first step in secondary analysis of existing data is to develop an analytic plan that includes specific variables to be considered and what analyses will be conducted (Cheng & Phillips, 2014). The SCCT (Lent et al., 1994) theoretical framework will guide the selection of appropriate variables (i.e., see Constructs and Variables). Chi-square tests of independence (RQ 1) and logistic regression analyses (RQ2, RQ 3, and RQ 4) were utilized to investigate the research questions. The second step is to develop a comprehensive understanding of the strengths and weaknesses inherent in the selected dataset (Cheng & Phillips, 2014). I have collected and read relevant codebooks, user manuals, and documentation from the NCES site (Cheng & Phillips, 2014; NCES, 2020b). The third step is to generate operational definitions of

the variables in the study, which are explained under Constructs and Variables (Cheng & Phillips, 2014; NCES, 2020b). The remaining steps, which are related to performing the data analysis, will be discussed within the Data Analysis section. Also, ethics must be considered in data collection. The study is considered exempt under IRB guidelines, as I utilized existing data in a public dataset.

Constructs and Variables

The included HSLS:09 (NCES, 2020a) variables for the current study cover both the research questions and fit within the theoretical framework (i.e., SCCT; Lent et al., 1994). The student characteristics in the study included the following constructs in SCCT models: person inputs and background variables, and student self-efficacy (i.e., of which learning experiences are included). School counseling access relates to the SCCT construct of proximal environmental influences, and included school counselor caseload and percentage of time spent college readiness counseling. College and STEM attainment and persistence are also known as "performance domains and attainments" within SCCT.

Person Inputs and Background/Environmental Characteristics Variables

Person inputs and background variables included: FGS status, sex, socioeconomic status, race/ethnicity. This data was collected at baseline.

First-Generation Student Status

The FGS status variable was constructed from the variable detailing the highest level of education achieved by either parent/guardian in the sample member's home in the HSLS:09 dataset. This was created from two composite variables within the dataset: highest education level of parent 1 and highest education level of parent 2. In its original categorical form, there are seven categories for parent highest level of education, but I recoded the data into a

dichotomous/dummy variable; either the student has a parent in the home who has a Bachelor's degree or a more advanced degree, or the student does not have a parent in the home who has a Bachelor's degree. This matches the federal definition for FGS officially developed for TRIO program acceptance and to determine eligibility for Pell Grants (Center for First-Generation Student Success, 2017).

Race/Ethnicity

Race/ethnicity information was provided through dichotomous race/ethnicity composites based on data from the student questionnaire, if available. If not available from the student questionnaire, they are based on, in order of preference: data from the school-provided sampling roster or data from the parent questionnaire. The designations included in the HSLS:09 and the current study are: (a) American Indian or Alaskan Native, (b) Asian, (c) Black, (d) Hispanic, no race specified, (e) Hispanic, race specified, (f) more than one race, (g) Native Hawaiian/ Pacific Islander, and (h) White. For the current study, the two Hispanic categories were combined.

Sex

This variable was categorical and referred to the sex of the sample member (male or female), and was provided by the student if possible, and if not, the parent or school roster. The labels male and female have held and continue to hold "powerful associations" (Lips, 2020, p. 3), and not all people identify into a gender binary of female and male (Lips, 2020). There is a gender variable assessed in the HSLS:09 study, however, it is only available in the restricted use dataset, so the sex variable will be utilized, and this is a limitation of the current study.

Socioeconomic Status (SES)

Socioeconomic status was a composite variable consisting of five components obtained from the parent/guardian questionnaire, aligned with previous NCES longitudinal study methods

for calculating SES: (a) the highest education among parents/guardians in the two-parent family of a responding student, or the education of the sole parent/guardian; (b) the education level of the other parent/guardian in the two-parent family; (c) the highest occupation prestige score among parents/guardians in the two-parent family of a responding student, or the prestige score of the sole parent/guardian; (d) the occupation prestige score of the other parent/guardian in the two-parent family; and (e) family income. In the continuous version of the variable utilized in the logistic regression analyses, the values ranged from -1.82 to 2.57. An ordinal SES variable, organized in quintiles by the NCES, was utilized for the chi-square analyses.

Self-Efficacy Variables

Self-efficacy expectations in the current study include college self-efficacy, math self-efficacy, and science self-efficacy. This data was collected at the baseline. SCCT also asserts learning experiences and prior accomplishments are an integral part of forming self-efficacy, hence STEM GPA and overall GPA are included under self-efficacy as well (Lent et al., 1994). GPA information was collected at the 2013 update.

College Self-efficacy

This is assessed by a student's response on a Likert scale to the question, "Whatever your plans, do you think you have the ability to complete a Bachelor's degree?" Responses were measured on a 4-point Likert scale, from 1- "definitely not" to 4- "definitely".

Math Self-efficacy

Math self-efficacy is a continuous variable, with higher values representing higher math self-efficacy. The information was assessed through a scale consisting of four items (e.g., "can do excellent job on math tests"). The variable was created through principal components factor analysis, and was standardized to a mean of 0 and standard deviation of 1. Only respondents who

provided a full set of responses were assigned a scale value. The coefficient of reliability (demonstrated by alpha) for the scale is .65 (NCES, 2020c).

Science Self-efficacy

Science self-efficacy is also a continuous variable collected through a scale of the sample member's science self-efficacy with higher values representing higher science self-efficacy. Again, this self-efficacy variable was created through principal components factor analysis, and standardized to a mean of 0 and standard deviation of 1. There were also four items on the self-efficacy scale (e.g., "can master skills in science course"). Only respondents who provided a full set of responses were assigned a scale value. The coefficient of reliability (indicated by alpha) for the scale is .65 (NCES, 2020c).

Overall GPA

Overall GPA, an interval variable, was computed during the 2013 update, through high school transcript composites. Overall GPA values range from 0.25 to 4.

STEM GPA

STEM GPA, an interval variable, was computed during the 2013 update, through high school transcript composites. STEM GPA values range from 0.25 to 4.

Proximal Environmental Influences (School Counseling Access Variables)

In the current study, these variables included: school counselor caseload and school counselor percentage of time spent college readiness counseling.

School Counselor Caseload

Information for this continuous variable was assessed through one item on the school counselor questionnaire. It read: "On average, what is the caseload for a counselor in this school? Students per counselor". Students per counselor ranged from 2 to 999 (NCES, 2020c). For

research question two analysis, the variable was recoded into a dichotomous variable, with 0 indicating a school counselor caseload of 250 or less, and 1 indicating a school counselor caseload of 251 or more.

School Counselor Percentage of Time Spent College Readiness Counseling

This was assessed through one item on the school counselor questionnaire which read, "Last school year (2008-2009), what percentage of work hours did your school's counseling staff spend Assisting students with college readiness, selection, and applications?" Responses were reported according to the following categories: 5% or less; 6%-10%; 11%-20%; 21%-50%; and more than 50%.

Performance Domains and Attainments Variables

The performance domains and attainments variables of the current study were: (1) college attainment and persistence, and (2) STEM major attainment and persistence.

College Attainment and Persistence

The HSLS:09 data provided a categorical variable to indicate attainment (i.e., graduated with a degree) and persistence (i.e., enrollment) in college during the second follow-up survey in February 2016 (i.e., approximately 3 years post-high school graduation). The labels included: (a) attained bachelor's degree; (b) attained associate's degree; (c) attained certificate; (d) no degree, enrolled at a 4-year; (e) no degree, enrolled at less than 4-year; (f) no degree, not enrolled. For the current study, the variable was recoded into a dichotomous variable, the participant is enrolled or persisted in college (yes or no).

STEM Major Attainment and Persistence

This is a dichotomous variable (Not STEM or STEM) was collected in the second follow-up study in 2016 (i.e., approximately 3 years post-high school graduation). It referred to

how the respondent declared or decided upon their reference degree. It refers to if the undergraduate reference degree or certificate is a field of study in a science, technology, engineering or math (STEM) field.

<div align="center">Data Analysis</div>

The following section includes an overview of the data cleaning, preliminary analysis, and primary data analyses for the current study. To answer the research questions, the primary data analyses included: (RQ1) chi-square tests of independence analyses to compare groups on school counselor percentage of time spent college readiness counseling, (RQ2) logistic regression analyses to compare groups on school counselor caseload, (RQ3) logistic regression to predict the relationship between school counseling access and college attainment and persistence, and (RQ4) logistic regression to predict the relationship between school counseling access and STEM major attainment and persistence. Computing software included SPSS 25 (IBM Corp, 2017) and STATA 14 (StataCorp, 2015).

Data Cleaning and Preliminary Analysis

Following Cheng & Phillips' (2014) steps to secondary analysis of existing data, I first ran frequency tables and cross-tabulations of all variables to collect information about the use of the coding pattern for each variable and about the profile of missing data for each variable. From there, as detailed under the Constructs and Variables section, I transformed the distribution of the variables so that they meet the assumptions of the model to be used in the analysis (Cheng & Phillips, 2014). After completing these steps, I ran preliminary analysis of descriptive statistics, such as frequencies, means, medians, and standard deviations of variables. Outliers were assessed and addressed in the various data analyses through examining box plots, histograms,

residual plots, and *z* scores for outliers with standardized residuals more than 3.3 standard deviations above or below the mean (Tabachnick & Fidell, 2013).

Inherent in many lengthy assessments are missing data, however, in the HSLS:09 dataset, "the variables in general did not suffer from high levels of item nonresponse" (Ingels & Dalton, 2013, p. A-6). When deemed necessary, the HSLS:09 developers did utilize imputation of values (Ingels & Dalton, 2013). Imputation allows the use of all study respondent records in an analysis, affording more power for statistical tests. Additionally, if the imputation procedure is effective then the analysis results can be less biased than if there was unaccounted missing data (Ingels & Dalton, 2013). Value imputation occurred in place of missing responses for select variables identified from the student and parent questionnaires through single-value imputation, and they are flagged (Duprey et al., 2018; Ingels & Dalton, 2013).

Further, the NCES provides analytic weighted variables, and replication weights associated with those main sampling weights. The analytic weights make estimates from the sample data (i.e., the HSLS:09 data) representative of the target population (i.e., 9th grade students in 2009-2010). These analytic weights account not only for differential selection probabilities, but also differential patterns of response and nonresponse, in other words, nonresponse bias (Duprey et al., 2018). Hence, the analytic weight variables are used to address missing data. In addition to the analytic weight variables accounting for stratified sampling and nonresponse bias, replication weight variables address standard error concerns. Standard error calculation calculates appropriate standard errors based on the differences between the estimates of the full sample and a series of replicates (Duprey et al., 2018). These replication weights are done with the Balanced Repeated Replication (BRR) method, and help account for the possibility of artificially low standard errors due to clustering in sampling (Duprey et al., 2018). I ran a

missing data analysis, to provide descriptive information on variables that have 10% or greater missing cases (Bennett, 2001; Tabachnick & Fidell, 2013). In summary, I accounted for missing data nonresponse bias and standard error concerns through using the BRR variance method with weights and replicate weights.

Preliminary analysis also included bivariate correlations of all variables in the study and examining the correlation matrix to determine collinearity and investigate relationships between the variables. Additional assumptions testing is described below and was assessed within the primary data analyses. Following are descriptions of the multivariate analyses that will be utilized for hypothesis testing of the four research questions.

Primary Analyses

Chi-square Test of Independence

Chi-square test of independence is used to understand the relationship between two discrete variables (Pallant, 2016; Tabachnick & Fidell, 2013). It is a non-parametric analysis to assess group differences when the dependent variable is nominal (McHugh, 2013). The test compares the observed frequencies (i.e., proportion of cases) that occur in each of the categories of the variables with the expected values if there were no association between those two variables (Pallant, 2016). The null hypothesis of a chi-square test of independence is retained when the observed frequencies within a group are similar to the expected frequencies (Tabachnick & Fidell, 2013). However, if the observed frequencies are sufficiently different from what is expected, then a large chi-square value is generated and the null hypothesis is rejected (Tabachnick & Fidell, 2013). This suggests that the two discrete variables are related.

Assumptions of chi-square test of independence include independent observations (i.e., each person or case is only counted once) and mutually exclusive categories, cell size adequacy (i.e., 5 or more in each cell) and random samples (Garson, 2012; McHigh, 2013; Pallant, 2016).

RQ1. Is there a relationship between percentage of time spent college readiness counseling and student first-generation status, sex, socioeconomic status, and race/ethnicity?

Four separate chi-square tests of independence were run to compare the observed frequencies of FGS status, race/ethnicity, SES, and sex in the categories of school counselor percentage of time spent college readiness counseling. The five categories of percentage of time spent college readiness counseling were: 5% or less; 6%-10%; 11%-20%; 21%-50%; and more than 50%. The groups for FGS status were FGS and non-FGS. The groups for race/ethnicity were: (a) American Indian or Alaskan Native, (b) Asian, (c) Black, (d) Hispanic, (e) more than one race, (f) Native Hawaiian/ Pacific Islander, and (g) White. The groups for sex were male and female. Finally, the groups for SES were the five quintile coded categories of the composite SES variable, with 1 indicating the lowest SES quintile, and 5 indicating the highest SES quintile.

Logistic Regression

Logistic regression provided the multivariate statistical analysis approach for research questions two, three, and four. Logistic regression analyses allow the use of criterion measures on a binary outcome (Meyers et al., 2016). The result of a logistic regression is the impact of each variable on the probability of the observed event of interest (Sperandei, 2014). In other words, logistic regression displays the probability of an outcome for each individual case (Tabachnick & Fidell, 2013). This analysis is appropriate to use in research studies where the outcome variable is dichotomous (Mau & Li, 2018). Additionally, logistic regression is flexible in that input variables can be categorical or continuous, and do not have to be normally

distributed, linearly related to the outcome variable, or have equal variance in each group (Ranganathan et al., 2017; Tabachnick & Fidell, 2013). An advantage of using logistic regression is that through analyzing the association of all variables together for research questions with multiple independent variables, one can avoid confounding effects (Sperandei, 2014). Data assumptions in logistic regression analysis include dependent variable structure (i.e., dichotomous), the absence of multicollinearity, a linear relationship between continuous predictors and the logit transform of the outcome variable, and large data size (Schreiber-Gregory & Henry M Jackson Foundation, 2018; Tabachnick & Fidell, 2013). These assumptions were assessed during data analysis.

