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UNIVERSITY OF NORTHERN COLORADO

Greeley, Colorado

The Graduate School

GROWTH MINDSET FOR INCOMING
COLLEGE STUDENTS

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Philosophy

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College of Education and Behavioral Sciences
Department of Leadership, Policy and Development:
Higher Education and P-12 Education

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This Dissertation by: Erin Michelle Datteri-Saboski

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has been approved as meeting the requirements for the Degree of Doctor of Philosophy in College of Education and Behavioral Sciences in Department of Leadership, Policy and Development: Higher Education and P-12 Education, Program of Higher Education and Student Affairs Leadership

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ABSTRACT

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The purpose of this study was to examine an educational psychology phenomenon called growth mindset and the influence it may have on first-generation college student transition as measured by first-semester GPA. I invited students attending the orientation first-generation workshop to participate in my study and had 308 participants. I systematically selected one-third of them to participate in a 35-minute intervention that taught them about growth mindset. Students in the control group participated in the session New Student Orientation had in place for years: a simple social-belonging intervention. My study found that students who participated in the control/social-belonging intervention had statistically significant higher GPAs than students who participated in the growth mindset intervention. This is important for institutions to consider when wanting to improve college graduation rates for more vulnerable populations like first-generation college students.

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CHAPTER I

INTRODUCTION

Among first-time, full-time undergraduate students attending a four-year degree-granting institution in the United States, research indicates, “by 2016 some 60 percent of students had completed a bachelor’s degree at the same institution where they started in 2010” (McFarland et al., 2018, p. 202). This national statistic is low, especially when considering the debt that is accrued by some students who start but do not finish their degree. Another set of researchers, Gershenfeld, Hood, and Zhan (2016), found that first-semester grade point average (GPA) was a strong early predictor of subsequent graduation. There is no such thing as a magic wand to improve GPA and subsequent retention and graduation rates for students participating in higher education. While fast and easy solutions do not exist, there are some known methods of improving retention for incoming students that are much more time and resource intensive.

An example comes from federal TRiO programs, the name is not an acronym but refers to the initial three programs supported by the Higher Education Act: Upward Bound, Talent Search, and Student Support Services (Council for Opportunity in Education, 2018). These types of programs provide funding to full-time staff members who work on college campuses to serve and assist low-income and first-generation college students through graduation in many capacities: from academic tutoring, assistance completing financial aid applications, and many more.

Another known intensive method is a first-year seminar course. There are many variations of implementation, but typically it is a credit-bearing course in the first semester designed to equip students with tools for success in college. In a meta-analytic study, research indicated that participation in these courses offers a small positive effect on grades and retention (Permzadian & Crede, 2016). These time and resource intensive methods are not easy to apply to the vast number of incoming students who need support to reach graduation.

There has been recent research about educational “nudges” providing students a gentle push in the direction of a positive academic outcome like GPA or learning (Damgaard & Nielsen, 2018). Damgaard and Nielsen (2018) offer many examples of these kind of nudges: changing default settings in online resources so students opt-in instead of opt-out, changing language to frame an outcome more positively, imposing interim deadlines to support commitment, manipulating peer groups, and more. In the current study, I focused on a growth mindset intervention that is beginning to show potential as a nudge that can be provided to all incoming students for relatively low cost and during a short amount of time.

The educational psychology phenomenon called growth mindset has been researched by Carol Dweck (2016) and originally published in her book’s first edition in 2006. Dweck offered two types of mindsets: fixed and growth. People with fixed mindsets believe intelligence is static. For example, students may think they are bad at math and that means they will always be bad at math no matter the number of math classes they take. People adopting the growth mindset believe that intelligence can be developed. Growth mindset “is about learning and growth, and everything (challenges, effort, set-backs) is seen as being helpful to learn and grow. It is a world of

opportunities to improve” (Yeager & Dweck, 2012, p. 304). Using this definition, it follows that growth mindset is a valuable trait for students to have when attending college for the first time as adapting and growing are essential for a successful college career.

As I will detail in the literature review, researchers have completed multiple studies using a growth mindset intervention on students and over time have demonstrated small but statistically significant increases in GPA and/or retention. The students retained as a result of a nudge from a growth mindset intervention have much to gain. One population growth mindset intervention has been focused on are middle or high school students (Blackwell, Trzesniewski, & Dweck, 2007; Burnette, Russell, Hoyt, Orvidas, & Widman, 2018; DeBacker et al., 2018; Paunesku et al., 2015; Yeager, Romero, et al., 2016). Another population is students in college (Aronson, Fried, & Good, 2002; Bostwick & Becker-Blease, 2018; Broda et al., 2018; Fink, Cahill, McDaniel, Hoffman, & Frey, 2018; Mills & Mills, 2018; Yeager, Walton, et al., 2016). The past research that focused on an intervention for college students at the point of orientation included only a few institutional types and student demographic populations. I intended to further the growth mindset research by identifying characteristics missing from previous research: first-generation college students at a less selective regional four-year institution.

These two specifications are important as they represent a growing type of incoming student and an institutional classification that is more representative of higher education in the U.S. First-generation college students are a growing population that has unequivocally lower college enrollment, retention, and graduation rates than those whose parents went to college (Cataldi, Bennett, & Chen, 2018; Pike & Kuh,

2005; Toutkoushian, Stollberg, & Slaton, 2018). First generation in college can be defined in many ways (Toutkoushian et al., 2018). In my research, I define a first-generation student based on the admissions application response that neither self-defined parent has a baccalaureate degree. According to the Carnegie classification system, one way higher education institutions can be classified is by the background achievement characteristics of incoming first-year students (Center for Postsecondary Research, 2015). This system identifies three selectivity profiles for four-year institutions: inclusive (the educational opportunity is extended to a wide range of students), selective (students come from the 40th to 80th percentile), and more selective (students come from the 80th to 100th percentile). It is important to concentrate the growth mindset intervention research on these characteristics as higher education works to improve graduation rates for all college students.

Purpose of the Study

I intended to further the growth mindset research by focusing specifically on an intervention for incoming first-generation college students at a regional four-year university, noting the difference in effectiveness for gender, race/ethnicity, Pell eligibility, previous experience with growth mindset, participation in a TRiO Student Support Services program, or enrollment in a first-year seminar course. Research on a growth mindset intervention delivered to an entire population of entering students has been so far limited to prestigious or very large universities and the student demographic characteristics that have been focused on have been related to race/ethnicity (Aronson et al., 2002; Broda et al., 2018; Yeager, Walton, et al., 2016). I performed a growth mindset intervention at a regional four-year university that provides targeted orientation programming for first-year first-generation students who

comprise more than one-third of the incoming population. The purpose of this study was to explore the effect of a growth mindset intervention on first-year, first-generation college students' grade point average (GPA) at a regional public four-year institution.

Research Questions

The research questions are as follows:

- Q1 Do first-year first-generation students who complete the growth mindset intervention report higher levels of growth mindset than first-year first-generation students who do not participate?
- Q2 Does first-semester GPA differ between first-year first-generation students who participate in a growth mindset intervention and those who do not?
- Q3 After controlling for high school GPA, do first-semester college GPA differences between treatment and non-treatment groups differ by the following moderator variables: gender, race/ethnicity, Pell eligibility, previous experience with growth mindset, participation in a TRiO Student Support Services program, or enrollment in a first-year seminar course?

Design Overview

This research was a post-test only experimental design utilizing the end of first-semester GPA to explore the effect of a 35-minute growth mindset intervention happening during new student orientation on a systematically sample of first-time first-generation college students. For the purposes of this study, I collected data immediately after the intervention in the form of the growth mindset questionnaire to understand if there were initial differences in growth and fixed mindset scores between the intervened and control group populations (Ying-yi, Chi-yue, Lin, Wan, & Dweck, 1999). I then compared final first-semester GPA between the participants of the intervention and the control group. I analyzed those data along with demographic

and involvement information collected from the Office of Institutional Reporting and Analysis Services and campus departments to consider if the identified variables moderate first-semester GPA.

Significance of the Study

Institutions have been increasingly incentivized to improve college graduation rates through performance-based funding (Ziskin, Rabourn, & Hossler, 2018). It is also a stated national priority to improve the retention and graduation rates of college students including the more vulnerable populations like first-generation students (McFarland et al., 2018). Even with only slight increases to students' first-semester GPA, there is an increased likelihood of students' being retained toward graduation (Gershenfeld et al., 2016). Gershenfeld et al. (2016) found that first-semester GPA was a strong early predictor of subsequent graduation. Specifically, they found that underrepresented students with a first-semester GPA of 2.33 or below were almost half as likely to graduate as students with a GPA above 2.33. A growth mindset intervention could be another educational nudge that would support the national priority of getting students through the academic pipeline.

CHAPTER II

REVIEW OF LITERATURE

To fully explore the concept of growth mindset within the context of supporting first-generation students' transition to college, I provide an overview of literature in several key areas. I begin by establishing a foundation of knowledge around student transition. This includes a key theoretical foundation and an overview of orientation and transition programming models. Next, I provide a foundation of knowledge related to the broad concept of social and psychosocial interventions and then narrow it to the research that exists on growth mindset. Finally, I provide an overview of research specifically about first-generation college students and differing outcomes by institutional type.

Orientation and Transition Purpose

I start this literature review with some insight on why institutions choose to do new student orientation and what is included in these types of programs, which helps to justify why it is an appropriate place to implement a growth mindset intervention.

Rode (2000) wrote about the importance of orientation:

The research on orientation clearly indicates that successful orientation programs have a powerful influence on first-year social and academic integration and, furthermore, that social and academic integration have a significant effect on student persistence and educational attainment. (p. 3)

Increasing student success through a positive transition from the student's previous experience to the current institution is one of the primary reasons campuses hold orientation.

There are several formats of orientation that are regularly used: pre-enrollment model (summer orientation), welcome week model (happens just before courses begin), and the first-year course model (Overland & Rentz, 2004). The program format is typically chosen to meet the needs of entering students and to complement the mission and needs of the institution (Rode & Wolfman, 2014). These types vary as institutions adapt and develop; though according to a nationwide data set from 2007 to 2008 more than 70% of institutions offered summer programming (Mack, 2010). This research also noted a trend in making orientation programs mandatory: “In the 1980s, 30% of these institutions indicated that their orientation programs were mandatory compared to 60% in the 2000s” (Mack, 2010, p. 7). Understanding what happens during new student orientation sets the stage for why a growth mindset intervention would be appropriate to include.

Campuses also vary on what happens during their specific orientation sessions. Jacobs (2010) outlined the general content of orientation, noting five categories which include: (a) disseminating information, (b) reducing costly errors, (c) building a framework for academic success, (d) building community, and (e) defining campus culture. The first type of orientation activity is straightforward and most understood by internal university constituents—orientation is a time to introduce students to policies, procedures, and resources. The second point, reducing costly errors, can be done at orientation by making sure students are led through the basics for their first semester. This includes, for example, directly addressing deadlines for financial aid and billing and helping students register for the correct set of classes in their first semester. If students take courses that are not needed, that is a costly error for the student and ultimately the university because the student risks running out of financial aid before

graduation. The third point includes building a framework for academic success that can be achieved at orientation by having students meet faculty members and hearing what habits they should develop for academic success. I argue that a growth mindset intervention would be aligned with this category as it gives the students a mindset framework to use when challenges arise. The fourth point of building community can be accomplished through peer orientation leaders and socially-based activities. The fifth point, defining campus culture, sets the stage for students and their institutional expectations. Here, orientation exposes students to the institutional perspective on culture-related topics like honor codes, traditions, pride, and rights and responsibilities. Orientation can be an effective tool for student acculturation and alignment.

Hossler, Gross, and Ziskin (2009) found that “campuses with lower retention rates had lower participation rates in orientation programs and were less likely to have mandatory orientation policies” (p. 8). Orientation programs can be a tool that helps support student transition and their ultimate success.

Orientation and Transition Theory

Introducing growth mindset is justifiable within the general content of orientation programming, and I further argue it aligns with the theory that many student affairs practitioners in the field of orientation, transition, and retention use: transition theory. Transition theory was developed from counseling research and suggests four major sets of factors that support or make transition more difficult for individuals (Goodman, Schlossberg, & Anderson, 2006). This includes what the authors describe as the Four S’s: situation, self, support, and strategies. The Four S’s describe assets or liabilities in how someone copes with change. “This approach

partially answers the question of why different individuals react differently to the same type of transition and why the same person reacts differently at different times” (p. 57). Analyzing the interrelationship of these four factors is a recommendation made for counselors who are supporting people through life transitions. Higher education and student affairs professionals consider these factors in developing support for students in transition. I provide an overview of each of these factors to elucidate where growth mindset is situated in this framework.

The first is Situation. Goodman et al. (2006) noted eight factors that can alter every situation; those factors will be briefly reviewed using short examples. Trigger is the first factor and it is what stimulates people to look at themselves or their lives differently. The trigger can be anticipated or unanticipated—heading to college after high school graduation (anticipated) or a heart attack (unanticipated). A trigger can also be an event, such as a decade birthday, or a non-event, such as not getting accepted into the college of choice. Timing is the next factor and is related to socially defined and expected time such as going to college or getting married. Being “off track” compared to what is socially acceptable can impact people’s transition. Timing also includes transition events that people perceive coming at either a good or bad time, like pregnancy or moving to a new city. Control is the third transition event that relates to whether the transition is chosen or forced by people or circumstances. An example is retirement. Control would be if the decision to retire was made by choice versus a forced retirement due to a company’s downsizing. Role change is next and accompanies a transition usually in the form of a role gain or loss such as becoming a college student or being widowed. Duration includes how long the situation is expected to last. A hospital surgery with a short recovery time is generally easier for

someone than the unknown duration of unemployment after losing a job. The sixth factor is previous experience with a similar transition. People are more comfortable coping with events that they have successfully assimilated to before or are less comfortable facing an experience that previously defeated them. Concurrent stress is next, and it means looking at the transition someone faces with all the additional stresses that might go along with the transition. A transition might be going to college. A transition with more concurrent stress might be going to college across the country while also starting a new job. Finally, the last factor in Situation is assessment. “An individual’s view of who or what is responsible for the transition affects how that individual appraises the transition and himself or herself and the environment” (Goodman et al., 2006, p. 64). An example is someone failing a class and how much that person assesses their role in the course failure that caused the transition.

Self is the next major set of factors and considers what the individual brings to the transition. Goodman et al. (2006) identified two sets of characteristics of Self that are relevant to people’s coping with change. The first set is personal and demographic characteristics, which includes socioeconomic status, gender, age and stage of life, state of health, and ethnicity/culture. These characteristics directly influence how a person perceives and assesses life. The authors (Goodman et al., 2006) described “people who inhabit different parts of the social system live, in many ways, in very different contexts, have different resources, and are affected differently by different events” (p. 66). One of the personal or demographic characteristics that influence transition is socioeconomic status. Students with lower socioeconomic statuses may have a more challenging transition to college as they come across unexpected and necessary costs, especially compared to an affluent student. Any of the personal and

demographic characteristics could influence a person's ability to transition to new life events.

The second set of Self characteristics is psychological resources that include ego development, optimism, self-efficacy, commitment, values, spirituality, and resiliency. These are based on personality characteristics that people draw on within themselves. For example, spirituality can be a tool for counseling people through transition, "By delving into questions regarding how our clients find meaning and purpose in their lives we may also tap into a hidden resource for coping with transitions" (Goodman et al., 2006, p. 73). I argue that growth mindset is situated in this second set of Self characteristics. As I will discuss further, there has been research assessing growth mindset without intervention to demonstrate the positive impact a student's growth mindset can have on the outcome of the transition (Aditomo, 2015; Dweck, 2016).

Support is the third set of factors within self. The types of support people receive can be classified according to the source. This could be romantic relationships, family, friends, neighbors, and the institutions or communities that people join like church or a bowling league. Students who identify as first in their families to attend college may have support from their family at home, but it would not be support based upon experience in college, which continuing-generation students could receive from their family. Counseling someone in transition includes considering their support system and whether it is an asset or liability for their adjustment to the change.

The final factor is Strategies. A more precise name might be coping strategies as this set of factors summarizes responses people use to manage a transition.

Goodman et al. (2006) cited a study that systematized three responses to transition.

The first is a response that actively modifies the situation, such as advice-seeking or working to find a solution. The second response is to control the meaning of the problem internally. An example is positive comparisons such as someone who thinks of the expression “count your blessings” when facing something difficult. Another internal control is the ability to substitute rewards. An example is a person who is having trouble at school, so they downplay the importance of school and more highly value other areas of life. The final response is stress management accommodations, which could support someone after the transition occurs, like going jogging to release tension. Goodman et al. (2006) noted an important final point; the most effective copers are flexible and use a range of strategies depending on the situation.

People often wonder if they should initiate a major transition in their life and how they might survive something that may happen to them. Counselors can consider the four S’s, Situation, Self, Support, and Strategies, to help individuals think about their current assets and liabilities in those areas. Goodman et al. (2006) described the transition process with a series of phrases: “moving in,” “moving through,” and “moving out,” (p. 166). The time it takes to transition varies by person and situation but there is an adjustment period, a normalization of the change, and then preparation for the next step. This aligns with the work that happens during student orientation, which is focused on supporting students who are “moving in” to their transition to college. I argue a growth mindset intervention during this time would bolster the Self as described in transition theory. Before getting into more information about growth mindset, I provide background about the larger social and psychosocial educational interventions in which this phenomenon is situated.

Social and Psychosocial Interventions

Researchers have had an interest in improving educational attainment rates for students from kindergarten-12 (K-12) education through the college environment. Achievement gaps have created educational disparities which are especially acute for students who are low-income, racial minority, and first-generation (Bailey & Dynarski, 2011). Students from these disadvantaged populations have shown overall lower rates of persistence and completion in four-year colleges than their counterparts; however, several social psychological interventions have demonstrated success in narrowing the gaps in educational outcomes (Spitzer & Aronson, 2015).

One such psychosocial intervention examined the effects of mindfulness education in 246 fourth to seventh graders (Schonert-Reichl & Lawlor, 2010). Students were taught mindfulness practices such as quieting the mind; spending time being mindful of sensation, thoughts, and feelings; managing negative thinking; and acknowledging self and others. The teachers in the experiment did the mindfulness curriculum three times a day for at least three minutes each time over the course of 10 weeks. The researchers found that there were significant increases in optimism for student participants as well as teacher-reported improvements in classroom social competent behaviors.

Another study explored a psychological intervention designed to improve students' scores on high-stakes exams by writing a brief expressive assignment about the students' worries immediately before the exam (Ramirez & Beilock, 2011). There were several studies in this research using ninth grade students and college students. The researchers found that "a short expressive writing intervention reduced performance deficits commonly associated with high-pressure writing situations" (p.

213). One specific study found that writing about fears before a final exam raised higher-test-anxious students' grades from a B- to a B+.

A study was completed during college orientation using a psycho-social intervention by inviting incoming college students to listen to student panelists about adjusting to college (Stephens, Hamedani, & Destin, 2014). Students were randomly assigned to one of two groups. One set of panelists highlighted their backgrounds (first-generation, social-class, etc.) and a separate standard group answered questions without providing details about their backgrounds. The researchers used the rest of the non-participating incoming students as a control population. The first-generation students who heard the highlighted background message demonstrated statistically significant increases in end-of-year cumulative grade point averages, decreasing the achievement gap by 63% compared to their peers in the standard group and control group. The researchers found that students hearing from others with similar backgrounds mattered. This aligns with another study done using a social-belonging intervention for which all students in the treatment group had an increase in grade point average (GPA), but minority students in the treatment group saw much greater growth (Walton & Cohen, 2011).

Social and psychosocial interventions have been used to make an impact on educational attainment in a variety of settings and through a variety of means, some particularly noting the narrowing of achievement gaps. The psychological intervention on which I am narrowing my research is called growth mindset.

Growth Mindset

Arguably, growth mindset has had a longer history under different names within educational psychology, such as attributions of achievement motivation and implicit theories of intelligence. One of the core researchers in this field was Bernard Weiner (1972) who published about the attributions of achievement motivation in the educational process. Weiner described how a person notices a behavior, determines it to be deliberate, and then attributes the success or failure to internal or external factors. Achievement can be impacted by effort, ability, level of difficulty, or luck and has causal dimensions like locus of control. There was subsequent research about the effect of attribution therapy in entering college students. Wilson and Linville (1982) performed an intervention on freshmen by giving information about how college students' grades improved as they progressed in their degree. Students who experienced this attributional intervention had significantly higher retention into their second year. Finally, researchers Ying-yi et al. (1999) began to make the connection between implicit theories about intelligence, ability attributions, and mastery-oriented coping. They found that "implicit theories create the meaning framework in which attributions occur and are important for understanding motivation" (p. 588). There has been an understanding of this psychological intervention for some time, but recently there has been additional focus within research and application.

In 2016, Carol Dweck coined the terms "fixed" and "growth" mindset. She defined fixed mindset as "believing that your qualities are carved in stone . . . a certain amount of intelligence, a certain personality, and a certain moral character" (p. 6). The opposite of that is the growth mindset, which she described as "based on the belief that your basic qualities are things you can cultivate through your efforts, your strategies,

and help from others” (p. 7). Dweck continued to say that people with growth mindset believe that a person’s true potential is unknowable as it is impossible to understand what time and hard work may accomplish. In a study of college students in Indonesia, Aditomo (2015) assessed psychological factors, including growth mindset, for students in a challenging statistics course. There was no manipulation or intervention; the researcher just assessed students’ mindsets and observed their final grades. This researcher found that growth mindset about academic ability was positively associated with learning goal and effort attribution. When the effect of prior ability was accounted for, those constructs were negatively linked with de-motivation, which was negatively associated with final exam grades. Ultimately, Aditomo described that “there are psychological factors which influence students’ response to setbacks and performance” (p. 217).

Educational transition exists from the time a young child enters kindergarten through the differing stages of elementary, middle or junior high, and high school. Some researchers have focused their growth mindset intervention strategy on K-12 students in transition. Blackwell et al. (2007) explored seventh graders in mathematics achievement. These researchers first explored students’ initial beliefs of malleable intelligence, or growth mindset, and found that increased belief predicted a positive trajectory of grades. They conducted a second study teaching malleable intelligence to another group of students and found positive change in classroom motivation and grades. Burnette et al. (2018) did research on a specific population of rural high school girls and found that the intervention did not improve grades but had an indirect effect on students’ motivation to learn. Another study explored the correlation between the psychological theories about implicit beliefs and performance-approach goals to a

growth mindset intervention. DeBacker et al. (2018) assessed ninth grade students with a pre-test, then administered the intervention, followed by several post-tests and found that this type of one-shot growth mindset intervention does have a modest positive change on the implicit beliefs and performance-approach goals of students.