There are various methods for entering variables into a logistic regression model, including direct, sequential, and stepwise (Ranganathan et al., 2017; Tabachnick & Fidell, 2013). Research question two consisted of a direct logistic regression model, where for each of the four separate logistic regressions, all independent variables were entered at once. I utilized the sequential logistic regression method for research questions three and four. Sequential logistic regression is when the researcher specifies the entry order of predictor variables into the model (Tabachnick & Fidell, 2013). This is appropriate given the large sample size and the theoretical grounding of the study (Sperandei, 2014).

Interpretation of results consisted of: (a) overall model evaluation, (b) goodness-of-fit statistics, (c) statistical tests of individual predictors, and (d) validations of predicted probabilities (Peng et al., 2002). In terms of the overall model evaluation, a logistic model is said to provide a better fit to the data if it demonstrates an improvement over the intercept-only model, also known as the null model (Peng 2002, Tabachnick & Fidell, 2013). For comparison

of the constant-only versus null model in survey data, an adjusted Wald test is used, and the F statistic is examined for significance ($p < .05$).

Next is goodness-of-fit statistics. Goodness-of-fit statistics move beyond the overall model evaluation, in that the statistics assess the fit of a logistic model against actual outcomes (Peng et al., 2002). Several goodness-of-fit measures are available for logistic regression, including the Archer-Lemeshow test (i.e., modification of the Hosmer-Lemeshow test that can be used with survey data) and the McFadden's pseudo R square statistic, to indicate effect sizes (Archer & Lemeshow, 2006; Tabachnick & Fidell, 2013). Pseudo R square statistics must be run on the weighted logistic regression model, but without the "svy" STATA command (StataCorp, 2013). The next step is statistical tests of individual predictors. The statistical significance of individual regression coefficients (i.e., input variables) are assessed with the *t* statistics (StataCorp, 2013). Significant *t* statistics indicate the predictor variable contributes significantly to the logistic regression model. The regression coefficients are also interpreted for each significantly contributing predictor variable, if significant, and indicate the direction of the relationship of the variable to the probability of the outcome. Finally, validations of predicted probabilities illustrate the degree to which predicted probabilities agree with actual outcomes (Peng et al., 2002). This is done through providing both false positive and false negative percentages to provide an overall correction prediction percentage by the model over chance (i.e., specificity and sensitivity; Peng et al., 2002).

RQ 2. Is there a relationship between school counselor caseload and student first-generation status, sex, socioeconomic status, and race/ethnicity?

Four separate logistic regression analyses were run to investigate the predictive power of these student-level variables on school counselor caseload. The school counselor caseload

continuous variable was transformed into a dichotomous variable, which reflects students who either (a) had a school counselor with the ASCA recommended caseload of 250 students or less, or (b) had a school counselor with a caseload larger than the 250 recommendation. The four logistic regressions each had the dichotomous school counselor caseload variable as the dependent variable and the independent variables were: (1) student FGS status (i.e., FGS or non-FGS); (2) race/ethnicity, with the aforementioned seven categories; (3) SES as a continuous variable; and (4) sex (i.e., male or female).

RQ 3. Does school counselor caseload and percentage of time spent college readiness counseling predict student college attainment and persistence when controlling for first-generation student status, sex, socioeconomic status, and race/ethnicity?

Model (1), the baseline model, will represent person inputs and background environmental influences. It will include the following variables: FGS status (non-FGS as reference category), race/ethnicity (White as reference category), sex (male reference category), and socioeconomic status (continuous). Model (2) will represent self-efficacy, after controlling for person inputs and background environmental influences. Self-efficacy variables will include college self-efficacy ("Definitely" as reference category) and overall GPA (3.0-4.0 GPA as reference category). Model (3) examines school counseling access, after controlling for the variables in the previous three models. School counseling access variables are school counselor caseload (continuous) and school counselor percentage of time spent college readiness counseling (re-coded into a dichotomous variable, with 20% or less as reference category). See Table 1 for a chart of the proposed models.

Table 1
Logistic Regression Model Steps for Research Question Three

Step	Variables	SCCT Tenets

1	First-Generation Student Status	Person Inputs and Background Environmental Influences
	Race/Ethnicity	
	Sex	
	Socioeconomic Status	
2	College Self-efficacy	Self-Efficacy
	Overall GPA	
3	School Counselor Ratio	Proximal Environmental Influences
	Percentage of Time Spent College Readiness Counseling	

Note. SCCT = Social Cognitive Career Theory

RQ 4. Does school counselor caseload and percentage of time spent college readiness counseling predict STEM major attainment and persistence when controlling for first-generation student status, sex, socioeconomic status, and race/ethnicity?

Model (1), the baseline model, will represent person inputs and background environmental influences. It will include the following variables: FGS status (non-FGS as reference category), race/ethnicity (White as reference category), sex (male reference category), and socioeconomic status (continuous). Model (2) will represent self-efficacy, after controlling for person inputs and background environmental influences. Self-efficacy variables will include math self-efficacy (continuous), science self-efficacy (continuous), and STEM GPA (3.0-4.0 GPA as reference category) variables. Model (3) examines school counseling access, after controlling for the variables in the previous three models. School counseling access variables are school counselor caseload (continuous) and school counselor percentage of time spent college

readiness counseling (re-coded into a dichotomous variable, with 20% or less as reference

category). See Table 2 for a chart of the proposed models.

Table 2

Logistic Regression Model Steps for Research Question Four

Step	Variables	SCCT Tenets
1	First-Generation Student Status	Person Inputs and Background Environmental Influences
	Race/Ethnicity	
	Sex	
	Socioeconomic Status	
2	Math Self-efficacy	Self-Efficacy
	Science Self-Efficacy	
	STEM GPA	
3	School Counselor Ratio	Proximal Environmental Influences
	Percentage of Time Spent College Readiness Counseling	

Note. SCCT = Social Cognitive Career Theory

Chapter Conclusion

This chapter explained the research questions, participants and sampling, data collection,

and data analysis that will be utilized in the proposed study. The current study contributes to the

counseling literature by utilizing a quantitative, longitudinal design to investigate long-term

impacts of school counseling access on college and STEM attainment and persistence. It will

also provide information on patterns of students who receive access to school counseling.

Chapter 4

RESULTS

Chapter Four contains the results from the preliminary (i.e., data cleaning, descriptive statistics, bivariate correlations) and primary analyses. First, I will detail preliminary analysis. Then, the results of the primary statistical analyses and their assumptions testing is presented, to include: (RQ1) four chi-square tests of independence; (RQ2) four logistic regressions; (RQ3) a sequential logistic regression; (RQ4) a sequential logistic regression. The purpose of this study is to examine the relationships between and contributions of school counselor caseload, school counselor percentage of time spent college readiness counseling, and student characteristics on postsecondary and science, technology, engineering, and mathematics (STEM) major attainment and persistence.

The research questions for the current study, that guided the analyses, are:

RQ1. Is there a relationship between percentage of time spent college readiness counseling and student first-generation status, race/ethnicity, sex, and socioeconomic status?

RQ2. Is there a relationship between school counselor caseload and student first-generation status, race/ethnicity, sex, and socioeconomic status?

RQ3. Does school counselor caseload and percentage of time spent college readiness counseling predict student college attainment and persistence?

RQ4. Does school counselor caseload and percentage of time spent college readiness counseling predict STEM major attainment and persistence?

Preliminary Analysis

Preliminary analysis for the current study included investigating and handling missing data and outliers, running descriptive statistics on the dataset, and examining a correlation matrix

of the study's variables. I will detail these processes, and my justification for how I treated missing data and outliers.

Missing Data, Weights, and Replication Weights

A missing values analysis on the variables of interest in the current study in SPSS 25 showed percentage and patterns of missing data (IBM Corp, 2017). The following variables had missing data (e.g., missing, unit nonresponse, item legitimate skip/NA) at approximately 10% or less, which is a proposed acceptable percentage of missing value to not address (Bennett, 2001): socioeconomic status, overall grade point average (GPA), STEM GPA, school counselor caseload, percentage of time spent college readiness counseling, college self-efficacy, race/ethnicity, and sex. Hence, the following variables showed greater than 10% missingness: math self-efficacy (20.2%), science self-efficacy (26.5%), FGS status (44%), college attainment and persistence (45%), and STEM major attainment and persistence (50.8%). Balanced repeated replication (BRR) variance estimation method is utilized to address missing data.

As detailed in Chapter Three, the NCES provides the means to utilize a BRR variance estimation method to account for nonresponse (i.e., missing values) bias (Duprey et al., 2018). This includes the use of analytic weighted variables, and replication weights associated with the main sampling weights. For the analyses associated with research questions one and two, the W1PARENT weight was utilized; this weight accounts for school nonresponse, student questionnaire nonresponse, and parent nonresponse in the base year survey data (Duprey et al., 2018). This weight can be used for analyses with a combination of base-year student, school, administrator, or school counselor data (Duprey et al., 2018). The accompanying replication weights were W1PARENT001 through W1PARENT200. For research questions three and four, the W4W1W2W3STU weight was used. This weight was created for analyses using data from

the base-year, first follow-up, 2013 Update, and second follow-up student surveys (Duprey et al., 2018). The accompanying replication weights were W4W1W2W3STU001 through W4W1W2W3STU200.

Outliers

Histograms, box plots, and normal probability plots provided information on outliers. All were inspected for outliers, and outlier values were deemed plausible for the respective variables. Further, all assumptions related to multicollinearity were met for the analyses (i.e., refer to the Primary Analysis section), indicating no negative effect of the outliers on the assumptions or biasing results. Model fit was unaffected. Thus, outliers were retained in the current study.

Descriptive Statistics

Descriptive statistics provided information about the variables of interest in the current models. Frequencies and percentages on the variables' unweighted, valid data (i.e., data before weights were applied and not including missing data) are reported in this section. First, descriptive statistics on person inputs and background variables (i.e., student demographics) were collected. A total of 56.4% (n = 9,468) of the valid sample were FGS, and 43.6% were non-FGS (n = 7,314). For information on participants' race/ethnicity, see Table 3.

Table 3
Participant Race and Ethnicity Variable Percentage and Frequencies

Race/Ethnicity	Valid Percentage (%)	Valid n
American Indian and Alaskan Native	0.7%	165
Asian	8.7%	1,952
Black/African American	10.9%	2,450
Hispanic	16.9%	3,797
More than one race	8.6%	1,941

Native Hawaiian and Pacific Islander	0.5%	110
White	53.7%	12,082
Total	100%	22,497

A total of 50.9% (n = 11,973) of the sample were identified as female, and the remaining 49% (n = 11,524) as male. The continuous socioeconomic status variable was standardized to 0, and ranged from -1.93 to 2.88, with a mean score of M = 0.05 (SD = 0.78). The 25th percentile was -0.50, the 50th was -0.01, and 75th at 0.56. See the Appendix for a histogram of the continuous socioeconomic status variable. The SES quintile variable, which is an interval variable of student SES, has the following percentages: (1) First quintile/lowest = 14.6% (n = 3,434); (2) Second quintile: 15.8% (n = 3,705); (3) Third quintile: 18% (n = 4,233); (4) Fourth quartile: 19.4% (n = 4,553); and (5) Fifth quintile/highest: 23.5% (n = 5,519).

Self-Efficacy Descriptive Statistics

The college self-efficacy variable was an ordinal variable assessing the participants' beliefs about ability to complete a Bachelor's degree, with possible values of 1 "definitely not", 2 "probably not", 3 "probably", and 4 "definitely". A total of 1.5% (n = 322) of participants chose 1. Then 6.7% (n = 1,415) of the participants chose 2. Following, 42.6% (n = 8,937) chose 3. Finally, answer choice 4 was the most endorsed response, with 49.1% (n = 10,297) of the sample selecting this answer choice. See the Appendix for a histogram of this variable.

Math self-efficacy was a scale of 4 items, and scores were standardized to 0; the range of scores in the current sample ranged from -2.92 to 1.62, M = 0.0421 (SD = 0.96). Science self-efficacy was also a scale of 4 items, and scores were standardized to 0; the scores of participants ranged from -2.91 to 1.83, M = .0372 (SD = 0.99). Overall GPA of the participants ranged from 0.25 through 4.00, reported in 0.25 intervals, M = 2.71 (SD = 0.86). In terms of STEM GPA, the

range was 0.25 through 4.00, reported in 0.25 intervals, $M = 2.43$ ($SD = 0.93$). Refer to the Appendix for histograms of the math self-efficacy, science self-efficacy, overall GPA, and STEM GPA variables.

Proximal Environmental Influences (School Counseling Access Variables)

The school counselor caseload in the current study had a mean score of $M = 347.65$ students ($SD = 130$). The median was 350. The 25th percentile was 270, the 50th was 350, and the 75th percentile was 420. This variable's values ranged from 2- 999 students per school counselor caseload. A histogram of this variable is pictured in the Appendix.

The school counselor percentage of time spent college readiness counseling was an ordinal variable. The scores ranged from 1-5, $M = 3.37$ ($SD = 0.95$). A total of 2.3% ($n = 484$) chose 1, indicating "5% or less". Next, 16.2% ($n = 3,389$) of the sample chose 2 indicating "6-10% of time". A total of 33.8% ($n = 7,094$) indicated 3, "11-20%"; followed by 37.5% ($n = 7,867$) choosing 4, indicating "21-50%". Finally, 10.2% ($n = 2,132$) of the sample chose 5, indicating "More than 50%". See the Appendix for a histogram of the percentage of time spent college readiness counseling variable.