Some of the research conducted in the K-12 environment has been concerned with the scalability of growth mindset interventions. A set of researchers explored ninth grade students making the transition to high school and delivered a growth mindset intervention to them (Yeager, Romero, et al., 2016). In 10 schools from five different states, they recruited over 3,000 students to participate in two online sessions. The effect sizes were small but statistically significant, where the growth mindset intervention reduced the number of students who earned D or F averages by four percentage points. Similarly, Paunesku et al. (2015) demonstrated a scalable growth mindset intervention that made a positive change on GPA in core courses for almost 1,600 high school students across several grade levels. For the students at most risk of dropping out of high school, which they defined by criteria of pre-study GPA, race, gender, and school, the researchers found a 6% increase in satisfactory completion rates. Students not at-risk experienced a negligible effect on their GPA.

The K-12 research on growth mindset is at a different educational timeframe than college but has demonstrated improvements in implicit beliefs, classroom motivation, and grades. These improvements provide some foundation to the growth mindset intervention I delivered. Another important set of considerations is the work that has previously been done with growth mindset in college students.

Previous research with the growth mindset intervention has also been completed in college and university settings, particularly within the classroom

environment. Bostwick and Becker-Blease (2018) did a relatively passive version of growth mindset. A faculty member of a large psychology class ($N = 278$) gave letters to students after the first exam that included a random distribution of growth, fixed, and neutral messages. The researchers found that the students who read the growth letter had a 7% higher score on the final exam than students who read the fixed mindset letter. Another growth mindset intervention was delivered during a remedial math course at a community college (Mills & Mills, 2018). Participants all received an assessment of their growth mindset at the start of the semester, which was converted to a score. Mills and Mills (2018) separated their participants into two categories: low mindset scores and high mindset scores. They chose just over half the remedial math courses to implement a growth mindset intervention in the form of initial class time spent learning the topic and reminders through the semester. Those who started with higher growth mindset scores and all who received the growth mindset intervention, from both low and high pre-scores, earned statistically significant higher final grades than their counterparts. Participants in the intervention had a 5% higher retention rate than those who were in the control group. Finally, a chemistry specific growth mindset intervention was completed, which revealed positive change in final exam scores for students who received the intervention (Fink et al., 2018). The Fink et al. (2018) study highlighted that the intervention eliminated the racial-achievement gap that was previously observed in the general chemistry course.

There has been another set of university-based studies particularly focusing on racial differences in the growth mindset intervention. Aronson et al. (2002) completed a study using a malleable intelligence intervention with undergraduates at Stanford University. Their research demonstrated positive changes in GPA during both the

quarter during which the intervention was delivered and the following quarter for the intervention groups of both Black and White students, with a higher positive increase in GPA for Black students. Michigan State University specifically targeted underrepresented and/or disadvantaged students in a study that explored two interventions: growth mindset and social belonging (Broda et al., 2018). Broda et al. (2018) delivered the intervention at the point of orientation as part of a set of systematic reforms. When reviewing their growth mindset outcomes based on race, the research found that the intervention group had significantly higher GPAs specifically among Latinx students for both fall and spring semesters. The difference was about .38 grade points on a 4.0 scale in the fall after adjusting for covariates compared to the control group and .33 grade points in the spring. Compared to the White students in the control group, “the effects seen here from the growth mindset intervention are equivalent to a 72% reduction in the GPA gap between Latino/a and White students” (p. 333).

Another set of researchers explored delivering a growth mindset intervention in two different ways to high school graduates moving on to post-secondary education (Yeager, Walton, et al., 2016). The first students were from one urban charter high school and participated online prior to college matriculation at various institutions. There were several psychological lay theories tested including growth mindset. One study found that growth mindset was not a statistically significant indicator of continuous full-time enrollment, though the researchers (Yeager, Walton, et al., 2016) had a germane belief that the cause of this non-effect was that the high school already taught growth mindset messages in the students’ curriculum. The same researchers conducted another experiment at a large “high-quality” public university delivered

pre-matriculation (p. E3347). They noted that over 85% of the entering first-year students were in the top 10% of their high school class. The researchers grouped students in an “advantaged” group and a “disadvantaged” group that differed by social and economic factors. They found that disadvantaged students who were in the growth mindset intervention had a 4% increase in continued full-time enrollment compared with the disadvantaged students who were in the control group. Advantaged students had the same full-time enrollment in both the control and the intervention. Overall, their study found “the lay theory interventions appear to have led to full-scale reduction in institutional inequality” (p. E3345).

As evidenced by this research, there are indications that the growth mindset theory can have greater effect on student demographics like race, social, and economic factors (Aronson et al., 2002; Broda et al., 2018; Fink et al., 2018; Yeager, Walton, et al., 2016). I believed that this intervention would provide a positive nudge to first-semester GPA for the students who participated in my research. Specifically, I was interested in focusing on students who were first in their family to attend college. First-generation students are a complex population and have some overlap with the race, social, and economic factors described in the research above, though they certainly stand alone as a unique population. This student type is important to consider for the growth mindset nudge as this group of undergraduate students makes up more than one-quarter of students enrolled in United States post-secondary institutions (Skomsvold, 2015).

First-Generation Students

I summarize the multiple ways first-generation students have been defined in research and then I describe the definition I used in my study. I also describe some of

the previous research that has been conducted with first-generation college students. Toutkoushian et al. (2018) explored a large data set from the Education Longitudinal Study of 2002 which took a nationally representative sample of 16,000 10th-grade students and followed up with them in 2004, 2006, and 2012. These researchers narrowed the large data set down to students who lived with two parents (the parents could be biological, step, adopted, or foster) who had known educational attainment. The final weighted sample for their study was 7,300 students. They considered eight definitions of first-generation and found there was a lot of variability in the number of students who could be included based on the specifics of the definition. For example, parental level of college experience can be defined in many ways, including no experience, attendance without degree, and degree attainment based on type, etc. They also demonstrated that “parent” can be defined in many ways by students who are answering a survey; some examples could include the variations of biological and step-, guardian, grandparent, etc. These researchers suggested that each institution working to support first-generation college students needs to collect better and more detailed information from students and then clearly articulate the institutional definition when publishing results. I defined my first-generation population based on the admissions application response that neither self-defined parent had a baccalaureate degree as that was the data-set I had access to use.

Using their large data set, Toutkoushian et al. (2018) also found that students with no college-educated parents faced larger college deficits than those with one college-educated parent and that both groups had greater deficits than students who had two parents with a college degree. This aligns with prior research which has demonstrated unequivocally that college enrollment, retention, and graduation rates

are significantly lower for students whose parents have lower educational attainment (Cataldi et al., 2018; Inkelas, Daver, Vogt, & Leonard, 2007; Ishitani, 2006; Pascarella, Pierson, Wolniak, & Terenzini, 2004; Pike & Kuh, 2005). Cataldi et al. (2018) used data from several of the National Center for Education Statistics reports to consider the persistence and graduation rates of first-generation college students. They defined their population as students whose parents had not participated in postsecondary education and found disproportionate levels of persistence after three years and subsequently lower level of degree attainment after six years. Sixty-five percent of first-generation students at public or private four-year institutions were still enrolled or had graduated after six years compared to the 83% rate of students whose parent(s) earned a bachelor's degree. Ishitani (2006) also found lower rates of persistence and degree-completion for first-generation students. Ishitani explored the additional demographic information in the study data set. As might be expected, greater graduation rates were experienced by first-generation students with higher high school rank, who received grants or work-study jobs from their financial aid packages, and with higher parental income. Another research study further delved into the question of academic preparation of first-generation college students. Atherton (2014) also found lower preparedness of first-generation students based on standardized tests and high school GPA. The researcher was surprised to find that the first-generation students seemed to have a lack of awareness of the extent of impact that the lower scores and GPA had on their academic outcomes, as assessed through self-evaluations and confidence scores. Atherton postulated that perhaps the lower initial semester GPA created frustration and compounded students' difficulties transitioning to college.

There is much research to suggest that first-generation students have a more challenging time in persisting through to graduation. In response to this knowledge, there has also been some success in programs created to support these students. A research study was completed on first-generation students who participated in living-learning programs in the residence hall. Inkelas et al. (2007) found that first-generation students participating in the living-learning communities created low to moderate positive impact on their academic and social transition to college. The researchers suggested that even the modest success of the programming is worth further investigation because of the importance of supporting this at-risk population. This is further reinforced by the first-generation student research of Pascarella et al. (2004) who wrote,

One clear implication of these findings is the need for more sharply focused and sustained efforts and campus and public policies designed to increase first-generation students' involvement in the academic and nonacademic systems of the institutions they attend. (p. 279)

They went on to further suggest that financial aid policies and packages need to make sure the access being given to first-generation students allows them to participate in the wide range of activities inside and outside the classroom.

In United States higher education, the federal TRiO programs support the success of students from disadvantaged backgrounds. One of these programs is called Student Support Services, which specifically targets students who meet at least one of the following criteria: low-income status, first-generation status, or disability status as well as exhibiting academic need (U.S. Department of Education, Office of Postsecondary Education, 2016). There are many required services of Student Support Services programs, some of which include assistance with financial aid applications,

academic tutoring, and guidance in course selection. These in-depth services provide tangible outcomes. The 2016 governmental report stated a 90% persistence rate into the second year of college for all Student Support Services participants in the most recently available year 2013 to 2014. This is well above and beyond the persistence rates of non-participants.

As Terenzini, Springer, Yaeger, Pascarella, and Nora, (1996) asserted from a nationwide diverse institutional study, first-generation students,

come less well prepared with more nonacademic demands on them, and they enter a world where they are less likely to experience many of the conditions that other research indicates are positively related to persistence, performance, and learning. (p. 18)

This transition to the new world of college creates an opportunity that may be especially ripe for a growth mindset intervention. Students are embedded within an institution that they attend. There are important distinctions about institutional type and final graduation outcomes that also contribute to each person's success.

Institutional Types and Outcomes

Institutional type is another line of differentiation. There are known differences in post-secondary institutions, even when narrowed by ones that offer only four-year degrees. One of the most commonly used categorizations of higher education institutions began in the 1970s and is called the Carnegie Classification system (McCormick & Zhao, 2005). There are many ways the Carnegie Classification system divides colleges and universities. For the purposes of my study, the relevant focus is the three primary categories that define the undergraduate profile: the proportion of undergraduate students who attend part- or full-time; background academic achievement characteristics of first-year, first-time students; and the proportion of

entering students who transfer in from another institution (Center for Postsecondary Research, 2015).