Performance Domains and Attainments Variables

The performance domains and attainment variables were re-coded into dichotomous variables for statistical analysis. For the college attainment and persistence variable, 80% ($n = 10,331$) of the valid sample was enrolled or attained a degree as of February 2016, and 20% ($n = 2,587$) were not enrolled or had never attained a degree as of February 2016. For the STEM major persistence and attainment variable, 23% ($n = 2,658$) of the valid sample were enrolled as a STEM major or had attained a STEM degree as of February 2016, and 77% ($n = 8,902$) were neither enrolled as a STEM major nor had attained a STEM degree as of February 2016.

Bivariate Correlations

A bivariate correlational analysis of interval and ratio variables in the study allowed for preliminary examination of collinearity, and provided information on relationships between the variables of interest. The bivariate correlation matrix indicated no concerns regarding multicollinearity. Overall GPA and STEM GPA were highly correlated, but they were not utilized in the same primary analysis. The correlations contain indications of relationships to school counseling access. For example, school counseling caseload and percentage of time spent college readiness counseling are inversely related (r = -.181, $p < .01$). School counselor caseload is negatively significantly correlated to: SES, Overall GPA, STEM GPA, college self-efficacy, and math self-efficacy. School counselor percentage of time spent college readiness counseling is positively significantly correlated with: SES, Overall GPA, STEM GPA, college self-efficacy, math self-efficacy, and science self-efficacy. See Table 4 for the full results of the bivariate correlations.

Table 4
Bivariate Correlations

Variables	1	2	3	4	5	6	7	8
1. SES	-							
2. Overall GPA	.407**	-						
3. STEM GPA	.398**	.924**	-					
4. College self-efficacy	.254**	.324**	.315**	-				
5. Math self-efficacy	.152**	.257**	.302**	.325**	-			
6. Science Self-efficacy	.15**	.221**	.233**	.319**	.395**	-		

| 7. School Counseling Caseload | -.152** | -.094** | -.105** | -.040** | -.045** | -.015 | - | |
| 8. % of Time Spent College Readiness Counseling | .150** | .105** | .104** | .053** | .042** | .027** | -.181** | - |

Note. SES = socioeconomic status; GPA = grade point average; STEM = Science, technology, engineering, mathematics. * = $p < .05$; ** = $p < .01$.

Primary Analysis

A presentation of the results of the primary analysis procedures follows. Research question one was explored through chi-square tests of independence. For research question two, four logistic regressions were conducted. Research questions three and four were also examined through logistic regressions. All assumptions were met and are discussed as well.

Research Question One

Chi-square tests of independence assessed the relationships between four student demographic predictor variables (i.e., FGS student status, race/ethnicity, sex, SES) and school counselor percentage of time spent college readiness counseling. The assumption of random sampling was accounted for through using the survey level command with the weighted data and BRR replicate weights, accordingly a second order correction of the Pearson chi-square value which was a design-based F statistic was also provided with the output (Rao and Scott, 1984). The assumptions of independent observations, mutually exclusive categories, and adequate cell count were met (Garson, 2012; McHugh, 2013; Pallant, 2016).

A chi-square test of independence was performed to examine the relation between gender and school counselor percentage of time spent college readiness counseling. The test indicated no significant association between gender and percentage of time spent college readiness counseling, uncorrected X^2 (4, 20,962) = 12.34, Design-based F(3.80, 755.86) = 0.6457, $p =$

.0622. A chi-square test of independence was performed to examine the relation between race/ethnicity and school counselor percentage of time spent college readiness counseling. The test indicated no significant association between race/ethnicity and percentage of time spent college readiness counseling, uncorrected $\mathcal{X}^2$ (24, 20,101) = 427.36, Design-based F(9.59, 1909.39) = 1.66, p = .0884.

A chi-square test of independence was performed to examine the relation between FGS status and school counselor percentage of time spent college readiness counseling. The relation between these variables was significant, uncorrected $\mathcal{X}^2$ (4, 15,086) = 170.35, Design-based F(3.82, 760.33) = 5.22, p = .0005. Cramer's V is an effect size statistic, and was 0.1504. FGS had higher cell percentages in the 5% or less category, the 6-10% category, and the 11-20% category. Non-FGS had higher cell percentages in the 21-50% category and the more than 50% category. See Table 5 for the cell percentages.

Table 5
Chi-Square Test of Independence Cell Percentages for First-Generation Student Status

Percentage of time spent college readiness counseling	First-generation Student	Non-first-generation Student	Total %
5% or less	2.33	1.786	2.131
6% - 10%	19.06	15.9	17.91
11% - 20%	36.38	30.86	34.36
21% - 50%	37.14	42.17	38.98
More than 50%	5.093	9.274	6.62
Total Percent	100	100	100

One last chi-square test of independence was performed to examine the relation between SES (i.e., quintile coding) and school counselor percentage of time spent college readiness counseling. The relationship between these variables was significant, uncorrected $\mathcal{X}^2$ (16,

19,253) = 313.06, Design-based F(8.28, 1648.32) = 2.79, *p* = .0041. Cramer's V was 0.0843 for

this chi-square test of independence. The cell percentages show as the SES quartiles increased,

percentage of students in the 5% or less, the 6-10%, and the 11-20% categories decreased.

Further, as SES quartiles increased, there is a pattern of increased percentages in the 21-50% and

more than 50% categories. See Table 6 for the cell percentages.

Table 6

Chi-Square Test of Independence Cell Percentages for Socioeconomic Status (Quintiles)

Percentage of time spent college readiness counseling	SES Quintile					
	1	2	3	4	5	Total
5% or less	2.955	2.456	2.247	1.525	1.492	2.131
6% - 10%	19.52	19.81	17.88	17.54	15.14	17.91
11% - 20%	38.42	35.89	35.04	33.09	29.88	34.36
21% - 50%	34.67	37.12	39.1	40.68	43.05	38.98
More than 50%	4.434	4.729	5.739	7.168	10.44	6.62
Total	100	100	100	100	100	100

Note. 1 = Lowest SES quintile; 2 = Second lowest SES quintile; 3 = Middle SES quintile; 4 = Second highest SES quintile; 5 = Highest SES quintile.

Research Question Two

To investigate if there is a relationship between school counselor caseload and student

demographics (i.e., student FGS status, race/ethnicity, sex, and SES), four individual logistic

regressions were run for each demographic variable, with school counselor caseload (re-coded to

dummy variable, 2-250 students and 251-999 students) as the outcome variable. Statistical

assumptions of the logistic regression were assessed for each model. Tolerance and VIF values

indicated no concerns regarding multicollinearity for any of the four models. The mean VIF

values were as follows: (1) race/ethnicity = 1.00; (2) SES = 1.03; (3) FGS status = 1.02; (4) sex =

1.00. Tolerance values ranged between 0.97-0.99 for all four predictor variables. The Box-Tidwell test indicating the assumption of a linear relationship between continuous predictors and the logit transform of the outcome variable was at $p = .02$ for SES, however visual assessment of scatterplot of the logit transform between the SES variable and the school counselor caseload variable did show a linear relationship, so there was not sufficient evidence to reject the null hypothesis. Hence, the results of the logistic regression are presented.

The first logistic regression's predictor variable was race/ethnicity. Utilizing the BRR variance estimation method, 22,025 observations were included in the regression model, with a population size of 3,720,391 and 200 replications. The model was significant, $F(6, 194) = 2.53$, $p = .02$, McFadden's R Square = 0.0034. This pseudo R square value indicates a very small percentage of the variance is accounted for by the model. The Archer Lemeshow test of goodness-of-fit was not significant, indicating good model fit. This model indicated that Hispanic race/ethnicity significantly predicted school counselor caseload ($\beta = 0.63$, OR = 1.88, $p = 0.03$), compared to the White reference category. This indicates Hispanic students are more likely than White students to have school counselors with higher caseloads than the ASCA recommended 250:1 ratio. No other categories of race/ethnicity were significant. The model correctly classified 76.85% of the cases, with 100% sensitivity, but 0% specificity.

The second logistic regression's predictor variable was SES. Utilizing the BRR variance estimation method, 22,025 observations were included in the regression model, with a population size of 3,720,391 and 200 replications. The model was significant, $F(1, 199) = 8.35$, $p = .004$, McFadden's R Square = .0228. The Archer Lemeshow test of goodness-of-fit was not significant and the adjusted Wald test was significant, indicating good model fit. This model indicated that as SES increases, the odds of having a school counselor with a caseload of 251 or

greater decreased (β = -.026, OR = 0.77, *p* = 0.004). Another way to interpret this, is that as student SES decreases, the odds of having a school counselor with a caseload of 251 or greater increases. The model correctly classified 76.62% of the cases, with 100% sensitivity, but 0.02% specificity.

Neither sex (F [1, 199] = 0.16, *p* = .68) nor FGS status (F [1, 199] = 3.49, *p* = .06) resulted in significant models. See Table 7 for the results of the two significant logistic regressions for research question two.

Table 7
Logistic Regression Results for Research Question Two

Predictor	ß	BRR *SE*	OR (CI)
Race/ Ethnicity			
American Indian or Alaskan Native	0.16	0.65	1.17 (0.32-4.20)
Asian	0.58	0.31	1.78 (0.96-3.29)
Black/ African American	0.04	0.36	1.04 (0.51-2.12)
Hispanic	0.63*	0.29	1.88 (1.06-3.36)
More than one race	0.17	0.26	1.19 (0.71-1.99)
Native Hawaiian or Pacific Islander	0.82	0.67	2.27 (0.60-8.56)
Model Fit	F(6,194) = 2.53*		
McFadden's R Square	0.0034		

Predictor	ß	BRR *SE*	OR *(CI)*
SES	-.26*	.09	0.77 (0.64-0.92)
Model Fit	F(1,199) = 8.35**		
McFadden's R Square	.0228		

Note. SES = socioeconomic composite variable. Race/ethnicity reference category = White. BRR = balanced repeated replication. Dependent variable reference group = school counselor caseload > 250 students. * *p* <.05, ** *p* < .01

Research Question Three

The aim of including research question three was to examine the predictors of college attainment and persistence in a nationally representative sample of ninth grade students. A sequential logistic regression analysis was utilized to answer this research question. The eight predictor variables were entered in three steps/models: (Model 1) FGS status, race/ethnicity, sex, and SES; (Model 2) model 1 variables, and college self-efficacy, total GPA (i.e., recoded to a dichotomous variable, 0.25 - 2.50 and 3.0 - 4.0); and (Model 3) model 1 and 2 variables, school counselor caseload, and school counselor percentage of time spent college readiness counseling (i.e., recoded to a dichotomous variable, 20% or less time spent on college readiness counseling or 21% or more time spent on college readiness counseling). The outcome variable was a dichotomous variable of college persistence and attainment, and indicated if a student is or is not either enrolled in a postsecondary institution or has attained a degree from a postsecondary institution in February of 2016. Statistical assumptions of the model were assessed. Tolerance (0.32) and VIF values (mean VIF = 1.33) indicated no concerns regarding multicollinearity. The Box-Tidwell test indicated the assumption of a linear relationship between continuous predictors and the logit transform of the outcome variable was met, with nonsignificant p values. Utilizing the BRR variance estimation method, 17,993 observations were included in the regression model, with a population size of 2,121,472 and 188 replications.

Model 1 included person inputs and background environmental influences (i.e., FGS status, race/ethnicity, sex, SES). Model 1 was significant, $F(9, 186) = 19.37$, $p < .001$, McFadden's R Square = 0.0577. This model indicated that SES significantly predicted college attainment and persistence ($\beta = 0.47$, $p = .019$). In addition, female students ($\beta = .40$, $p < .001$) were more likely than males, and Asian ($\beta = 0.72$, $p < .001$) students were significantly more

likely than White students to report college attainment and persistence. Black ($\beta = -0.35$, $p < .05$) and students of more than one race ($\beta = -0.55$, $p = .001$) were significantly less likely than White students to report college attainment and persistence. FGS were significantly less likely than their non-FGS peers to report college attainment and persistence ($\beta = -0.41$, $p < .001$).

Model 2 examined two self-efficacy variables, which were college self-efficacy and overall GPA, after controlling for the variables in the previous model. Model 2 was significant, $F(13, 182) = 24.52$, $p < .001$, McFadden's R Square = 0.1063. GPA significantly predicted college attainment and persistence, with students with GPAs ranging from 0.25-2.50 being significantly less likely to report college attainment and persistence compared to students with GPAs of 3.00- 4.00 ($\beta = -1.14$, $p < .001$). College self-efficacy was not significant. SES, female sex, and students who were more than one race, remained significant; while Black/African American race and FGS status were no longer significant.

Model 3 examined school counseling access, including school counselor caseload and percentage of time spent college readiness counseling, after controlling for the variables included in the other models. Model 3 was significant, $F(15, 163) = 20.28$, $p < .001$. For Model 3, the Archer Lemeshow test of goodness-of-fit was not significant and the adjusted Wald test was significant, indicating good model fit. McFadden's R2 was 0.1111, indicating that the model explains 11.1% of the variance outcomes. For Model 3, school counselor percentage of time spent college readiness counseling predicted student college attainment and persistence, with 21% or more time spent on college readiness counseling being more likely to result in the outcome compared to 20% or less time spent college readiness counseling ($\beta = .23$, $p < .05$). School counselor's caseload was not significant. SES, female sex, more than one race identity, and GPA all remained significant predictors in the final model. The model correctly classified

81.60% of the cases, with higher sensitivity (98.21%) than specificity (7.58%). Table 8 contains

the results of the logistic regression analyses.