The variations of growth mindset research that has been completed already on undergraduate students in transition to a four-year institution has been done at Michigan State University, Stanford University, and an unnamed “high-quality” large public university (Aronson et al., 2002; Broda et al., 2018; Yeager, Walton, et al., 2016). Using the Carnegie Classification system’s search engine, Stanford University and Michigan State University both differ from where I conducted my research by the background achievement characteristics of first-year, first-time students as they each are labeled “more selective.” My research institutions of interest have the “selective” label. This differentiates institutions by the American college testing/scholastic aptitude test (ACT/SAT) test score selectivity profiles of 80th to 100th percentile of selectivity to the 40th to 80th, respectively. I was unable to search the final institution using the Carnegie system’s search engine, but Yeager, Walton, et al. (2016) offered that 85% of first-year students were in the top 10% of their high school class. This information certainly aligns that institution closely to the selective label. While the Carnegie Classifications are different, I wanted to be more descriptive in the ways I explained the differences in institutional types, especially describing the preparation of incoming students. One of the data sources for the Carnegie Classification as well as for federal reporting is called the Integrated Postsecondary Educational Data System, which collects information from all United States colleges, universities, and technical and vocational institutions (National Center for Education Statistics, 2017). The admissions data for the institution I included in my research indicates that it accepted 89% of applicants in Fall 2019 compared to Michigan State, which accepted 71% of

applicants, and Stanford, which accepted 5%. I also researched what percent of full-time undergraduates were awarded Pell grants by institution. My institution gave 35% of full-time, first-time undergraduates Pell grants. Michigan State gave 19% and Stanford University gave 14%. The data points that are especially illuminating are the variation between institutional graduation rates in both four- and six-years. My institution had a 27% four-year and 48% six-year graduation rate compared to Michigan State's 51% four-year and 77% six-year graduation rate or Stanford's 75% four-year and 94% six-year graduation rates. The educational outcomes of these institutions are different, and the impact of a growth mindset education could vary because of this factor as well.

When I cross-reference the data about first-generation and institutional type, there are notable differences in where first-generation students first attend postsecondary education (Cataldi et al., 2018). A much larger population of first-generation students went to public two-year institutions and private for-profit institutions than students whose parent(s) earned a bachelor's degree. On the other side, fewer first-generation students started at a public four-year and far fewer went to a private four-year institution. First-generation status influences institutional type selection, which in turn influences graduation rates.

Chapter Summary

Chapter II provided a review of literature in several key areas. I started with a broad overview of knowledge about students in transition, including the counseling-based transition theory as well as a summary of orientation and transition programming. The next section included a review of social and psychosocial interventions in education and narrowed specifically on the concept and research

behind growth mindset. Next I reviewed some of the research that exists on college students who identify as first generation. Finally, a section on institutional type provided background on some of the differences in four-year institutions and subsequent graduation rates.

A major gap in the literature is using a growth mindset intervention at the point of college transition in colleges with lower selectivity levels, higher percentage first-generation students, and lower subsequent graduation rates. The research has indicated statistically significantly higher retention rates and/or GPA in several cases with more prestigious institutions. The purpose of the current study was to determine what effect a growth mindset intervention can have on first-generation college students in a less selective institution. Further research is also warranted exploring the first-generation population and the variance that might exist in characteristics they are bringing with them to college (gender, Pell-eligibility, high school GPA, race/ethnicity, previous experience with the concept of growth mindset) or experiences they have during their first semester (participation in a TRiO Support Services program or enrollment in a first-year seminar course).

CHAPTER III

METHODOLOGY

Purpose of the Study and Research Questions

The purpose of this study was to explore the effect of a growth mindset intervention on first-year, first-generation college students' grade point average (GPA) at a regional public four-year institution. In this study, I examined the variability of the effect using different student characteristics. The research questions were as follows:

- Q1 Do first-year first-generation students who complete the growth mindset intervention report higher levels of growth mindset than first-year first-generation students who do not participate?
- Q2 Does first-semester GPA differ between first-year first-generation students who participate in a growth mindset intervention and those who do not?
- Q3 After controlling for high school GPA, do first-semester GPA differences between treatment and non-treatment groups differ by the following moderator variables: gender, race/ethnicity, Pell eligibility, previous experience with growth mindset, participation in a TRiO Student Support Services program, or enrollment in a first-year seminar course?

Research Hypotheses

The literature review provided examples of a relationship between growth mindset education and higher student GPA in specific populations; however, it was unclear as to the relationship between growth mindset education and GPA when considering first-generation college students from an institution with less selectivity and lower graduation rates. This study was conducted with the following hypotheses:

- H1 There will be higher levels of growth mindset from the first-year, first-generation students who participate in the growth mindset intervention than those who did not participate.
- H2 There will be higher first-semester GPA from first-year, first-generation students who participate in the growth mindset intervention than for those who do not participate.
- H3 After controlling for high school GPA, there will be differences in first-semester GPA between treatment and non-treatment groups based on some of the moderator variables. Based on previous research, I expected the treatment group will have higher GPAs. Specifically, the treatment group members who identify as Latinx will have increased final GPAs compared to the other race/ethnicity groups and non-treatment groups. I believe that those who are in the treatment group who participate in a TRiO Student Support Services program and/or enrollment in a first-year seminar course will have higher GPAs than students in the non-treatment group, as the growth mindset concept will be reinforced in the participation of the TRiO program and/or first-year seminar. Regarding the remaining moderators I did not expect treatment and non-treatment to differ depending on: gender, Caucasian race/ethnicity versus other racial/ethnic groups, Pell eligibility, and previous experience with growth mindset.

Research Design and Procedures

The research questions were designed to determine if a growth mindset intervention at the point of orientation can improve first-semester GPA of first-generation college students. I accomplished this goal through use of a randomized post-test only experimental design. As the establishment of a cause-and-effect relationship is so complex within a social phenomenon, I tried to control for as many variables as possible via systematic assignment to treatment and control conditions and then manipulated the treatment group to claim that the manipulated variable caused the effect (Mertens, 2005). I explored the effect of a growth mindset intervention through a post-test only experimental control group design that allowed me to randomly assign students to treatment and control conditions.

Study Site

The setting was at the University of Northern Colorado (UNC): a regional public four-year institution in the United States Mountain West. UNC is located in Greeley, Colorado, a city of just over 100,000 people, which has its roots in agriculture. The university has a Carnegie Classification of “selective” when considering the background achievement characteristics of first-year, first-time students. There were 12,930 students enrolled in the Fall 2019 semester of whom 9,810 were undergraduate. The institution has the history of being a teacher educator in the state, though it also has popular degrees in health professions and business. In Fall 2019, the institutional undergraduate profile consisted of 91% full-time students, 35% students of color, 32% Pell recipient (low income), and 43% first-generation (University of Northern Colorado, 2020a). The high number of first-generation students was particularly important in this research as it made UNC distinct from the previous studies that have been done on growth mindset research at the point of college transition such as Stanford University, Michigan State University, and another unnamed “high-quality” large public university (Aronson et al., 2002; Broda et al., 2018; Yeager, Walton, et al., 2016).

Participants

The target population was first-time, first-generation undergraduate students, who were 18 years of age or older, and started in the Summer or Fall 2019 semester. Orientation is a required part of the matriculation process for first-year students at UNC and is delivered in a two-day format that is repeated throughout the summer months. This is a typical orientation programming model (Mack, 2010). The sampling frame came from participants of the I’m First Workshop, which was a voluntary

session that supported first-generation student transition and happened at the beginning of the two-day summer orientation programs. All first-year, first-generation students were invited to participate in the workshop and as an average from the last three summers, about two-thirds of them attend (P. Johnsen, personal communication, September 19, 2019). During summer 2019, there were typically 50 to 70 students per session. The summer is a time when about a quarter of the college population turns 18 years old, so there was a number of students who could not sign the Institutional Review Board (IRB) consent form, especially in the first half of the summer. There were 747 first-generation students at UNC in Fall 2019 and, as usual, about two-thirds of them attending the I'm First Workshop. I received signed IRB consent forms from 332 participants of the workshop and 110 of them experienced the intervention.

The Office of Institutional Reporting and Analysis Services provided the demographic data for this study. There were 110 students who completed the intervention, and 222 students who signed the waiver but did not participate in the intervention. I cleaned the data, removing the invalid ID numbers and students who dropped out. There were two intervention students with invalid student ID numbers and five who were not enrolled at the end of the second week of the semester, or the census date. The UNC non-intervened population had four students with invalid student ID numbers, 12 who were not enrolled at census, and one more who was enrolled at census but dropped before the end of the semester. These data were removed from the final analysis. The final starting dataset included 103 intervened students and 205 non-intervened UNC students. I lost almost 8% of students due to attrition from the outset because of the invalid numbers and students not enrolling for the semester.

I am including two tables of descriptive statistics from my dataset. Table 1 includes information about students who were participants but not enrolled by census date. The small number of students who were not enrolled by census date were mostly similar to students who were enrolled except for Pell eligibility. All students who were not enrolled did not receive Pell funding while more than half of the students who enrolled had Pell eligibility.

Table 1

Descriptive Statistics for Student Participants Who Were Not Enrolled by Census Date Compared to Those Who Were (N = 325)

Variable	Not enrolled intervened <i>n</i> = 5	Not enrolled non-intervened <i>n</i> = 12	Enrolled intervened <i>n</i> = 103	Enrolled non- intervened <i>n</i> = 205
Average high school GPA	<i>M</i> = 3.45 <i>SD</i> = .15	<i>M</i> = 3.3 <i>SD</i> = .45	<i>M</i> = 3.36 <i>SD</i> = .42	<i>M</i> = 3.28 <i>SD</i> = .49
Gender				
Male	0 (0%)	2 (17%)	22 (21%)	47 (23%)
Female	5 (100%)	10 (83%)	81 (79%)	158 (77%)
Race/ethnicity				
White	3 (60%)	3 (25%)	37 (36%)	69 (34%)
Latinx	1 (20%)	4 (33%)	56 (54%)	110 (54%)
All other students of color	1 (20%)	5 (42%)	10 (10%)	26 (13%)
Pell eligibility				
Yes	0 (0%)	0 (0%)	56 (54%)	119 (58%)
No	5 (100%)	12 (100%)	47 (46%)	86 (42%)

Note. GPA = grade point average. Percentages are based upon the column *n*.

Table 2 is a summary of student participant information. The student demographics mirror what would be expected for systematic selection. In every category the intervened population was approximately one-third of the control population which is important to verify that the systematic selection was effective and supports the generalizability.

Table 2

Descriptive Statistics for Student Research Participants

Variable	Intervened <i>n</i> = 103 (33%)	Non-intervened <i>n</i> = 205 (67%)	Overall sample <i>N</i> = 308
Average high school GPA	<i>M</i> = 3.36 (<i>SD</i> = .42)	<i>M</i> = 3.28 (<i>SD</i> = .49)	<i>M</i> = 3.31 (<i>SD</i> = .46)
Gender			
Male	22 (21%)	47 (23%)	69 (22%)
Female	81 (79%)	158 (77%)	239 (78%)
Race/ethnicity			
White	37 (36%)	69 (34%)	106 (34%)
Latinx	56 (54%)	110 (54%)	166 (54%)
All other students of color	10 (10%)	26 (13%)	36 (12%)
Pell eligibility			
Yes	56 (54%)	119 (58%)	175 (57%)
No	47 (46%)	86 (42%)	133 (43%)
TRiO			
Yes	4 (4%)	12 (6%)	16 (5%)
No	99 (96%)	193 (94%)	292 (95%)
University 101			
Yes	32 (31%)	70 (34%)	102 (33%)
No	71 (69%)	135 (66%)	206 (67%)
Previous experience with growth mindset			
Yes	29 (28%)	51 (25%)	80 (26%)
No	74 (72%)	151 (74%)	225 (73%)
Unanswered	0 (0%)	3 (1%)	3 (1%)
College			
Education & Behavioral Sciences	22 (21%)	32 (16%)	54 (18%)
Humanities & Social Sciences	15 (15%)	36 (18%)	51 (17%)
Monfort College of Business	9 (9%)	27 (13%)	36 (12%)
Natural & Health Sciences	43 (42%)	77 (38%)	120 (39%)
Performing & Visual Arts	10 (10%)	21 (10%)	31 (10%)
Undergraduate Studies	4 (4%)	12 (6%)	16 (5%)

Note. GPA = grade point average. Percentages are based upon the column's *n*.

Materials and Instrumentation

Materials. There are several tools I used to enhance student learning about growth mindset during the intervention. There was an eight-and-a-half-minute video accessed through YouTube® that introduces and summarizes the concept of growth mindset (Ragan, 2018). The video is a combination of cited research, graphics, and dynamic photos that give an overview. A one-page handout that was an illustrated overview of the growth mindset concept that was included in Dweck's (2016) book was also distributed to student participants.

Instrumentation. The growth mindset questionnaire has been in standard use for growth mindset research, and its scores were originally psychometrically supported in undergraduate students (Ying-yi et al., 1999). Ying-yi et al. (1999) examined the implicit theories of intelligence—the belief in malleable intelligence (growth) versus fixed intelligence. The researchers examined 97 undergraduate university students and determined that the three questions did not represent an acquiescence set, that students who were asked to explain their responses gave clear growth mindset justifications, and they computed high internal consistency and test-retest reliability of scores obtained from the responses of the students to the measure. They also completed validation studies to show scores from the measure were independent of students' sex, age, social desirability, cognitive ability, and comparison to a longer eight-item questionnaire. In short, the researchers described that scores from this growth mindset measure appear to be reliable and valid. The questionnaire has been regularly used in further studies since 1999 (Aronson et al., 2002; Blackwell et al., 2007; Broda et al., 2018; Burnette et al., 2018). There has not been further psychometric examination of the scores from this measure since that time, which provides a concern about its

relevancy to college students today. I used it in my research since it is the regularly cited instrument, and I also acknowledge the limitations of the instrument because of its age.

The three questions in the growth mindset questionnaire use a 6-point Likert scale ranging from one (*strongly disagree*) to six (*strongly agree*) and are actually a measure of fixed mindset that needed to be reverse coded so that higher scores equal more growth mindset. The items are: “You have a certain amount of intelligence and you really can’t do much to change it”; “Your intelligence is something about you that you can’t change very much”; and “You can learn new things, but you can’t really change your basic intelligence.” I reverse-coded the three items so that the higher scores meant a higher growth mindset. I then computed a mean score for each participant by adding the numeric value of their answers and dividing the sum by three, so the score range could be from one to six. The higher participants score, the more they believe in growth mindset and the lower their score the higher their belief that intelligence is a fixed entity. I also ran Cronbach’s alpha on the responses to the growth mindset measure and found it to be .85 which suggests responses to the items have a relatively high internal consistency.

The only other variable for measurement was GPA obtained at the end of the first semester. It was used as a comparison point for students who completed a growth mindset intervention and those who did not. The GPA is one of the only measures regularly used to indicate student academic success (York, Gibson, & Rankin, 2015). Despite its regular use, GPA is known to not consistently represent the construct of interest, which is learning. Research indicates that populations, such as males, ethnic minorities, and people with lower socioeconomic status, are disadvantaged by using

GPA as a sole measure (Vulperhorst, Lutz, de Kleijn, & van Tartwijk, 2018).

Moreover, research on a younger population of students, demonstrates the variable grades of different classroom subjects in high school cannot be validly captured in the final high school GPA (Thorsen & Cliffordson, 2012). As a researcher I wanted to clearly address that I have concerns with the validity of GPA as a measure for academic success. Despite these concerns and demonstrated issues with validity, GPA has remained the single most reliable factor to predict academic success and ultimate college graduation (Tumen, Shulruf, & Hattie, 2008). As such, I used it in this study as a measure of academic success in the first semester.

Procedures

The I'm First Workshop two-hour session included three main sections. The first was a 30-minute financial aid overview. Next, there was a 30-minute panel presentation from first-generation identified faculty, professional staff, and student staff. The people on the panel varied over the course of the summer, but the subject matter they covered was consistent through an outline and a moderator. Finally, the program finished with a 35-minute breakout session in which parents and support people went to a different room to have a specialized conversation about student transition, and students were split into smaller groups to have a question and answer session with the student staff or to participate in the intervention.

During this study, as students entered the room at the beginning of the workshop, they were handed the IRB paperwork. All students were asked if they were willing to participate by being given the IRB consent form. In the systematic sampling method (Remler & Van Ryzin, 2015), every third student was given paperwork with a different mascot design that later denoted the invitation into the intervention. I

delivered the intervention to approximately one-third of the students in each session. The IRB consent form included a bolded statement near the signature telling students to not sign the paperwork if they were under 18. I did not include under 18-year-old student data in the analysis.

In the last 35-minutes of the I'm First Workshop parents and support people were asked to go to a different room, and first-generation students were divided into smaller groups for a question and answer session with a student staff member who identified as first-generation. During this sorting, student staff asked the students who had the Bear head mascot on their paper to meet with pre-identified student staff members who delivered the growth mindset intervention content. The rest of the students were in the control group and did the small group question and answer session led by other student staff members, which had been completed during this time in previous years. The control group student staff members started by having students read and sign the consent form. The control group students gave their student identification number, completed a three-question growth mindset questionnaire, described above, and answered one additional question about their previous experience with the concept of growth mindset at the beginning of the question and answer session. I collected the student identification number to accurately access the student information system for the descriptive data about the students and their first-semester GPAs. Student staff collected the IRB paperwork with the questionnaire, and I filtered out students who were under the age of 18.

Students participating in the intervention were split into two groups each led by a student staff member. The group sizes varied by session, but there were about six to 10 students in each intervention group. The intervention student staff members

started by having students read and sign the consent form. Any students who did not want to participate could have gone to another group that was completing the general question and answer session. There were students who were under 18 years of age. The under 18 students participated, but I did not consider their data in the analysis. Prior to receiving the growth mindset intervention, students were asked to note whether they had heard of the concept of growth mindset.

The student staff began by having the new students watch an eight-and-a-half-minute video overview of the concept (Ragan, 2018). After watching the video, the student staff member asked the students to create their own definition of the concept and share it. The student staff member shared a personal story about growth mindset experienced during their first semester in college and distributed a handout overview of the concept. After the students had some time to review, the staff member asked them to come up with examples of fixed or growth mindsets from their own lives. The student staff member asked them to share a few of those examples with each other. The staff member summarized the students' ideas and made the connection to their upcoming transition to college. After checking on the students' overall comfort with understanding growth mindset, the staff member asked the students if they had ideas they could share on how we might best teach future incoming students about this material. This aligned with psychological research about the power of self-persuasion (Aronson, 1999; Aronson et al., 2002; Walton & Cohen, 2011). Essentially, when students described ways future students may be convinced of the concept, the material was further reinforced in their minds. Finally, the students were asked to complete the three-item questionnaire, described above, to measure their level of growth mindset

before they left. Student staff collected the IRB paperwork with the questionnaire, and I filtered out students who were under the age of 18.

The following is a shortened summary of the intervened student experimental procedures:

1. The student staff member provided an overview of the concept.
2. Students watched an eight-minute video about growth mindset.
3. Student staff shared their own personal story of the concept and distributed a handout overview.
4. Students were asked to come up with their own examples, and student staff made the connection to the transition to college.
5. Student staff asked students for any ideas on how we might best teach this concept to future incoming students.

As I was not delivering the intervention, I took measures to train the student staff prior to implementation. I selected the student staff members based on their interest and my knowledge of them. The training consisted of having me deliver the intervention to them, time for questions, and a trial run before the student staff delivered the intervention to a small group of current students. I did a treatment fidelity check by having the student staff members take notes on their experience delivering the content and their perception of the students' responses to the concept. This allowed me the chance to see if interactions with the students changed over time and to see if there were self-reflected consistencies or variation in the student staff members' delivery. I coded the students' responses by session and by which staff member delivered the intervention. I also noted any variations by session that happened during the study. The most variability happened during the first session

when the computer went to sleep before the staff arrived and it took 10 minutes to get everything restarted again. This session had a shorter amount of time for the delivery of content.

I took measures to consider and address potential concerns about design validity, which describes the potential threats that could compromise my ability to attribute the results to my intervention (Mertens, 2005). The three internal validity threats that were relevant for this research included history, experimental mortality, and experimental treatment diffusion (Mertens, 2005). History is a threat when there are events that happen during the study that could influence students but are not related to the intervention. In this study, the control group was exposed to generally the same events as the intervened group since orientation happened 10 times over the course of the summer months as well as during the rest of the summer or the fall semester. Either all students were exposed to the issue (like the publicized university-wide budget concerns) or it had the opportunity to be disbursed evenly between the randomly selected intervened and not intervened (like a family member getting sick and affecting the student's attendance). Experimental mortality was experienced to some degree as there were 17 students who dropped out of school after orientation and before classes began as well as one student before the end of the first semester. The students who dropped out after orientation were generally the same as students who stayed except none of them received federal Pell funding and the drop-out was evenly distributed between the treatment and control groups. They were not included in the final analysis. The final notable internal validity concern was experimental treatment diffusion, or when members of the treatment group talk to the members of the control group. The intervention happened at the end of the I'm First workshop and as soon as

the intervention was over, parents and support people rejoined their students and the doors opened for the main welcome. All participants filled the room, so the intervened group of approximately 20 was mixed in with the roughly 200 students who were attending that session. I believe that the change of setting and disbursement of students helped to alleviate the concern regarding treatment diffusion. The intervened students could have talked to the control group students at any point in time during their first semester which could not be formally addressed in this study.

Data Analysis

- Q1 Do first-year first-generation students who complete the growth mindset intervention report higher levels of growth mindset than first-year first-generation students who do not participate?

The first research question was answered using an independent sample *t*-test at an alpha of .05. See below for the assumptions and the test of assumptions I performed before I ran this analysis.

- Q2 Does first-semester GPA differ between first-year first-generation students who participate in a growth mindset intervention and those who do not?

The second research question was answered using an analysis of covariance (ANCOVA) at an alpha of .05. The covariate was high school grade point average (HSGPA) because studies have found that HSGPA was the best predictor for college success compared to many other commonly used variables (Geiser & Santelices, 2007). Because students were systematically assigned, I assumed high school HSGPA to be equal across treatment and non-treatment groups. I completed analysis provided evidence of that and increased the power of the results. See below for the assumptions and the test of assumptions I performed before I ran this analysis.

- Q3 After controlling for high school GPA, do first-semester college GPA differences between treatment and non-treatment groups differ by the following moderator variables: gender, race/ethnicity, Pell eligibility, previous experience with growth mindset, participation in a TRiO Student Support Services program, or enrollment in a first-year seminar course?

The final question was answerable using a factorial ANCOVA. The covariate was again HSGPA and I ran separate ANCOVAs for each of the described moderator variables.