Table 8
Logistic Regression Model Predicting College Attainment and Persistence

	Model 1			Model 2			Model 3		
Predictor	**ß**	*SE*	**OR (CI)**	**ß**	*SE*	**OR (CI)**	**ß**	*SE*	**OR (CI)**
FGS	-0.41**	0.13	0.66 (0.51-0.86)	-0.29	0.15	0.75 (0.56-1.00)	-0.28	0.16	0.75 (0.56-1.03)
Race/ Ethnicity									
American Indian or Alaskan Native	-0.14	0.63	0.87 (0.25-3.00)	1.21	0.83	3.35 (0.65-17.32)	1.29	0.88	3.63 (0.64-20.52)
Asian	0.72*	0.30	2.06 (1.13-3.75)	0.50	0.33	1.64 (0.85-3.16)	0.58	0.38	1.79 (0.85-3.80)
Black/ African American	-0.36*	0.18	0.70 (0.49-0.99)	-0.06	0.20	0.94 (0.63-1.39)	0.07	0.20	1.07 (0.72-1.60)
Hispanic	-0.03	0.14	0.97 (0.73-1.28)	0.23	0.17	1.26 (0.90-1.76)	0.14	0.17	1.15 (0.83-1.60)
More than one race	-0.55**	0.16	0.58 (0.42-0.80)	-0.46**	0.17	0.63 (0.46-0.88)	-0.39*	0.17	0.68 (0.48-0.94)
Native Hawaiian / Pacific Islander	0.55	1.02	1.73 (0.23-12.97)	0.91	1.01	2.48 (0.34-18.08)	1.02	1.08	2.78 (0.33-23.42)
Sex	0.40***	0.09	1.49 (1.24-1.80)	0.30**	0.11	1.35 (1.09-1.67)	0.32**	0.12	1.37 (1.09-1.73)

	B	SE	OR (CI)	B	SE	OR (CI)	B	SE	OR (CI)
SES	0.48***	0.09	1.61 (1.34-1.93)	0.44***	0.11	1.56 (1.27-1.93)	0.43***	.0.11	1.54 (1.24-1.91)
College Self-efficacy									
Definitely not				-1.14	0.64	0.32 (0.09-1.14)	-0.99	0.67	0.37 (0.10-1.41)
Probably not				0.30	0.30	1.35 (0.75-2.45)	0.46	0.33	1.59 (0.82-3.06)
Probably				-0.08	0.14	0.92 (0.70-1.20)	-0.12	0.15	0.89 (0.67-1.18)
Overall GPA				-1.15***	0.12	0.32 (0.25-0.40)	-1.19***	0.12	0.30 (0.24-0.39)
School counselor caseload							-0.00	0.00	0.99 (0.99-1.00)
% of time spent college readiness counseling							0.24*	0.12	1.27 (1.00-1.60)

Note. Model 1 = person inputs and background environmental influences (first-generation student [FGS], race/ethnicity, sex, socioeconomic status [SES]), without any controls; Model 2 = person inputs and background environmental influences, and self-efficacy variables (college self-efficacy and overall grade point average [GPA]); Model 3 = person inputs and background environmental influences, self-efficacy variables, and proximal environmental influences (school counselor caseload and percentage of time spent college readiness counseling).
Reference categories: FGS = non-FGS; Sex = male; Race/ethnicity = White; College self-efficacy = "Definitely"/4; Overall GPA = 3.0 - 4.0 GPA; % of time spent college readiness counseling = Less than 21%.
* *p* < .05. ** *p* < .01. *** *p* < .001

Research Question Four

The aim of including research four was to examine the predictors of science, technology, engineering, and mathematics (STEM) major attainment and persistence. A sequential logistic regression analysis guided the investigation into this research question. The nine predictor variables were entered in three steps: (Model 1) FGS status, race/ethnicity, sex, and SES; (Model

2) model 1 variables, and math self-efficacy, science self-efficacy, and STEM GPA (i.e., recoded to a dichotomous variable, 0.25 - 2.50 and 3.0 - 4.0); and (Model 3) model 1 and 2 variables, school counselor caseload, and school counselor percentage of time spent college readiness counseling (i.e., recoded to a dichotomous variable, 20% or less time spent on college readiness counseling or 21% or more time spent on college readiness counseling). The outcome variable is a dichotomous variable of STEM major persistence and attainment, and indicated if a student is or is not either enrolled as a declared STEM major in a postsecondary institution or attained a degree in a STEM field from a postsecondary institution in February of 2016. Statistical assumptions of the model were assessed. Tolerance (0.26) and VIF values (mean VIF = 1.34) indicated no concerns regarding multicollinearity. The Box-Tidwell test indicated the assumption of a linear relationship between continuous predictors and the logit transform of the outcome variable was met, with nonsignificant p values. Utilizing the BRR variance estimation method, 16, 007 observations were included in the regression model, with a population size of 1,540,118 and 192 replications.

Model 1 included person inputs and background environmental influences (i.e., FGS status, race/ethnicity, sex, SES). Model 1 was significant, $F(9, 189) = 12.49$, $p < .001$, McFadden's R Square = 0.0506. This model indicated that SES significantly predicted STEM major attainment and persistence ($\beta = 0.22$, $p < .001$). In addition, female students ($\beta = -0.94$, $p < .001$) were less likely than males to report STEM major attainment and persistence. Asian students were significantly more likely than White students to report STEM major attainment and persistence ($\beta = 0.91$, $p < .001$).

Model 2 examined self-efficacy variables, math self-efficacy, science self-efficacy and STEM GPA, after controlling for the variables in the previous model. Model 2 was significant,

F(12, 185) = 19.03, *p* < 0.001, McFadden's R Square = 0.0966. STEM GPA significantly predicted STEM major attainment and persistence, with students with GPAs ranging from 0.25-2.50 being significantly less likely to report STEM attainment and persistence compared to students with GPAs of 3.00- 4.00 (β = -0.64, *p* < .001). Both math self-efficacy (β = 0.27, *p* < .001) and science self-efficacy (β = 0.26, *p* < .001) were significant predictors of STEM major attainment and persistence, with increases in these variables resulting in higher odds of the outcome. Female sex and Asian race identity remained significant, while SES was no longer significant.

Model 3 examined school counseling access, including school counselor caseload and percentage of time spent college readiness counseling, after controlling for the variables included in the other models. Model 3 was significant, F(14, 178) = 15.90, *p* < .001. For Model 3, the Archer Lemeshow test of goodness-of-fit was not significant and the adjusted Wald test was significant, indicating good model fit. McFadden's R2 was 0.1005, indicating that the model explains 10.05% of the variance outcomes. For Model 3, school counselor percentage of time spent college readiness counseling predicted student STEM major attainment and persistence, with 21% or more time spent on college readiness counseling being more likely to result in the outcome, compared to 20% or less time spent college readiness counseling (β = .26, *p* < .05). School counselor's caseload was not significant. Female sex, Asian race identity, STEM GPA, math self-efficacy, and science self-efficacy all remained significant predictors in the final model. The model correctly classified 77.34% of the cases, with higher specificity (95.94%) than sensitivity (19.40%). Table 9 contains the results of the logistic regression analyses.

Table 9

Logistic Regression Model Predicting STEM Major Attainment and Persistence

Predictor	ß	SE	OR (CI)	ß	SE	OR (CI)	ß	SE	OR (CI)
	Model 1			**Model 2**			**Model 3**		
FGS	-0.15	0.12	0.86 (0.68-1.10)	-0.16	0.15	0.86 (0.64-1.14)	-0.26	0.14	0.77 (0.59-1.02)
Race/ Ethnicity									
American Indian or Alaskan Native	-0.45	0.85	0.64 (0.12-3.44)	-0.13	1.01	0.88 (0.12-6.34)	-0.13	1.15	0.87 (0.09-8.48)
Asian	0.91***	0.21	2.48 (1.65-3.73)	0.89***	0.24	2.45 (1.52-3.94)	0.92**	0.27	2.50 (1.48-4.23)
Black/ African American	-0.09	0.17	0.92 (0.65-1.29)	0.22	0.22	1.24 (0.81-1.91)	0.23	0.24	1.26 (0.78-2.04)
Hispanic	0.11	0.15	1.12 (0.83-1.51)	0.38*	0.18	1.46 (1.02-2.08)	0.44*	0.19	1.56 (1.07-2.28)
More than one race	-0.05	0.15	0.95 (0.71-1.28)	0.09	0.17	1.10 (0.78-1.55)	0.13	0.19	1.14 (0.78-1.65)
Native Hawaiian / Pacific Islander	0.67	0.81	1.97 (0.40-9.65)	0.58	0.82	1.78 (0.35-9.03)	0.51	1.00	1.67 (0.23-12.05)
Sex	-0.94***	0.10	0.39 (0.32-0.48)	-0.93***	0.11	0.39 (0.32-0.49)	-0.94***	0.12	0.39 (0.31-0.50)
SES	0.22**	0.08	1.25 (1.06-1.46)	0.07	0.10	1.07 (0.89-1.30)	0.01	0.09	1.01 (0.85-1.21)
Math Self-efficacy				0.27***	0.06	1.31 (1.17-1.47)	0.27***	0.07	1.31 (1.16-1.49)

	B	SE	OR (CI)	B	SE	OR (CI)
Science Self-efficacy	0.26***	0.07	1.30 (1.14-1.47)	0.26***	0.07	1.30 (1.13-1.50)
STEM GPA	-0.64***	0.13	0.86 (0.64-1.14)	-0.65***	0.14	0.52 (0.40-0.68)
School counselor caseload				0.00	0.00	1.00 (1.01-1.65)
% of time spent college readiness counseling				0.26*	0.12	1.29 (1.01-1.65)

Note. Model 1 = person inputs and background environmental influences (first-generation student [FGS], race/ethnicity, sex, socioeconomic status [SES]), without any controls; Model 2 = person inputs and background environmental influences, and self-efficacy variables (math self-efficacy, science self-efficacy, and STEM grade point average [GPA]); Model 3 = person inputs and background environmental influences, self-efficacy variables, and proximal environmental influences (school counselor caseload and percentage of time spent college readiness counseling).
Reference categories: FGS = non-FGS; Sex = male; Race/ethnicity = White; STEM GPA = 3.0 - 4.0 GPA; % of time spent college readiness counseling = Less than 21%.
* $p < .05$. ** $p < .01$. *** $p < .001$

Chapter Conclusion

Within this chapter, the results of several statistical analyses were presented, including descriptive statistics, bivariate correlations, assumptions testing, chi-square test for independence analyses, and logistic regression analyses. Results of research questions one and two, in sum, indicated that there are nuanced differences in which students are offered access to school counseling services. Results of research question three suggested certain student demographics, overall high school GPA, and school counselor percentage of time spent college readiness counseling are related to college attainment and persistence. Finally, results of research question four indicated that certain student demographics, math and science self-efficacy, STEM high school GPA, and school counselor percentage of time spent college readiness counseling are related to STEM major attainment and persistence. These results as a whole provided supporting evidence that a social cognitive career theory (SCCT) model of students' college and STEM

major attainment and persistence is predictive of longitudinal outcomes, and can aid professional
school counselors in their practice, and provide researchers with future research directions.
Chapter five contains a discussion of the results, as well as the limitations of the study. It also
details implications for practice, training, policy, and future research.

Chapter 5

DISCUSSION

Equitable educational access and opportunity is a human right (United Nations, 1948). Research has shown that not all students are persisting in college and attaining degrees at the same rate as other students, for instance, FGS, students of lower SES, and underrepresented racial minorities are persisting and attaining at lower rates than their peers (Cahalan et al., 2019). Outcomes in STEM major persistence and degree attainment show similar trends, and women are also less likely than men to achieve STEM degree attainment (Chen, 2013; NCSES, 2019). School counselors are called to be change agents in their schools, who support all students to ensure equity in college and career readiness outcomes (ASCA, 2019; ASCA, 2014). This call is often made difficult to achieve due to large caseloads and inappropriate duties (Hall et al., 2011; McKillip et al., 2018; O'Connor, 2018). Research has shown that college readiness counseling has positive benefits for high school students as far as gaining college information, enrolling in college, and persisting one-year post-enrollment (Griffin et al., 2011; Lapan et al., 2012; Poynton & Lapan, 2017; Tang & Ng, 2019). Emerging research on STEM counseling on students' science self-efficacy is also promising (Falco & Summers, 2019).

This purpose of this study was to understand the relationships between and contributions of school counseling ratios, percentage of time spent college readiness counseling, student demographics (i.e., race/ethnicity, gender, socioeconomic status, FGS status), and self-efficacy on postsecondary and STEM major attainment and persistence. These outcomes were assessed three years post-high school graduation. Also investigated was which students have access to school counseling services, as evidenced by school counselor caseload and school counselor percentage of time spent college readiness counseling. It is important to understand the

predictors of college attainment and persistence, as this helps school counselors tailor their interventions. Understanding both school counseling's impact on student outcomes and which students have access to school counseling has policy implications.

Guided by a Social Cognitive Career Theory (SCCT; Lent et al., 1994) framework, the current study consisted of several novel findings. Aligned with the previous literature on the positive impact of college readiness counseling, results suggested college readiness counseling does play a role in long-term post-secondary attainment and persistence, with the current study showing the positive outcomes three years after high school graduation. Further, results supported that college readiness counseling plays a role in STEM major attainment and persistence. School counselor caseload did not significantly predict either postsecondary or STEM outcomes, but caseload was negatively significantly correlated with percentage of time spent college readiness counseling. A detailed discussion of other SCCT aligned variables which did and did not predict the outcomes follows. The results of this study also showed that there are differences in which students have access to school counseling services, evidenced by school counseling caseload showing differences by student race/ethnicity and SES. Finally, there were differences in school counselor percentage of time spent college readiness counseling by FGS status and student SES.

Chapter five contains a discussion of the study's results. This chapter provides an in-depth discussion of each research questions and their accompanying data analysis results. The limitations of the study are also discussed, as well as future research directions. Then, the implications of these results are further expanded.

Research Question One

The analyses for research question one examined the relationships between student demographics and school counselor percentage of time spent college readiness counseling, to answer the question, "Is there a relationship between percentage of time spent college readiness counseling and student first-generation status, race/ethnicity, sex, and socioeconomic status?" Four separate chi-square tests of independence were utilized to do so. This line of inquiry into school counseling access is relevant because according to SCCT (Lent et al., 1994), structure of opportunity (e.g., education access and support) is important in career-related performance and outcomes (Lent & Brown, 1996). Within SCCT, the concept of proximal environmental influences, also known as contextual supports and barriers, serve as important potential sources for affecting choice goals and actions, as well as increasing self-efficacy (Lent & Brown, 2006). College readiness counseling is an example of a contextual support. When a student has access to college readiness counseling, this is a support for a student's academic career goals, as there are noted benefits to college readiness counseling on student postsecondary outcomes in the literature (Dunlop-Velez, 2016; Poynton & Lapan, 2017; Tang & Ng, 2019).

Results indicated that there were no significant differences between male and female students in the percentage of time their school counselors spent college readiness counseling. Similarly, results indicated that there were not significant differences between students of various race/ethnicities (i.e., American Indian or Alaskan Native, Asian, Black or African American, Hispanic, more than one race, Native Hawaiian or Pacific Islander, and White) and percentage of time spent college readiness counseling.

There were significant differences between FGS status and percentage of time spent college readiness counseling. For reference, the national average of time spent college readiness

counseling by school counselors is approximately 21% of time (Clinedinst & Koranteng, 2017).

FGS were more likely to have a school counselor who spent 20% or less time on college

readiness counseling, while non-FGS were more likely to have a school counselor who spent

21% of more time in college readiness counseling. Additionally, 42.23% of FGS had school

counselors who spent at least the national average percentage of time versus 51.44% of non-

FGS. This disparity is unfortunate, as FGS are two and a half times more likely than non-FGS to

report their school counselor as the most influential person in their thinking about postsecondary

education (Chowela et al., 2015). School counselors must be aware that FGS students matriculate

into college at lower rates than their peers, and are more likely to leave STEM majors by college

attrition (Cataldi et al., 2018; Chen, 2013). Thus, FGS can benefit greatly from college readiness

counseling, as these students often require extra support and information from school counselors,

since their parents and guardians often do not have access to this information (Gilfillan, 2018).

To increase the potential for access to college readiness counseling for FGS, school counselors

can advocate to administration and school board officials for appropriate duties in their role.

When school counselors are faced with non-counseling activities that inhibit their ability to

engage in 21% or more of their time college readiness counseling, they must be strategic. School

counselors can also create and implement specific activities for FGS beyond individual

counseling to maximize their time spent with these students (e.g., small group counseling,

evening school-wide programming for completing college applications, consulting and

coordinating services with mentoring programs or local colleges).

The other significant difference in percentage of time spent college readiness counseling

by group discovered was student SES. The students in higher SES quintiles (i.e., students who

were more affluent), had school counselors who spent more time college readiness counseling.

The opposite pattern emerged as well; students in the lower SES quintiles were more likely to have a school counselor who spent less time on college readiness counseling. For reference, when assessing students who had school counselors that spent 21% and higher time college readiness counseling, the proportion of students from the quintiles were as follows: (1) lowest SES quintile = 39.10%; (2) second lowest SES quintile = 41.85%; (3) middle SES quintile = 44.84%; (4) second highest SES quintile = 47.85%; (5) highest SES quintile = 53.49%. This result highlights how not all students in the US educational system are afforded the same support, and students of low SES do commonly attend school with less resources (Barbarin & Aikens, 2015). Students who are from lower SES households are less likely to attain a postsecondary degree and/or a STEM degree (Cahalan et al., 2019; Chen, 2013). The current study results showed students from low SES backgrounds are receiving less support for college success before even matriculating into postsecondary education. This lack of school counseling access for college readiness with students of low SES status is ill-matched with their need for this support. Again, school counselors must advocate for their role as a counselor who is focused on college and career development. They should also strive to strategically offer targeted, comprehensive school counseling services for their students of lower SES. There are many organizations and websites that are helpful for students when they apply for financial aid for college. The school counselor can collaborate with or recommend these services and people.

Finally, it has been noted that FGS status and SES are also related to one another, in that students who are FGS tend to come from a lower SES household (Engle, 2007). Thus, it is logical that both were significant in these analyses. Connected, research has found that students who are both from low-income families and are FGS are twice as likely to leave postsecondary education without attaining a degree within three years of enrolling, compared to their peers

(Cahalan et al., 2019). College readiness counseling is important for all students, but especially those who are underrepresented in higher education. The current results show a failure of the US education system in equity in college readiness supports for underrepresented students.

Research Question Two

Research question two asked, "Is there a relationship between school counselor caseload and student first-generation status, race/ethnicity, sex, and socioeconomic status?" Hence, research question two continued the line of inquiry into which students have access to school counseling, with a student's school counselor's caseload ratio as the second proximal environmental influence examined (Lent & Brown, 2006).

Results indicated no significant differences in students' school counselor's caseload by student sex or FGS status. There were, however, significant differences in who had a school counselor with the ASCA recommended 250:1 student to school counselor caseload ratio by student race/ethnicity. The logistic regression model indicated that Hispanic students had higher odds of having a school counselor with a caseload greater than 250 students, compared to White students. Since previous research has suggested school counseling caseload has an impact on school counselors' propensity to provide the appropriate counseling services, including college readiness counseling, this finding is alarming (Pham & Keenan, 2011). Further, as Hispanic students are underserved and underrepresented in postsecondary and STEM education, this finding is particularly concerning (Cahalan et al., 2019; Mau, 2016; NCES, 2020d). Previous research had found Hispanic students are more likely to be enrolled in schools where their future career goals were not being met due to barriers such as large caseloads or prioritization of crisis intervention (Dimmitt & Wilkerson, 2012). Within their attention to anti-racist school

counseling, school counseling leaders should engage in advocacy efforts at the policy-level focused on increasing the number of school counselors in high Hispanic serving school districts.

Results also indicated that student SES status significantly predicted which students had a school counselor caseload above or below the ASCA recommended 250:1 ratio. The results indicated that as SES status (i.e., as indicated by the SES composite score) increased, the odds of having a school counselor with the ASCA recommended caseload of 250:1 or less increased. This can also be interpreted as, that as a student's SES status decreases, their odds of having a school counselor with a caseload greater than 250 increases. There has been previous research that has noted differences in school counseling ratios based on socioeconomic factors, such as school counseling ratios increasing as per-pupil expenditures decreased (Lapan et al., 2012); the results of research question two, unfortunately, support those findings. When a student has a school counselor with a smaller caseload, the school counselor could potentially have the ability to pay more attention to both individual students and comprehensive programming for all students, which could then increase the student's access to appropriate college readiness counseling services (Pham & Keenan, 2011). Hence, the results of research question two were alarming as college readiness counseling is important for all students to have access to, and the results unfortunately reiterate the inequities in the U.S. educational system (Dyce et al., 2013; Noltemeyer et al., 2012).

Research Question Three

A logistic regression analysis was utilized to investigate research question three, which asked, "Does school counselor caseload and percentage of time spent college readiness counseling predict student college attainment and persistence?". Aligned with SCCT, the goal was to create a comprehensive model of prediction to answer this question, to include person

inputs and background variables, self-efficacy variables, and the proximal environmental influences of caseload and percentage of time spent college readiness counseling (Lent et al., 2017). The first model in the sequential logistic regression solely examined what are known as person inputs and background variables in SCCT (Lent et al., 1994).

FGS had lower odds of attaining a postsecondary degree or persisting in postsecondary education, three years post-high school graduation compared to non-FGS students. This is aligned with previous research (Cahalan et al., 2019), but the FGS status variable did not stay significant in the next two models. Also with lower odds of attainment and persistence in postsecondary education (i.e., compared to the reference group, White students) were Black/African American students, and previous research notes an opportunity gap does exist for Black/African American students (Calahan et al., 2019). This result did not hold in the next two models when self-efficacy was held constant, indicating that self-efficacy plays a large role in underrepresented students' college persistence and attainment. Thus, school counselors can seek to focus on strengthening student college-going self-efficacy. Results also indicated that students of more than one race had lower odds of college attainment and persistence compared to White students. This is not similar to previous research which stated multiracial students graduate at higher rates than students of other races, with the exception of Asian students (Calahan et al., 2019). Other researchers have noted the inadequate attention and 'difficulties' in assessing multiracial outcomes in research (Berzenski, 2019), which suggests the multiracial student population's education outcomes and experiences may not be well understood by educational researchers. Female students compared to male students, Asian students compared to White students, and students with higher SES status were more likely to attain a degree and persist in

postsecondary education. These findings are aligned with previous research (Cahalan et al., 2019; NCES, 2019).

The second model extended the investigation of predictors of college attainment and persistence to include self-efficacy variables (i.e., college self-efficacy and overall high school GPA), in addition to still accounting for the person inputs and background variables. Female students were still more likely to attain and persist, and students of more than one race and students of lower SES status remained having lower odds of attaining and persisting. College self-efficacy was not significant in this model. This is an interesting finding, because within the SCCT framework (Lent et al., 1994), and previous research studies, various forms of self-efficacy including college self-efficacy and general self-efficacy, were significant influences on and predictors of academic and career outcomes (Baier et al., 2016; Brady-Amoon & Fuertes, 2011; Hsieh et al., 2007; Vuong et al., 2011; Wright et al., 2013). Perhaps one reason for the lack of significance in this study is that the college self-efficacy variable was data collected from one item asking about the student's college self-efficacy, assessed when they were in the ninth grade. Self-efficacy is often assessed through a scale, and scales provide more sensitivity in scores than one-item assessments (Bandura, 2006). Overall GPA was included as part of the self-efficacy model, as learning experiences and prior accomplishments are an integral part of forming self-efficacy (Lent et al., 1994). Overall GPA was significantly predictive of the outcome (i.e., higher GPA is higher odds of the outcome), and this is aligned with SCCT researchers' assertion that while self-efficacy is important in career and academic outcomes, ability is also an important and irreplaceable component of career performance (Lent & Brown, 1996). While GPA is just one indication of ability, school counselors should support students' holistic academic development

as part of their comprehensive school counseling programs (ASCA, 2019), and ensure that all students have the opportunity to be academically successful in a supportive school climate.

In the final model, all previous variables were included and accounted for, and the two school counseling access variables were also added: (a) school counselor caseload and (b) school counselor percentage of time spent college readiness counseling. Variables that remained significant in the final model included: (1) identity of more than one race (i.e., lower odds of the outcome), (2) sex (i.e., female students had higher odds of the outcome); (3) SES (i.e., as SES increased, odds of the outcome increased); and (4) overall GPA (i.e., as GPA increased, odds of the outcome increased).

The results showed that school counselor caseload was not significant in the model. However, promising evidence of the impact of school counseling is that school counselor percentage of time spent college readiness counseling was a significant predictor of college attainment and persistence. Students who had access to a school counselor who spends at least the national average of time college readiness counseling (i.e., 21% or more), were more likely to attain a postsecondary degree or persist in college three years after high school graduation. Results indicated that students with school counselors who spent 21% or more time college readiness counseling had 27% higher odds of persisting or attaining a college degree. This finding supports previous research that details the importance of college readiness counseling and its positive impact on student outcomes (Dunlop-Velez, 2016; Tang & Ng, 2019). Further, it is the first study to my knowledge which investigates the impact of college readiness counseling three years after high school graduation; positive impacts have been noted up to one year post graduation (Poynton & Lapan, 2017).

It is important to note that even when controlling for school counselor percentage of time spent college readiness counseling and various other variables (e.g., college self-efficacy, overall GPA), students of lower SES status and students identifying as more than one race still had lower odds of persisting in college and attaining a degree. These results suggest that the opportunity gap with students of low SES and multiracial students needs to be addressed beyond what is currently being offered by college readiness counseling. School counselors and school counselor educators must learn evidence-based and culturally responsive interventions and incorporate them into their work (Berbery & O'Brien, 2018; McMahon et al., 2017).

Despite school counseling ratio not being a statistically significant predictor of college attainment and persistence, it is important to note that school counseling ratio in the current study's bivariate correlation analysis showed school counselor caseload was negatively statistically correlated with percentage of time spent college readiness counseling. This means that a school counselor with a larger caseload spent a smaller percentage of time on college readiness counseling in the current sample. Additionally, prior research has also shown a school counselor's distribution of time spent in college readiness counseling is influenced by school counseling ratios, with higher caseloads resulting in less time spent college readiness counseling (Clinedinst & Koranteng, 2017; Engberg & Gilbert, 2014).

Research Question Four

One final logistic regression analysis provided the exploration of research question four: "Does school counselor caseload and percentage of time spent college readiness counseling predict STEM major attainment and persistence?" Sequential logistic regression allowed for sociocultural context to be considered in the prediction of STEM career-related performance. This is important, as the structure of opportunity (e.g., socioeconomic status, education access,

social support), socialization of gender roles, and other societal and family norms influence abilities, self-efficacy, outcome expectations, and goals within SCCT (Lent & Brown, 1996). The first model included what are termed person inputs and background variables in SCCT (Lent et al., 1994), including FGS status, race/ethnicity, sex, and SES. Students of Asian race/ethnicity had higher odds of persisting in a STEM major or attaining a degree, compared to the White student reference group, which echoes previous research (Chen, 2013; Mau, 2016). SES also predicted the outcome, with students of higher SES having higher odds of STEM persistence and attainment, which is aligned with previous research on students' SES status and STEM outcomes (Chen, 2013). Finally, female students had lower odds of persisting in a STEM major or attaining a STEM degree than male students in the model; this gender disparity in STEM academic and career related outcomes has been noted in the literature (Mau, 2016).