In data analysis for these research questions I needed to satisfy research assumptions for my chosen statistical tests. The following assumptions, addressing violations of the assumptions, and analysis are summarized from Laerd Statistics (2018). First, my dependent variable was measured on a continuous scale. Since my dependent variable was Fall 2019 GPA, that was a continuous scale from 0-4.0. Next my independent variable consisted of two categorical, independent groups. This was true for the separate categories of intervened or non-intervened and was also true for the moderator variables which included: gender – male or female; race/ethnicity – American Indian or Alaska Native, Asian, Black or African American, Hispanic or Latino, Multiracial, Native Hawaiian or Other Pacific Islander, Non-Resident Alien, and White; Pell eligibility – yes or no; TRiO – yes or no; University 101 – yes or no; and previous experience with growth mindset – yes, no, or unanswered. Finally, I reviewed for independence of observations. My consistent independent variable was the intervention or non-intervention students. I reviewed my dataset to confirm that a student ID number only existed in one of the two categories. Similarly, when I did the ANCOVAs, I confirmed that each student ID number only had one of the independent categories I had for each of the moderator variables. I also checked for independence

of observations by reviewing the data I collected from the students to compare and ensure the intervened and non-intervened participants seemed randomly distributed.

The final three assumptions were: there were no significant outliers; my dependent variable was approximately normally distributed for each group of the independent variable; and I tested for homogeneity of variance. I checked for these using statistical software in Chapter 4.

After I gained an impression of my data by looking at graphs and descriptive statistics, I worked to interpret the main result of the factorial ANCOVA through SPSS and the test of between-subjects effects table. The partial eta squared value indicated the effect size and I interpreted the effect size using Cohen's guidelines, which suggests that Cohen's $d = .2$ is a small effect size, $d = .5$ represents a medium effect size, and $d = .8$ a large effect size. None proved to be statistically significant. All statistical analyses were conducted in SPSS version 25.

Chapter Summary

This chapter described the methods and procedures completed for this study to determine if a growth mindset intervention had a relationship with first-semester GPA and if moderator variables could explain any intervention differences. The purpose of the study, hypotheses, research design and procedures, and data analysis were included. Chapter IV addresses the answer to the research questions.

CHAPTER IV

RESULTS

Purpose of the Study and Research Questions

The purpose of this study was to explore the effect of a growth mindset intervention on first-year, first-generation college students' GPA at a regional public four-year institution. I further examined the variability of the effect using different student characteristics. This chapter details the study's findings and is organized into a results section for the three research questions, and a brief concluding summary. The research questions examined were as follows:

- Q1 Do first-year first-generation students who complete the growth mindset intervention report higher levels of growth mindset than first-year first-generation students who do not participate?
- Q2 Does first-semester GPA differ between first-year first-generation students who participate in a growth mindset intervention and those who do not?
- Q3 After controlling for high school GPA, do first-semester GPA differences between treatment and non-treatment groups differ by the following moderator variables: gender, race/ethnicity, Pell eligibility, previous experience with growth mindset, participation in a TRiO Student Support Services program, or enrollment in a first-year seminar course?

Results for Research Questions

The first research question, "Do first-year first-generation students who complete the growth mindset intervention report higher levels of growth mindset than

first-year first-generation students who do not participate?” was answered using independent samples t-tests at an alpha of .05.

I began my analyses by conducting preliminary and descriptive analyses for the first research question. I examined frequencies of individual questionnaire items along with means, standard deviations, skew, and kurtosis of composite growth mindset scores.

Research Question Q1

When I considered my first research question, “Do first-year first-generation students who complete the growth mindset intervention report higher levels of growth mindset than first-year first-generation students who do not participate?”, the first assumption to test was that there were no significant outliers. I determined this in SPSS by reviewing boxplots of my data and found I did have outliers. If I kept or removed the students who had were outliers, the analysis had similar results in terms of statistical significance of the t-test. My outliers were on the lower end of the data. Because I do not believe there were data entry or measurement errors, I reported the results with all data included. Next, I checked for a normal distribution of the dependent variable. Looking at the boxplots, the median line was in the approximate same place between intervened and non-intervened data and the data were skewed to the left. For the intervention group the skew was -1.32 and the kurtosis was 2.6 and for the non-intervened group the skew was -.5 and the kurtosis was -.32. There was homogeneity of variance, as assessed by Levene’s test for equality of variances ($p = .255$). There were 103 intervened students and 206 non-intervened students. Intervened students’ growth mindset score was ($M = 5.01, SD = .97$) and the control group’s growth mindset score ($M = 4.59, SD = .98$). There was a statistically

significant difference in growth mindset scores between non-intervened students and intervened students. The mean difference was $M = -0.42$, 95% CI [-0.65 to -0.18], $t(307) = -3.53$, $p < .001$. The effect size was small to medium, according to Cohen's $d = .43$.

After reviewing the initial data, I wanted to further analyze the question I asked regarding both intervened and non-intervened students, "Have you learned about the theory of growth and fixed mindsets before?", which had a simple yes or no check box followed by the question, "If yes, when and how?".

I ran a two-way ANOVA to find out if these mean scores were statistically significant. I started by examining studentized residuals and searched for any that had a value more than +/-3 standard deviations. There were two in my dataset at -3.67 and -3.56. I ran the ANOVA with and without the outliers to determine if their presence was influential. If I kept or removed the students who had the greater than three standard deviations in the studentized residuals, the analysis had similar results. Because I do not believe there were data entry or measurement errors, I reported the results with all data included. I reviewed the Q-Q plot to compare the residuals to what I expected to see and found evidence of normality. There was homogeneity of variances, as assessed by Levene's test of homogeneity of variance ($p = .182$). There was not a statistically significant interaction between intervention and previous experience for the growth mindset score, $F(1, 302) = 1.11$, $p = .294$, partial $\eta^2 = .004$. Next I interpreted the main effects. As expected, there was a statistically significant difference in mean growth mindset scores between students who participated in the intervention and those who did not, $F(1, 302) = 12.65$, $p < .001$, partial $\eta^2 = .04$. I also found there was a statistically significant difference in mean growth mindset scores

between students who had previous experience and those who did not, $F(1, 302) = 13.18, p < .001, \text{partial } \eta^2 = .042$.

When I included their yes/no answers to previous experience with growth and fixed mindsets into the intervened or not analysis of their fixed mindset scores, I found that previous experience mattered. There were three students who did not answer the previous experience question on the survey and are not included in the following analysis. The 152 students with no previous experience and no intervention had an average growth mindset score of 4.5 ($SD = .97$). The 74 students with no previous experience and an intervention scored 4.83 ($SD = 1.01$), similar to the 51 students with no intervention but with previous experience at 4.84 ($SD = 1.01$). Finally, the 29 students who participated in the intervention and had previous experience had the highest growth mindset score of all at 5.45 ($SD = .7$).

Research Question Q2

When considering my second research question, “Does first-semester GPA differ between first-year first-generation students who participate in a growth mindset intervention and those who do not?”, I ran the data using an ANCOVA. As I described in Chapter 2, studies have found that HSGPA was the best predictor for college success compared to many other commonly used variables (Geiser & Santelices, 2007). Because students were somewhat systematically assigned, I found HSGPA to be similar across treatment and non-treatment groups. This analysis used HSGPA as a covariate and increased the power of the results. There was a linear relationship between HSGPA and fall 2019 first-semester GPA for intervened and non-intervened, as assessed by visual inspection of a scatterplot. There was homogeneity of regression slopes as the interaction term between HSGPA and intervention group was not

statistically significant, $F(1, 304) = 0.071, p = .79$. There was homoscedasticity, as assessed by visual inspection of the standardized residuals plotted against the predicted values. There was homogeneity of variances, as assessed by Levene's test of homogeneity of variance ($p = .535$). I examined standardized residuals and searched for any that had a value more than ± 3 standard deviations. There were two cases in my dataset at -3.76 and -3.54 . I ran the ANCOVA with and without the outliers to determine if their presence was influential. If I kept or removed the students who had the greater than three standard deviations in the standardized residuals, the analysis had similar results. Because I do not believe there were data entry or measurement errors, I reported the results with all data included.

After adjustment for high school GPA, there was a statistically significant difference in fall 2019 GPA between the intervened and non-intervened groups, $F(1, 305) = 4.521, p = .034$, partial $\eta^2 = .015$. Fall 2019 GPA was statistically significantly greater in the control group versus the intervention group ($M_{\text{diff}} = .238$, 95% CI [.018, .457]). Because of the unexpected results, I decided to re-run my analysis removing the 15 students who obtained a 0.0 first-semester GPA as it could be argued there were outside factors other than growth mindset that impacted their first semester. While removing these 15 students slightly lowered the GPA difference, the ANCOVA was still statistically significant indicating that the non-intervened students had a higher first-semester GPA, $F(1, 290) = 4.867, p = .028$, partial $\eta^2 = .017$. Fall 2019 GPA was statistically significantly greater in the control group vs the intervention group ($M_{\text{diff}} = .208$, 95% CI [.022, .394]).

In an attempt to understand the reverse directionality of Fall 2019 GPA to my expectations, I also analyzed the growth mindset scores in a hierarchical linear

regression. I ran this to determine if the addition of the growth mindset score improved the prediction of Fall 2019 GPA over and above high school GPA. There was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of extreme multicollinearity, as assessed by tolerance values greater than .1. There were two studentized residuals greater than ± 3 standard deviations at -3.65 and -3.66. If I kept or removed the students who had the greater than three standard deviations in the studentized residuals, the analysis had similar results. Because I do not believe there were data entry or measurement errors, I reported the results with all data included. I found no leverage values greater than 0.2. The Cook's D values were below one and there were no noticeably higher values followed by a drop-off. The assumption of normality was met, as assessed by Q-Q Plot. High school GPA alone accounts for $R^2 = .245$ of the explained variance of Fall 2019 GPA, $F(1, 306) = 99.28, p < .001$. The added explained variance of the effect growth mindset score on Fall 2019 GPA when controlling for high school GPA was not statistically significant, $\Delta R^2 = .001, F(1, 305) = .507, p = .477$. This suggests either the growth mindset score was not a good measure of growth mindset or the level of growth mindset did not explain any variance of first-semester college GPA.

Research Question Q3

The final question, “After controlling for high school GPA, do first-semester college GPA differences between treatment and non-treatment groups differ by the following moderator variables: gender, race/ethnicity, Pell eligibility, previous experience with growth mindset, participation in a TRiO Student Support Services

program, or enrollment in a first-year seminar course?” was answerable using a factorial ANCOVA. I ran a separate factorial ANCOVA for each moderator variable with an alpha of .05.

In order to run a factorial ANCOVA I needed to satisfy assumptions and address other issues. The first assumption is that there was one dependent variable measured at the continuous level, in my study this was first-semester GPA. The second was that there are two or more independent variables which each consist of two or more categorical independent groups. The two independent variables were the treatment variable that included two levels (students who participated in the intervention and those who did not) and the categorical moderator variables, including: gender, race/ethnicity, Pell eligibility, previous experience with growth mindset, participation in a TRiO Student Support Services program, and enrollment in a first-year seminar course. The third variable was one covariate measured at the continuous level, which in this study was high school GPA. The third assumption was independence of observations, which was achieved in the same way as the initial two research questions. I verified independence of observations by reviewing participant and non-participant student ID numbers and made sure they were only in an intervened or not intervened group, though, as covered in Chapter III, experimental treatment diffusion was a known possible internal validity concern that could not be fully addressed in the study. I also demonstrated the covariate was linearly related to the dependent variable based on the independent variable of participation and non-participation using a grouped scatterplot between the covariate and GPA on the independent variable participation and non-participation and verified the linear

relationship. The rest of the assumptions will be addressed in the analysis with each of the moderator variables.

Gender. I started by analyzing my data by gender. This was a simple M or F in my dataset. I started by making sure there was a homogeneity of regression slopes, by looking at the interaction term between HSGPA and the combination of gender and intervention, $F(3, 300) = 1.7, p = .168$. The next assumption was there should be homoscedasticity, or whether the variance of error was identical for all combinations of the values of the independent variables and covariate. I determined this by reviewing a plot of the studentized residuals against the predicted values of each cell of the design. There was no pattern and approximately constant spread. Next I checked for homogeneity of variances; that the variances of the residuals were equal between each combination of the two independent variables. There was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .269$).

Finally, I examined the data for potentially influential points which can be found by using SPSS's Cook's distance values and by checking for extreme cases. The Cook's values were below one and there were no noticeably higher values followed by a drop-off. In addition to check the data for potentially influential cases, I reviewed for unusual points in any combinations of my two independent variables. I used SPSS to run studentized residuals and searched for any that had a value more than ± 3 standard deviations. There were three in my dataset which included -3.22, -3.59, and -3.76. If I kept or removed the students who had the greater than three standard deviations in the standardized residuals, the analysis had similar results. Because I do not believe there were data entry or measurement errors, I reported the results with all data included. I also reviewed for leverage points which were found by consulting the

leverage values data set in SPSS. All were less than .2 and considered safe. The final assumption was determining if my dependent variable was approximately normally distributed for each combination of groups of the two independent variables. This can be done with the Shapiro-Wilk test for normality in SPSS, but since my sample sizes were greater than 50, I reviewed the Q-Q plot to compare the residuals to what I expected to see and found normality.

I found no statistically significant interaction between the intervention and gender on first-semester GPA, whilst controlling for high school GPA, $F(1, 303) = 0.32, p = .57, \text{partial } \eta^2 = .001$.

Race/ethnicity. I analyzed my data by race/ethnicity as reported by the student information system at UNC. This dataset included students in the following categories: American Indian or Alaska Native, Asian, Black or African American, Hispanic or Latino, Multiracial, Native Hawaiian or Other Pacific Islander, Non-Resident Alien, and White. I split the data into three groups based on previous research and the number of student participants. National research on postsecondary education by racial and ethnic groups demonstrates that graduation rates for white are higher than every other race/ethnicity with the exception of Asian (National Center for Education Statistics, 2019). My data only included four Asian identified students, so I could not create a category for their experience only. Other research has been done on the experience of students of color in higher education and it is understood that there are subtle and not-so-subtle forms of microaggressions that occur on college campuses (Minikel-Lacocque, 2013). “Racial microaggressions are brief and commonplace daily verbal, behavioral, or environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults toward

people of color” (Sue et al., 2007, p. 271). There has also been past research specifically about growth mindset which found statistically significantly higher GPAs among Latinx participants (Broda et al., 2018). Knowing that student experiences differ based on race and because past research highlights a different experience of the Latinx population for growth mindset, I created three groups for race: white, Latinx, and all other students of color.

I started by making sure there was a homogeneity of regression slopes. There was homogeneity of regression slopes by looking at the interaction term between HSGPA and a combination of race/ethnicity and intervention, $F(5, 296) = 1.07, p = .377$. The next assumption was there should be homoscedasticity, or whether the variance of error was identical for all combinations of the values of the independent variables and covariate. I determined this by reviewing a plot of the studentized residuals against the predicted values of each cell of the design. There was no pattern and approximately constant spread. Next I checked for homogeneity of variances; that the variances of the residuals were equal between each combination of the two independent variables. There was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .147$).

I reviewed for potentially influential points which can be found by using SPSS's Cook's distance values and examination of outlying cases. The Cook's values were below one and there were no noticeably higher values followed by a drop-off. Next I reviewed for unusual points in any combinations of my two independent variables. I examined studentized residuals and searched for any that had a value more than +/-3 standard deviations. There were three in my dataset which included -3.67, -3.51, and -3.00. If I kept or removed the students who had the greater than three

standard deviations in the standardized residuals, the analysis had similar results.

Because I do not believe there were data entry or measurement errors, I reported the results with all data included. I also reviewed for leverage points which were found by consulting the leverage values. All were less than .2 and considered safe. The final assumption was determining if my dependent variable was approximately normally distributed for each combination of groups of the two independent variables. This can be done with the Shapiro-Wilk test for normality in SPSS, but since my sample sizes were greater than 50, I reviewed the Q-Q plot to compare the residuals to what I expected to see and found normality.

I found no statistically significant interaction between the intervention and race/ethnicity on first-semester GPA, whilst controlling for high school GPA, $F(1, 301) = .09, p = .914, \text{partial } \eta^2 = .001$.

Pell eligibility. Next I analyzed the data by the moderator variable Pell eligibility. This was a simple yes or no in my dataset. I started by making sure there was homogeneity of regression slopes. There was homogeneity of regression slopes by looking at the interaction term between HSGPA and the combination of Pell eligibility and the intervention, $F(3, 300) = 0.31, p = .818$. The next assumption was there should be homoscedasticity, or whether the variance of error was identical for all combinations of the values of the independent variables and covariate. I determined this by reviewing a plot of the studentized residuals against the predicted values of each cell of the design. There was no pattern and approximately constant spread. Next I checked for homogeneity of variances; that the variances of the residuals were equal between each combination of the two independent variables. The assumption of homogeneity of variances was violated, as assessed by Levene's test for equality of

variances ($p = .02$). Violating this assumption means I needed to consider how I would deal with heteroscedasticity. I decided to run the data anyway and also run it with a variance stabilizing transformation to see what differs in the result.

Without transforming my data, I used SPSS to run studentized residuals and searched for any that had a value more than ± 3 standard deviations. There were two in my dataset which included -3.67 and -3.56 . If I kept or removed the students who had the greater than three standard deviations in the standardized residuals, the analysis had similar results. The second way I reviewed the data for potentially influential points was through examination of Cook's distance values. The Cook's values were below one and there were no noticeably higher values followed by a drop-off. Because I do not believe there were data entry or measurement errors, I reported the results with all data included. I also reviewed for leverage points which were found by consulting the leverage values. All were less than $.2$ and considered safe. The final assumption was determining if my dependent variable was approximately normally distributed for each combination of groups of the two independent variables. This can be done with the Shapiro-Wilk test for normality in SPSS, but since my sample sizes were greater than 50 , I reviewed the Q-Q plot to compare the residuals to what I expected to see and found normality.

There was a statistically significant interaction between the intervention and Pell eligibility on first-semester GPA, whilst controlling for high school GPA, $F(1, 303) = 4.036$, $p = .045$, partial $\eta^2 = .013$. Since I originally violated homogeneity of variance, I reviewed the Pell eligible group with the larger number of students and found that it had the smaller standard deviation. This means there is a greater chance of Type I error, which makes my first result untrustworthy. I decided to also run the

analysis with a variance stabilizing transformation. The spread of residuals decreased with increasing predicted values, so I applied a squared transformation to the dependent variable and rechecked the assumptions. I again found homogeneity of regression slopes as determined by a comparison between the two-way ANCOVA model with and without interaction terms, $F(3, 300) = 0.621, p = .602$. Again reviewing for homoscedasticity with the squared first-semester GPA, I found no pattern and approximately constant spread. This time there was homogeneity of variances, as assessed by Levene's test of homogeneity of variance ($p = .124$). Next I reviewed for unusual points in any combinations of my two independent variables. I used SPSS to run studentized residuals and searched for any that had a value more than ± 3 standard deviations. There was one in my dataset at -3.21 . If I kept or removed the student who had the greater than three standard deviations in the standardized residuals, the analysis had similar results. A second way I reviewed the data for potentially influential points was using Cook's distance values. The Cook's values were below one and there were no noticeably higher values followed by a drop-off. Because I do not believe there were data entry or measurement errors, I reported the results with all data included. I also reviewed for leverage points which were found by consulting the leverage values. All were less than $.2$ and considered safe. The final assumption was determining if my dependent variable was approximately normally distributed for each combination of groups of the two independent variables. This can be done with the Shapiro-Wilk test for normality in SPSS, but since my sample sizes were greater than 50 , I reviewed the Q-Q plot to compare the residuals to what I expected to see and found normality. In this case, there was no statistically significant

interaction between the intervention and Pell eligibility on Fall 2019 GPA, whilst controlling for high school GPA, $F(1, 303) = 1.94, p = .165$, partial $\eta^2 = .006$.

I looked at Pell eligibility in two ways. The first analysis was completed despite the failed Levene's test which revealed that my data were heteroscedastic. I found a statistically significant interaction in this analysis. When I ran the test again using a variance stabilizing transformation, I passed Levene's test and did not find a statistically significant interaction. Therefore, I will use the second result which finds no statistically significant interaction between the intervention and Pell eligibility on Fall 2019 GPA.

Previous experience with growth mindset. Next I analyzed my data by previous experience with growth mindset. This was a simple Y or N in my dataset. There were three students who did not answer the yes or no question on the survey, so my analysis for this moderator variable used 306 students in the dataset. I started by making sure there was a homogeneity of regression slopes, which was indicated by looking at the interaction terms between HSGPA and a combination of previous experience with growth mindset and the intervention, $F(3, 297) = 1.24, p = .295$. The next assumption was there should be homoscedasticity, or whether the variance of error was identical for all combinations of the values of the independent variables and covariate. I determined this by reviewing a plot of the studentized residuals against the predicted values of each cell of the design. There was no pattern and approximately constant spread. Next I checked for homogeneity of variances; that the variances of the residuals were equal between each combination of the two independent variables. There was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .639$).

I reviewed for influential points which can be found by using Cook's distance values. The Cook's values were below one and there were no noticeably higher values followed by a drop-off. Next I reviewed for unusual points in any combinations of my two independent variables. I examined the studentized residuals and searched for any that had a value more than +/-3 standard deviations. There were two in my dataset which included -3.78 and -3.45. If I kept or removed the students who had the greater than three standard deviations in the standardized residuals, the analysis had similar results. Because I do not believe there were data entry or measurement errors, I reported the results with all data included. I also reviewed for leverage points which were found by consulting the leverage values. All were less than .2 and considered safe. The final assumption was determining if my dependent variable was approximately normally distributed for each combination of groups of the two independent variables. This can be done with the Shapiro-Wilk test for normality in SPSS, but since my sample sizes were greater than 50, I reviewed the Q-Q plot to compare the residuals to what I expected to see and found normality.

I found no statistically significant interaction between the intervention and previous experience with growth mindset on first-semester GPA, whilst controlling for high school GPA, $F(1, 300) = 2.347, p = .127, \text{partial } \eta^2 = .008$.

TRiO program. Next I reviewed my data by participation in the TRiO program. This was a simple Y or N in my dataset. I found that there were 16 students of the 308 from whom I received signed IRB forms in total; of those only 4 participated in the intervention. The total number of students who participated from TRiO programs was too small for conducting a factorial analysis.