The second model extended the investigation of predictors of STEM major attainment and persistence to include self-efficacy variables (i.e., math self-efficacy, science self-efficacy, and STEM high school GPA), in addition to still accounting for the person inputs and background variables. Within this second model, Asian identifying students and female students held the same patterns of significance as in the first model. When accounting for the self-efficacy variables, Hispanic identifying students now showed significantly higher odds of persisting in a STEM major and attaining a STEM degree. Previous research does not report higher odds of Hispanic student STEM major persistence and attainment (Mau, 2016; NSF, 2019). But, this result within this model suggests that when Hispanic students have equitable math self-efficacy, science self-efficacy, and STEM GPAs, their opportunity for STEM success is increased, which has been reflected in a SCCT academic persistence model with Latinx engineering student participants (Lee et al., 2015). STEM self-efficacy is an important target for school counselors to

address with students (Falco, 2017), given its influential role in STEM outcomes (Mau & Li, 2018; Shaw & Barbuti, 2010).

The second model demonstrated that as math self-efficacy and science self-efficacy scores increased, the odds of a student persisting in a STEM major or attaining a STEM degree increased significantly. Further, students with higher STEM GPAs in high school were more likely to persist in STEM majors or attain a STEM degree. This is aligned with SCCT, which suggests previous learning experiences and prior accomplishments have a positive effect on career related outcomes (Lent & Brown, 1996). Previous research (Chen, 2013) has also suggested that lack of preparation in advanced STEM courses in high school leads to more STEM major attrition.

The final model to answer research question four included all previous variables, and added the two school counseling access variables: (a) school counselor caseload and (b) school counselor percentage of time spent college readiness counseling. Variables that remained significant in the model, in the same directionality of odds of the outcome, were: Asian race/ethnicity, Hispanic race/ethnicity, sex, math self-efficacy, science self-efficacy, and high school STEM GPA. The final model showing women were less likely to persist in STEM majors or attain a STEM degree even when accounting for the access to school counseling variables, indicates school counselors must increase their knowledge and awareness of the barriers their girl students are facing related to STEM, and seek to correct the barriers. Barriers can include school climate, which school counselors can address in their role, through both the messages they themselves and all school staff are sending to their girl students about STEM.

In the current study, school counselor caseload was not significant in the model. This finding is not aligned with previous research that found the addition of each school counselor to

a school's staff was associated with 10%-point increase in four-year college-going rates (Hurwitz & Howell, 2013), which suggests the influence of caseload on student postsecondary outcomes, as typically more school counselors staffed results in lower caseloads. However, it is important to note that school counseling ratio did have a significant relationship with the percentage of time in college readiness counseling in the current study, with more students on a caseload resulting in less time spent college readiness counseling, according to the bivariate correlation analysis.

School counselor percentage of time spent college readiness counseling was significant in the final model, and the results indicated that students who have a school counselor who spends at least the national average of time on college readiness counseling (i.e., 21%), have higher odds of persisting in STEM majors or attaining a STEM degree. Students who have a school counselor who spends 21% or more of their time on college readiness counseling have 29% higher odds of STEM major persistence and attainment three years post-high school graduation. This finding is novel in the literature. School counseling and STEM counseling is a relatively new area of research in the school counseling literature (Falco, 2017; Schmidt et al., 2012). The current study's finding on the impact of school counselors' college readiness counseling on STEM outcomes extends existing research that has noted the importance of school counselor's role in STEM counseling (Falco, 2017; Shillingford et al., 2018), as well as short-term impacts on STEM self-efficacy from school counseling interventions (Falco & Summers, 2019).

Implications

The implications of this dissertation study include practice, policy, and training and education implications. Overall, these findings supported that college readiness counseling has an impact on students' long-term college and STEM attainment and persistence outcomes. It then

follows that improved attention to preparing school counselors to provide transformative college readiness and STEM counseling, advocating for proper allocation of time spent on appropriate and direct services for students, and ensuring all students have equitable access to school counseling services can have a positive impact on student longitudinal outcomes.

Practice

School counselors have been called to engage in college readiness counseling and STEM counseling within their role in career development within the ASCA National Model (ASCA, 2019; Gilfillan, 2018; Schmidt et al., 2012). The results of this study provide further evidence of the importance of these activities for longitudinal student outcomes, and also provide a quantitative perspective on best practices in this endeavor.

College Readiness Counseling

These results have highlighted how students who have access to a school counselor who spends 21% or more time on college readiness counseling show increased odds of persisting in postsecondary education or attaining a degree, in addition to persistence and attainment in a STEM major, three years post-high school graduation. School counselors can utilize this information to inform the creation of their annual student outcome plans, classroom and group Mindsets & Behaviors action plans, and school counselor weekly calendar, which are all tools school counselors utilize to plan their CSCP and time (ASCA, 2020). School counselors can strive to spend 21% of their time on career and college readiness programming. Within their CSCP, school counselors can engage in best practices of college readiness counseling as outlined by various frameworks. For example, The NACAC and The College Board provide guidelines and suggestions for college readiness counseling that school counselors can use (Clinedinst & Koranteng, 2017; College Board, 2010).

The results also highlighted the importance of equity in school counselors' college readiness counseling services. Despite the great strides underrepresented minorities have made in increased representation in higher education (Cahalan et al., 2019), the current study found that multiracial individuals had lower odds of persisting and attainment compared to their White peers. Further, as participants' SES composite score decreased, so did their odds of persisting and attaining a degree. The ASCA National Model designates school counselors as educators who promote equitable college opportunities for students (ASCA, 2019). Equity and equality are not interchangeable terms; in order to achieve equity in higher education student outcomes, a school counselors' CSCP requires tailored policies and procedures for students (Mason et al., 2013). While a CSCP serves to help all students in the career development domain and school counselors seek to create a school-wide college-going culture (Bryan et al., 2017), a school counselor may supplement their college readiness counseling efforts with students of lower SES status and multiracial identity.

This may include increased attention to assisting students in connecting to monetary resources, and incorporating culturally relevant discussion in college planning. School counselors should seek training on financial aid and how to make college accessible for all, and incorporate discussions about financial aid and scholarships in their college readiness counseling services. The school counselor can utilize the Competencies for Counseling the Multiracial Population (Kenney et al., 2015) to guide their career development work with multiracial students, including assisting their multiracial students with exploring career/college choices that best facilitate identity formation and satisfaction, and linking students with racially and culturally open individuals who can serve as mentors. While the results were positive in terms of the

connection between access to school counseling and long-term outcomes, not all students benefitted in the same ways, and school counselors must seek to close opportunity gaps.

STEM Counseling

School counselors can also use the results of this study to inform their STEM counseling work in their roles. A promising result of the study was that school counselors' percentage of time spent college readiness counseling was predictive of STEM major attainment and persistence. But, there were still inequities in which students were achieving this outcome, including female identifying students. This is helpful information to lead school counselors to target intervention efforts with their girl students. For instance, girls may benefit from more STEM focused occupational information, and the verbal persuasion (i.e., encouragement) from their school counselors. In terms of consultation, it has been suggested school counselors should play an important role in working with math and science teachers to develop curricula that are unbiased and culturally sensitive to the needs of female and minority students, and the results of the study show the long-lasting effects of how a ninth-grade student perceives their self-efficacy in math and science to support this suggestion (Mau, 2016).

Additionally, high school STEM GPA was predictive of persisting and attaining a STEM degree. School counselors encourage high achievement from all students, and this result does not suggest that school counselors should focus their STEM career exploration on just those students who have higher STEM GPAs, assuming that those with lower STEM GPAs will not want to enroll in as a STEM major in college or cannot be successful once there. All students, regardless of STEM GPA, should receive STEM counseling opportunities. School counselors should also strive to create an environment that is inclusive for all students to be successful in STEM. This is supported by research showing historically black colleges and universities and high-Hispanic-

enrollment institutions are advancing the representation in the STEM field of racial and ethnic minorities (NSF, 2019). Further, school counselors can connect their students to the resources to support their success in STEM coursework.

Math and science self-efficacy were important predictive factors of persistence and attainment in a STEM degree, and these areas of self-efficacy can be targeted through interventions with students, and previous literature has provided suggestions on how school counselors can do so (Falco, 2017; Schmidt et al., 2012; Shillingford et al., 2018). Falco and Summers (2019) offer an overview of a STEM counseling intervention with girl students that showed gains in the students' STEM self-efficacy and career decision making self-efficacy. Developing STEM self-efficacy is important, because when this was held constant, there were no students of different race/ethnicities who were at lower odds of persisting and attaining a STEM degree, nor did SES have an influence on outcomes. School counselors must remain vigilant of the structural inequalities underrepresented students face and remove these barriers (Wolniak et al., 2016).

Policy

The policy implications resulting from the current study are three-fold: (a) providing support for proper allocation of time and duties for school counselors, (b) providing support for lower school counseling ratios, and (c) investigating the distribution of school counselors amongst students of different identities to call for equitable access to school counseling. There is a national call for increased STEM engagement, especially from women and underrepresented racial minorities (National Science Foundation, 2019; U.S. Bureau of Labor Statistics, 2020; Xue & Larson, 2015), as well as equitable access to postsecondary education for all students (ASCA, 2019; McKillip et al., 2012). The results of this study indicate the connection between access to

school counselors and college readiness counseling's impact on college and STEM outcomes, but often it is school counselors who are the first to get cut due to budgeting in K12 schools (Hanna, 2019). The NACAC and ASCA are working together on policy advocacy, such as the Secondary and Elementary School Counseling Act. This act calls for two five-year renewable grant programs to staff elementary and secondary schools with school counselors, psychologists and social workers effectively by providing federal grants to states to disburse to school districts. The current results are further evidence for the need for this collaboration and the passing of the act (H.R.4381). Further, the inequitable distribution of school counselors amongst students of Hispanic heritage, of students who come from lower SES backgrounds, and of FGS, is concerning and requires policy intervention.

School counselors personally can use the data in their self-advocacy in district-level and state-level policies (Cigrand et al., 2015). As college/career readiness and STEM readiness are national imperatives, they can advocate to their administration, school board, and state department of education for lower school counselor-to-student caseload ratios and proper allocation of time through lessened administrative duties, using the results from the current study as evidence for the importance of their work doing college readiness counseling. Policy has an impact on school counselors' ability to effectively work with students; high caseload numbers and non-counseling duties inhibit their ability to work directly with students on college readiness (McKillip et al., 2012; Pham & Keenan, 2011). While this may seem like common sense, the caseload average in the United States still remains at 482 students, and school counselors are still tasked with inappropriate duties (NCAC & ASCA, 2015; O'Connor, 2018).

Training and Education

The current study's results suggest that career counseling course content tailored to increase knowledge and skills in college readiness counseling for school counselors-in-training could benefit these students as they enter the field. This content could include the frameworks provided to conceptualize and guide college readiness counseling (Clinedinst & Koranteng, 2017; College Board, 2010) as well as discussions around the current research surrounding school counselors and college readiness counseling (e.g., Gilfillan, 2018). Experiential activities, supervision discussions, and assignments tailored to increase school counseling students' self-efficacy regarding college readiness counseling are other examples of incorporating college readiness counseling fluency into the curriculum. This is supported by the CACREP Standards (CACREP, 2015). Previous research has suggested increased attention to developmental career counseling in school counselor preparation programs is needed, as school counselors are often entering the field unprepared to engage in college readiness counseling in their schools (Hall et al., 2011; Knight, 2014).

The results of this study also emphasize the importance of counselor educators intentionally discussing STEM career development in the career counseling and other school counseling curriculum. Research has shown school counselors do not feel knowledgeable about careers in the STEM fields (Hall et al., 2011). STEM counseling within the school counselor repertoire is a relatively new topic (Schmidt et al., 2012), and counselor educators must be aware of this counseling area and incorporate it into their curriculum. Additionally, the results of this study support the need for collaborations between university counseling programs and neighboring school districts to increase counseling access to improve underrepresented students' STEM outcomes. For instance, a counselor educator could develop an interdisciplinary approach

to improving STEM self-efficacy and counseling access for a local high school. Faculty in the STEM departments in the university could provide professional development about STEM careers and how to best prepare for a career in STEM to Masters students enrolled in the career counseling course. The Masters counseling students could then provide career and college STEM counseling to the high school students. This would benefit both the high school students in their access to counseling services and the Masters students' experiential learning in STEM related career development interventions.

Similar to the implications for school counselors, counselor educators have a responsibility to be leaders and advocates for the school counseling profession (Cigrand et al., 2015). Research is needed to support the efficacy of school counseling interventions, and counselor educators can team with school counselors to conduct further research on their college readiness and STEM career development efforts (Whiston et al., 2011). The information from this study and others can be presented to lawmakers, news outlets, and school board officials (Cigrand et al., 2015). Counselor educators can model this advocacy to their students, and encourage their development and efficacy in advocacy efforts.

Limitations

While the current study makes contributions to the school counseling literature regarding college readiness counseling and STEM counseling, this dissertation study does have limitations. First, there are limitations to utilizing secondary analysis of existing data, specifically, researchers are not privy to selection of the variables (Cheng & Phillips, 2014). However, the use of the NCES-led HSLS:09 dataset allowed for an extensive number of variables for a massive longitudinal study (NCES, 2020a). As mentioned previously, a scale measurement of the college self-efficacy variable would provide sensitivity. Next, a potential area for future exploration in

this model could also be school counselors' self-efficacy in college counseling and STEM counseling and how that impacts students' outcomes. Additionally, NCES student data is not linked to their individual school counselor, rather, the lead counselor was used as a source of school-level student contextual data (Ingels & Dalton, 2013). Also, as is typical in longitudinal studies, attrition of the sample is a concern; there was a lower response rate for the second follow-up survey as compared to the baseline data. Sampling weights and standard error adjustment methods as detailed by the NCES were utilized to account for nonresponse bias and missing data (Duprey et al., 2018). Additionally, causal inferences should not be assumed in logistic regression models; probability in correctly predicting an outcome does not mean that these variables cause the outcomes (Tabachnick & Fidell, 2013). With large datasets, such as the HSLS:09, the researcher's bias can influence which variables are selected to study an outcome; there are many more variables in this dataset which could be included for an exploration of the research questions. Relatedly, while statistical significance was found for various chi-square and logistic regression models, the percentage of variance accounted for by the models were in the weak range, suggesting that there are more variables that could be accounted for to create even better fitting models.

<div align="center">**Recommendations for Future Research**</div>

There are exciting future research directions to extend the findings in this dissertation study. For instance, future research studies could utilize multilevel modeling methods to account for school-level variables, such as school staff-to-student ratio, percentage of students on free-and-reduced lunch, geographic area characteristics, etc. This would further investigate systemic influences on access to school counseling and student outcomes, and could have the potential to increase the percentage of variance accounted for by the models.

Additionally, research with individuals who identify as multiracial/more than one race about their college persistence and attainment influences and outcomes is needed, as current research often does not include multiracial individuals in their analysis (Berzenski, 2019; Museus et al., 2015). Multiracial student career development in relation to school counseling needs to be explored, as there are unique counseling competencies when working with multiracial counseling clients (Alvarado et al., 2015). This research is especially needed as the current results indicated a different pattern than previous studies that suggested students of more than one race have increased odds of postsecondary attainment (Calahan et al., 2019). This line of research will investigate how we are and are not supporting the unique needs of multiracial students in their college experiences (Museus et al., 2015).

As mentioned previously, current results indicated that the percentage of time spent college readiness counseling by a student's school counselor does have predictive power on student outcomes in both postsecondary persistence and attainment and STEM major persistence and attainment. Research on school counselors and STEM is growing, and should be continued. For instance, Shillingford and colleagues (2018) explored school counselors' experiences regarding STEM and STEM counseling, and how that impacts their ability and willingness to provide STEM counseling. Quantitative research surrounding this topic is needed as well to measure differences in STEM counseling allocation and student STEM outcomes as a result of school counselors' preparation and efficacy in this area. Previous quantitative research by Sanders and colleagues (2017) investigated school counselor self-efficacy in conjunction with the Career Counseling Self-Efficacy Scale-Modified, and results indicated an overall confidence in career counseling, but limited time to do career counseling (i.e., which include college

readiness counseling). Continued research connecting school counselors' career and college readiness counseling self-efficacy, but in relation to long-term student outcomes, is needed.

Related, an understanding of how counselor education programs are and are not preparing their students to engage in college readiness counseling and STEM counseling is warranted. As college readiness counseling and STEM counseling are both important roles of the professional school counselor, it is imperative that the school counselors-in-training are entering the field prepared to provide these services to students.

Conclusion

This study provided encouraging results regarding the impact of school counselors' college readiness counseling on students' postsecondary and STEM major attainment and persistence. It also detailed how science and math self-efficacy had strong predictive power on STEM outcomes, which informs school counseling practice. Further, it has provided information on the students who are unfortunately not receiving equitable access to school counseling services, specifically, students of lower SES, first-generation students, and Hispanic students. Through policy change to increase school counseling access to those students who are underserved, increased training in college readiness counseling and STEM counseling in school counseling training programs, and continued attention to a holistic model of college readiness, school counselors can continue to play an integral role in *all* students' college and STEM readiness through providing college readiness counseling (Gilfillan, 2018; Schmidt et al., 2012).

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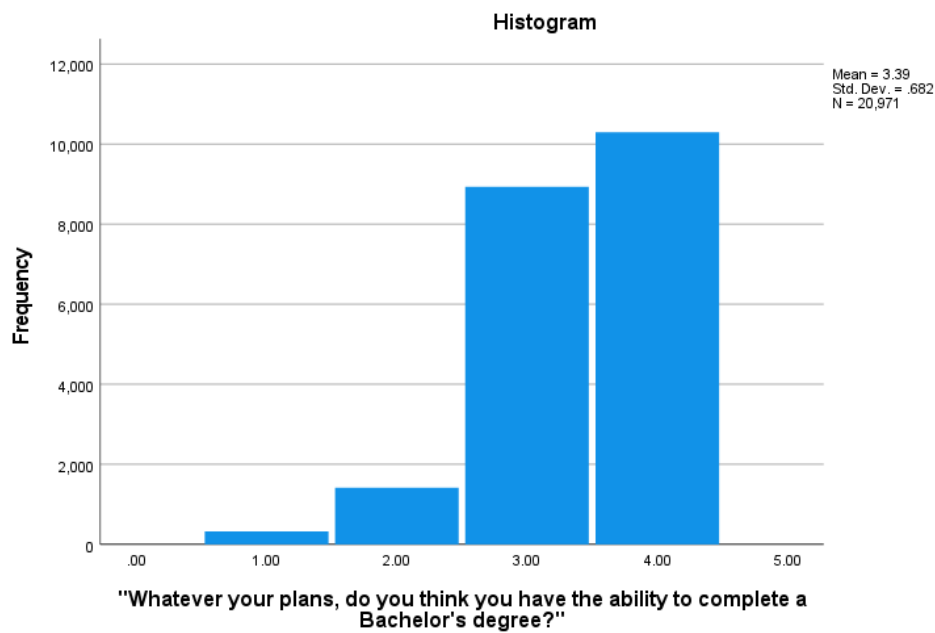
Appendix

Descriptive Statistics Chart Outputs

Histogram of Student Socioeconomic Status Variable
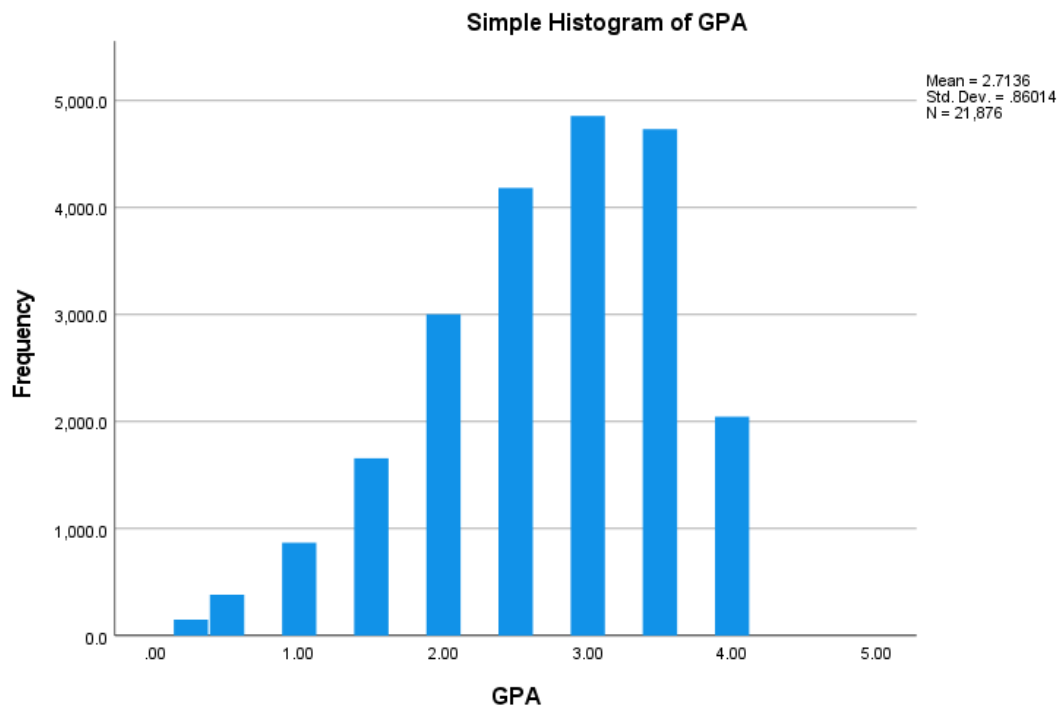

Simple Histogram of Composite Variable of Student SES

Mean = .0541
Std. Dev. = .7803
N = 21,444
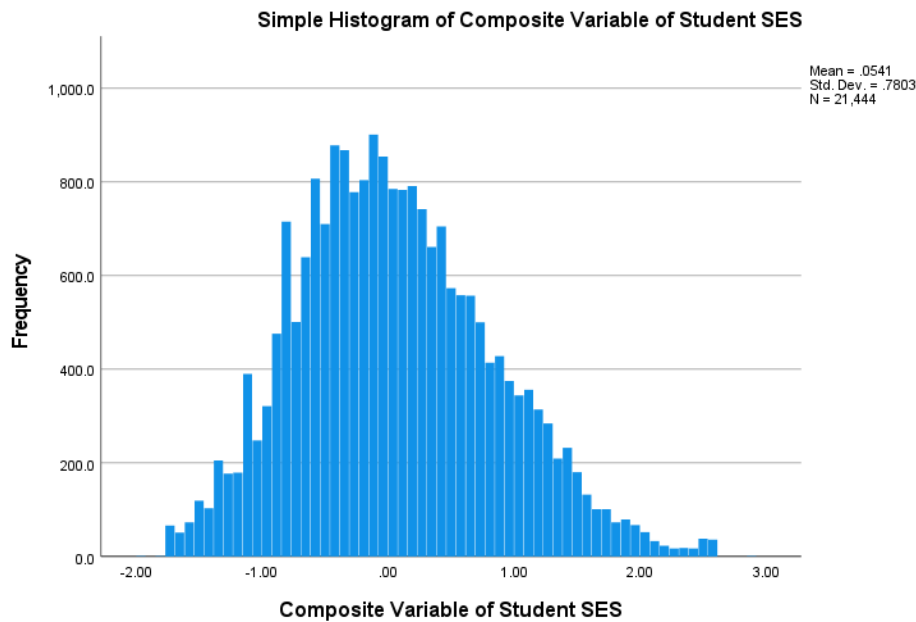
Histogram of College Self-Efficacy Variable

Histogram

Mean = 3.39
Std. Dev. = .682
N = 20,971

Histogram of Math Self-Efficacy Variable

Simple Histogram of Scale of student's mathematics self-efficacy

Mean = .0421
Std. Dev. = .99518
N = 18,759
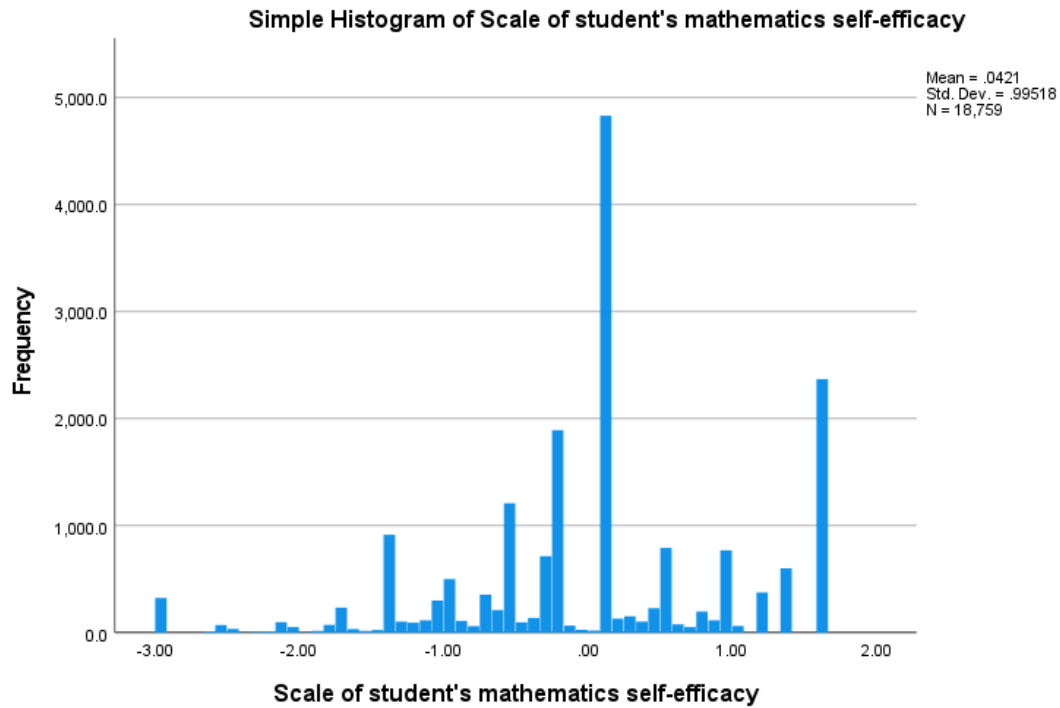
Histogram of Science Self-Efficacy Variable

Simple Histogram of Scale of student's science self-efficacy
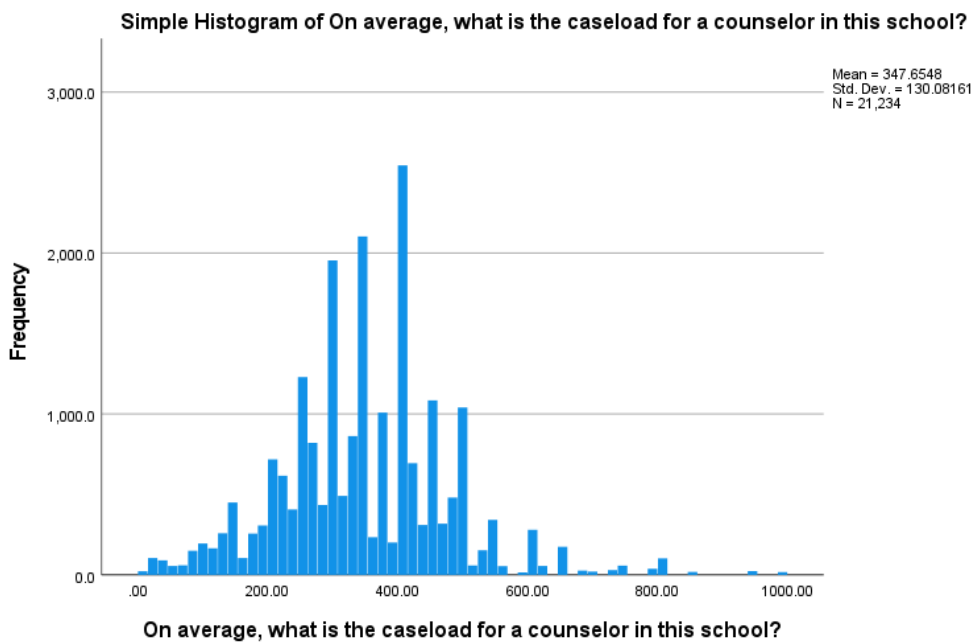
Mean = .0372
Std. Dev. = .99835
N = 17,264
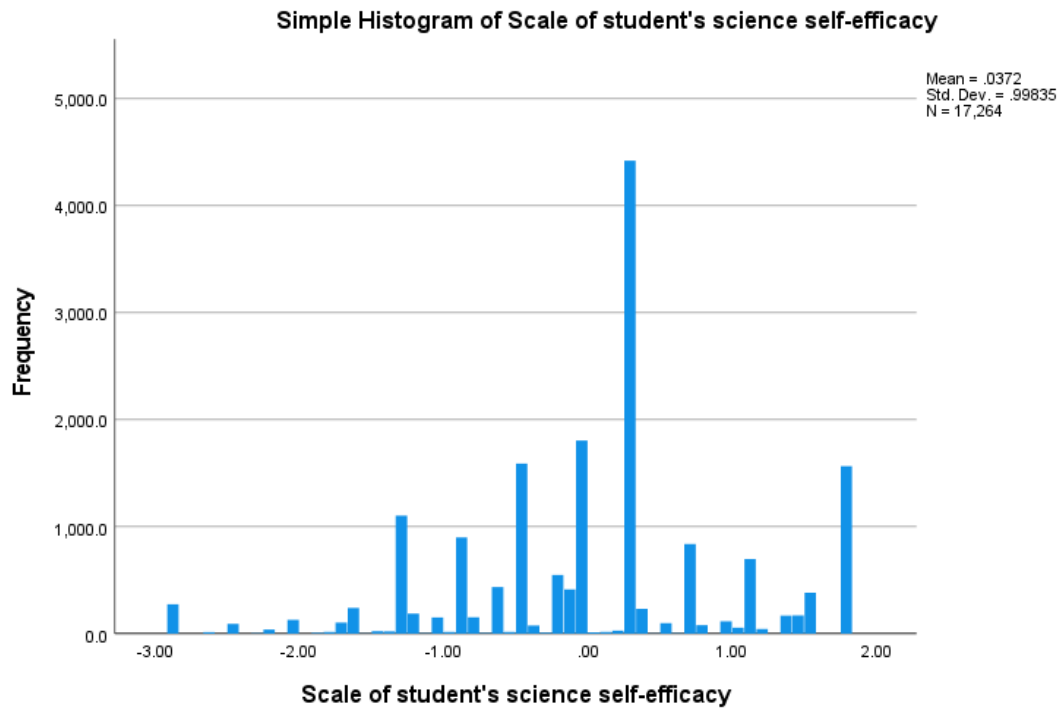
Histogram of Overall GPA Variable

Histogram of STEM GPA Variable
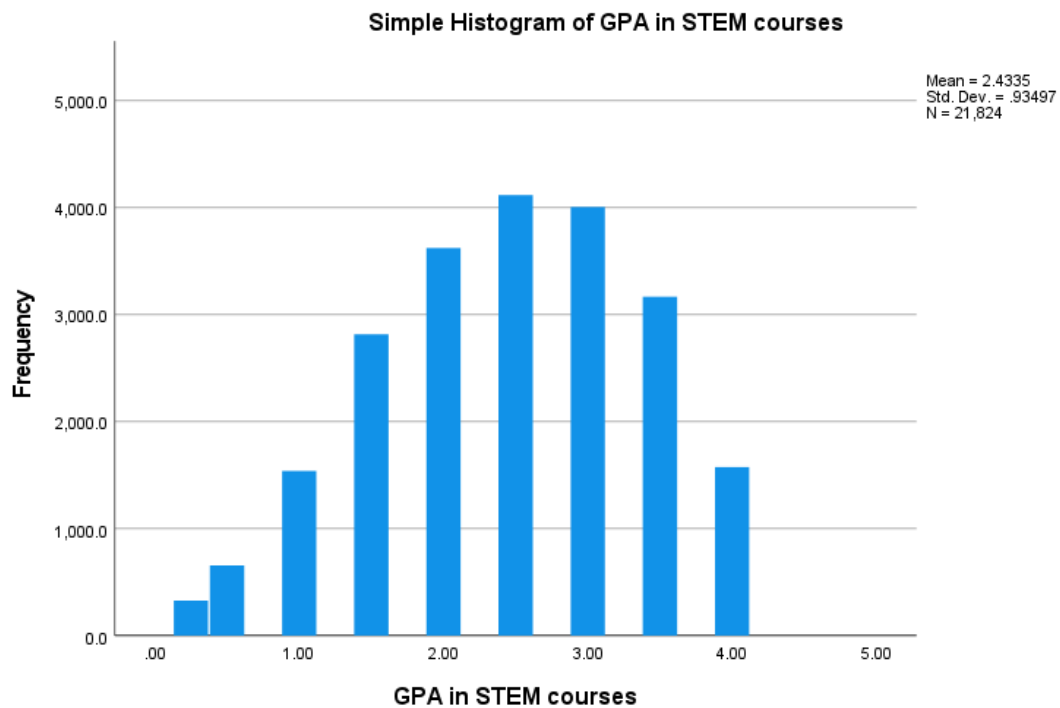
Histogram of School Counselor Caseload Variable

Simple Histogram of On average, what is the caseload for a counselor in this school?

Mean = 347.6548
Std. Dev. = 130.08161
N = 21,234

On average, what is the caseload for a counselor in this school?

Histogram of School Counselor Percentage of Time Spent College Readiness Counseling Variable

Simple Histogram of Last school year, what percentage of work hours did your school's counseling staff spend..college readiness?

Mean = 3.3708
Std. Dev. = .9479
N = 20,966

Last school year, what percentage of work hours did your school's counseling staff spend..college readiness?
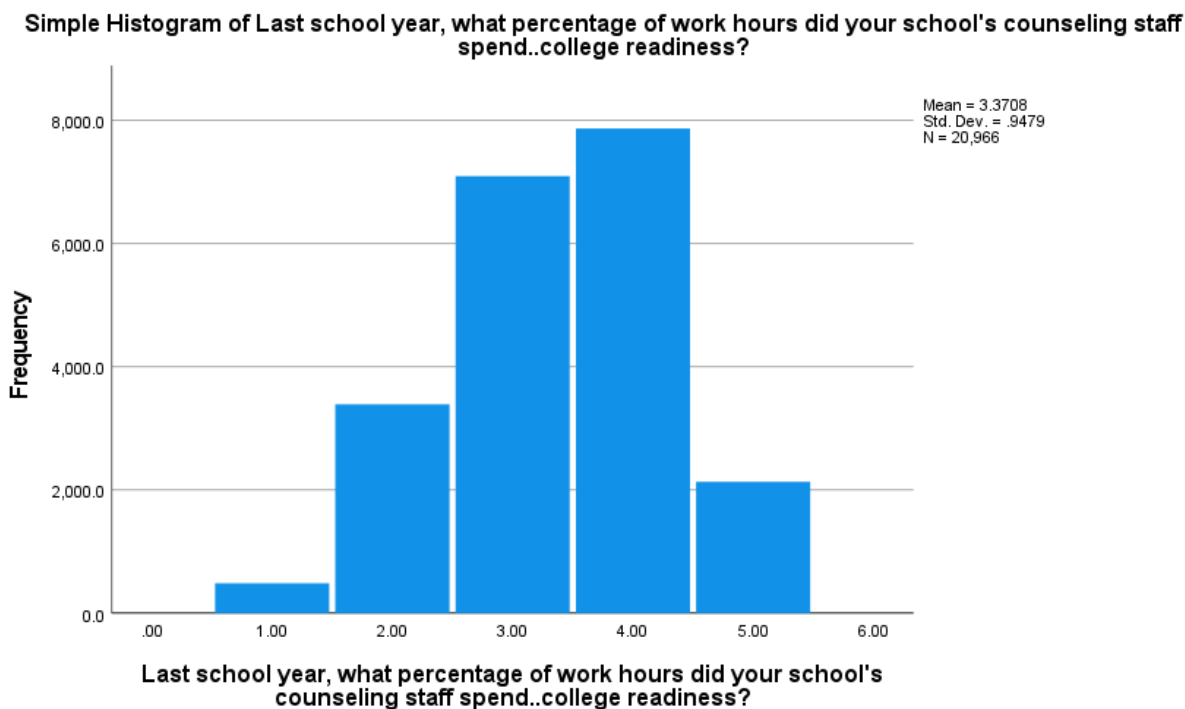
VITA
Dana L. Brookover

Dana Lynn Brookover was born January 12, 1991 in Willingboro, New Jersey.

EDUCATION

Virginia Commonwealth University
Doctorate of Philosophy, Counselor Education and Supervision
Graduation Date December 2020

The College of William and Mary
Master of Education, School Counseling
Graduation Date May 2015

Christopher Newport University
Bachelor of Science, Psychology
Graduation Date December 2012

PUBLICATIONS

10. **Brookover, D.L.**, Hanley, E.M., Boulden, R., & Johnson, K.F. (in press). "I want to be a first": Student, family, and school factors influencing first-generation student college readiness. *School Community Journal.*

9. Johnson, K.F., & **Brookover, D.L.** (in press). School counselors' knowledge, actions, and recommendations for addressing social determinants of health with students, families, and in communities. *Professional School Counseling*.

8. Johnson, K.F., & **Brookover, D.L.** (in press). Leveraging technology to reduce literacy barriers on social health screening tools: Implications for human service professionals and administrators. *Journal of Technology in Human Services*.

7. Hermann, M. A., Gorlewski, J., **Brookover, D.L.**, Walsh, R. L., Kozachuk, L., Deitz, M. E., & Ciminelli, E. (in press). Policy, practice, and parenthood: A study of teacher mothers. *Educational Studies*.

6. Suggs, B.G., Mahan, L.B., Cannedy, M., Gantt, A.C., **Brookover, D.L**., & Johnson, K.F. (in press). Helper, healer, and mitigator: The essential role of the human services provider in current and post-pandemic climates. *Journal of Human Services.*

5. Mahan, L.B., Johnson, K.F., Gantt, A.C., **Brookover, D.L.**, Suggs, B.G., Jones, J.L. Cannedy, M.. (in press). The role of human services providers in addressing social determinants of health. *Journal of Human Services.*

4. Johnson, K.F., **Brookover, D.L.,** & Borden, N. (in press). General health and depression outcomes related to cumulative indicators of unmet social determinant of health needs for college students. *Journal of College Student Psychotherapy*.

3. Johnson, K.F., & **Brookover, D**.L., & Bradbrook, K. (2020). Social health needs and promotive health factors scale for college students: Scale development and initial validation. *Journal of American College Health.* https://doi.org/10.1080/07448481.2020.1725021

2. Johnson, K. F., & **Brookover, D.L.** (2020). Counselors' role in decreasing suicide in mental health professional shortage areas in the United States. *Journal of Mental Health Counseling, 42*(2), 170-186. https://doi.org/10.17744/mehc.42.2.06

1. Johnson, K.F., Worth, A., & **Brookover, D**. (2019). Families facing the opioid crisis: Content and frame analysis of YouTube videos. *The Family Journal*, *27*(2), 209-220. https://doi.org/10.1177/1066480719832507

SELECT PRESENTATIONS

5. **Brookover, D.L**., & Johnson, K.F. (2020, September). *School Counselors' Knowledge, Actions, and Recommendations for Addressing Social Determinants of Health with Students, Families, and in Communities*. Symposium at the Association for Assessment and Research in Counseling Conference, Virtual.

4. **Brookover, D. L.**, Hermann, M. A., & Deitz, M. E. (2020, April). *Wellness Counseling with Adolescent Females: A Qualitative Study of Student Experiences with School Counselor Led Wellness Programs.* Session accepted for the canceled American Counseling Association Conference, San Diego, CA, and presented on-line through Chi Sigma Iota.

3. **Brookover, D.L.**, Hanley, E., & Johnson, K. (2020, April). *School counselors and first-generation students: A qualitative perspective*. Accepted poster session for the canceled 2020 American Counseling Association Conference, San Diego, CA.

2. Randell, A., Rutledge, M., **Brookover, D.L**, Dawson, M., Dockery, D., & Gnilka, P. (2019, October). *A quantitative study on wellness in counseling students.* Poster session for the 2019 Association for Counselor Education and Supervision Conference, Seattle, WA.

1. Torres, N., & **Brookover, D.L.** (2019, October). *Title IX: How Will the Changes Affect You and Your Students.* Roundtable session for the 2019 Association for Counselor Education and Supervision Conference, Seattle, WA.

SELECT CLINICAL EXPERIENCE

Licensed School Counselor (K-12), Virginia, 2015- Present
National Certified Counselor, ID: 1231138

School Counselor, Great Bridge High School, Chesapeake, VA, August 2015- July 2018

Interim School Counselor, New Kent High School, New Kent, VA, January 2015- March 2015

School Counselor, Intern, George Watkins Elementary School, New Kent, VA, January 2015- May 2015

School Counselor, Intern, New Kent High School, New Kent, VA, September 2014-December 2014

School Counselor, Practicum Student, Grafton Middle School, Yorktown, VA, January 2014- May 2014

Shelter Intern, Avalon: A Shelter for Women and Children, Williamsburg, VA, January 2012- June 2012

SELECT TEACHING EXPERIENCE

Instructor for Virginia Commonwealth University CLED 501- Survey of the Counseling Profession. (Spring, 2020).

Instructor for Virginia Commonwealth University CLED 604 - Practicum: School Counseling. (Fall, 2019).

AWARDS

Andrew and Darnetta Daire Dissertation Scholarship recipient - VCU School of Education (2020-2021)