University 101. Next I analyzed my data by participation in University 101. This was a simple Y or N in my dataset. I started by making sure there was homogeneity of regression slopes. There was homogeneity of regression slopes by looking at the interaction term between HSGPA and the combination of University 101 and the intervention, $F(3, 300) = .09, p = .966$. The next assumption was there should be homoscedasticity, or whether the variance of error was identical for all combinations of the values of the independent variables and covariate. I determined this by reviewing a plot of the studentized residuals against the predicted values of each cell of the design. There was no pattern and approximately constant spread. Next I checked for homogeneity of variances; that the variances of the residuals were equal between each combination of the two independent variables. There was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .223$).

Next I reviewed for unusual points in any combinations of my two independent variables. I used SPSS to run studentized residuals and searched for any that had a value more than ± 3 standard deviations. There were three in my dataset which included -3.73, -3.48, and -3.03. If I kept or removed the students who had the greater than three standard deviations in the standardized residuals, the analysis had similar results. The second diagnostic I used to check for potentially influential points was done using Cook's distance values. The Cook's values were below one and there were no noticeably higher values followed by a drop-off. Because I do not believe there were data entry or measurement errors, I reported the results with all data included. I also reviewed for leverage points which were found by consulting the leverage values. All were less than .2 and considered safe. The final assumption was determining if my dependent variable was approximately normally distributed for each combination of

groups of the two independent variables. This can be done with the Shapiro-Wilk test for normality in SPSS, but since my sample sizes were greater than 50, I reviewed the Q-Q plots to compare the residuals to what I expected to see and found normality.

I found no statistically significant interaction between the intervention and participation in University 101 on first-semester GPA, whilst controlling for high school GPA, $F(1, 303) = 2.85, p = .093, \text{partial } \eta^2 = .009$.

Summarized results. Table 3 includes the moderator variables and the Fall 2019 GPA means by intervention or not as well as the means adjusted by the covariate high school GPA by intervention or not. Pell eligibility was heteroscedastic so I transformed the variables by squaring them to pass Levene's test. The GPA scores for Pell eligibility reflect the variance stabilization in the table. I also included the statistical results of the ANCOVAs that were run. As was described throughout this section, there were no statistically significant results.

Table 3

Summarized Results of Fall 2019 Grade Point Average by Moderator Variable

Variable	Intervened means	Non-intervened means	Intervened adjusted means	Non-intervened adjusted means	Statistical results
Gender					ns
Male	$M = 2.43$ $SD = 1.06$	$M = 2.62$ $SD = 1.11$	$M = 2.54$ $SE = .2$	$M = 2.9$ $SE = .14$	
Female	$M = 2.56$ $SD = 1.06$	$M = 2.7$ $SD = 1.06$	$M = 2.45$ $SE = .1$	$M = 2.66$ $SE = .07$	
Race/ethnicity					ns
White	$M = 2.69$ $SD = 1.05$	$M = 2.82$ $SD = 1.01$	$M = 2.57$ $SE = .15$	$M = 2.81$ $SE = .11$	
Latinx	$M = 2.4$ $SD = 1.08$	$M = 2.56$ $SD = 1.17$	$M = 2.38$ $SE = .12$	$M = 2.58$ $SE = .09$	
All other students of Color	$M = 2.67$ $SD = .94$	$M = 2.86$ $SD = .67$	$M = 2.65$ $SE = .29$	$M = 3.01$ $SE = .18$	
Pell eligibility					ns
Yes	$M = 7.27$ $SD = 4.16$	$M = 7.69$ $SD = 4.94$	$M = 7.11$ $SE = .53$	$M = 7.81$ $SE = .36$	
No	$M = 7.8$ $SD = 5.27$	$M = 9.21$ $SD = 4.64$	$M = 7.36$ $SE = .58$	$M = 9.39$ $SE = .43$	
University 101					ns
Yes	$M = 2.35$ $SD = 1.25$	$M = 2.74$ $SD = .97$	$M = 2.34$ $SE = .16$	$M = 2.85$ $SE = .11$	
No	$M = 2.61$ $SD = .96$	$M = 2.65$ $SD = 1.12$	$M = 2.53$ $SE = .11$	$M = 2.64$ $SE = .08$	
Previous experience with growth mindset					ns
Yes	$M = 2.86$ $SD = .85$	$M = 2.68$ $SD = 1.06$	$M = 2.78$ $SE = .17$	$M = 2.74$ $SE = .13$	
No	$M = 2.4$ $SD = 1.11$	$M = 2.68$ $SD = 1.07$	$M = 2.35$ $SE = .11$	$M = 2.7$ $SE = .08$	

Note. ns = not significant.

Chapter Summary

This chapter contained a comprehensive analysis of this research. I found that students who completed the intervention had a statistically significantly higher growth mindset score than the students who did not receive the intervention. My research also indicated that students who participated in the intervention had a statistically significantly lower GPA than students who participated in the control group. I also analyzed Fall 2019 GPA differences between the intervention and non-intervention groups by several moderator variable and did not find any statistically significant moderator effects. My analysis had unexpected results in demonstrating statistically significantly lower first-semester college GPAs for students who participated in a growth mindset intervention. Chapter V provides a summary of results, implications for practice, limitations, implications for future research, and conclusion.

CHAPTER V

DISCUSSION

The purpose of this study was to explore the effect of a growth mindset intervention on first-year, first-generation college student GPA at a regional public four-year institution. I further examined the variability of the effect using different student characteristics. Through this study, I sought to expand the current literature by investigating if the educational psychology concept of growth mindset could positively nudge first-semester GPA of first-generation college students, which could change orientation practices for new students in the future.

Summary of Results

To answer the research questions, I analyzed several variables about the student population which I either collected from participants or received their permission to access through the Office of Institutional Reporting and Analysis Services. Those variables included the following per student: growth mindset scores, past experience with growth mindset, first-semester college GPA, high school GPA, gender, race/ethnicity, Pell eligibility, participation in a TRiO Student Support Services program, and enrollment in a first-year seminar course.

Research Question Q1

- Q1 Do first-year first-generation students who complete the growth mindset intervention report higher levels of growth mindset than first-year first-generation students who do not participate?

Evaluating the results for research question one, I expected to find that students who participated in the growth mindset intervention had higher levels of growth mindset than those who did not. My hypothesis was supported by my study. I found statistically significantly higher growth mindset scores of students who participated in the intervention. Further, I found that students who self-reported previous experience with growth mindset and participated in the intervention had the highest growth mindset scores, followed by students who either participated in the intervention or had previous experience, and the lowest growth mindset scores were from students who neither participated nor had previous experience. This finding was expected and mirrors prior research which demonstrates that understanding of growth mindset can be influenced by an intervention (Blackwell et al., 2007; DeBacker et al., 2018; Mills & Mills, 2018; Yeager, Romero, et al., 2016).

Research Question Q2

Q2 Does first-semester GPA differ between first-year first-generation students who participate in a growth mindset intervention and those who do not?

I found that first-semester GPA does differ between participants and non-participants, just not in the way I hypothesized. After adjusting for high school GPA, students who participated in the intervention had a statically significantly lower GPA than students who did not participate by .238. This was unexpected and there were several reasons that contributed to this result.

The previous research that found improved educational outcomes for students who received a growth mindset intervention during the transition to college was completed at higher education institutions with higher selectivity (Aronson et al., 2002; Broda et al., 2018; Yeager, Walton, et al., 2016). As I argued in Chapter II, the

educational outcomes of institutions with higher selectivity are different from those with lower selectivity (National Center for Education Statistics, 2017) and the impact of a growth mindset education could vary from this factor. This study focused on the effect of growth mindset on first-generation college students. I similarly argued in Chapter II that first-generation college students have unique needs. Research has unequivocally demonstrated lower college enrollment, retention, and graduation rates among first-generation students (Cataldi et al., 2018; Inkelas et al., 2007; Ishitani, 2006; Pascarella et al., 2004; Pike & Kuh, 2005). In my research explored the viability of this type of intervention on an institution and student population that could use additional support and I found that it did not, though there were several confounding factors.

As described, first-generation college students have unique needs which makes it harder for them to graduate from college and less selective institutions have lower retention and graduation rates. A simple explanation for the results of this study is that a quick intervention is not enough to overcome the challenges first-generation college students bring with them to a less selective institution. I also further analyzed growth mindset scores, without considering the intervention or previous experience, to first-semester GPA while controlling for high school GPA. There was no added explained variance beyond HSGPA which causes concern about the measure of the theory of growth mindset. Finally, the control group in this study participated in the same activity that had been done for years in the I'm First Workshop. I argue that the small group question and answer session facilitated by a first-generation student staff member who shared the commonality of their identity may explain the unexpected success of the control group.

Research Question Q3

- Q3 After controlling for high school GPA, do first-semester GPA differences between treatment and non-treatment groups differ by the following moderator variables: gender, race/ethnicity, Pell eligibility, previous experience with growth mindset, participation in a TRiO Student Support Services program, or enrollment in a first-year seminar course?

My predication was that there were going to be differences in first-semester GPA based on some of the moderator variables, specifically, I expected higher GPAs in the following: the race/ethnicity group Latinx, students who participated in TRiO, and the students enrolled in the first-year seminar course. Based on the study by Broda et al. (2018), I expected to see a statistically significant increase in first-semester GPA in race by Latinx students compared with all other race/ethnicity groups. I also believed that enrollment in a TRiO program or participation in a first-year seminar course would create more positive outcomes as the growth mindset concept would have been reinforced by student participation. I did not have enough students to analyze the TRiO experience. I did not find statistical significance for participation in the first-year seminar course. I ran a two-way ANCOVA for all of these moderator variables and found no statistical significance in any of them.

Summary

Based on my findings, it would seem that a growth mindset intervention does not positively nudge first-semester GPA of first-generation college students at less selective institutions. I suggest that these unexpected results might be because of a weak growth mindset measure, because of the differing institutional type and student demographics, that the control group did not receive nothing, and/or that a quick and easy intervention may not be a viable solution for students at this type of institution.

There were additional limitations to the study that I will describe as well as related future research opportunities.

Implications for Theory

Growth Mindset Theory

I used the theory of growth mindset in this research. This theory is an educational psychology concept that describes a dichotomy of mindsets – fixed or growth (Dweck, 2016). Fixed mindset indicates a belief that each person has a certain amount of intelligence, a fixed personality, or a certain moral character while growth mindset indicates a belief that those qualities are changeable with effort. There has been a long history of research into growth mindset, which has been called several names (Weiner, 1972; Wilson & Linville, 1982; Ying-yi et al., 1999).

I completed an intervention to see if a short lesson on growth mindset during orientation could improve first-year first-generation students' GPA. My research results demonstrated that students who participated in the growth mindset intervention had statistically significantly higher scores than students who did not participate and growth mindset scores scaffolded as expected with students who reported previous experience learning about growth mindset. In this way, my results closely aligned with this theoretical framework, though that quickly changed when I considered the outcome I was trying to influence, first-semester GPA, which had been previously connected to success using growth mindset.

Social Belonging Theory

When describing the procedures of my study, I referenced the systematic selection of students who received the intervention. I stated that the remaining two-thirds of students were in the control group and participated in a small group question

and answer session which had been completed during this time in previous years. Because my research indicated that the students who participated in the control group question and answer session had a statistically significantly higher average GPA by .238, it drove me to further explore the control group. When New Student Orientation implemented the I'm First Workshop in 2014, it was a collective effort from members of the campus community interested in first-generation student success. At that time, we intentionally created space for first-generation students to interact in a small group environment with first-generation student staff members. There was an understanding that it was good practice to provide role models from similar identities. I argue that in this circumstance the interaction with someone who was perceived to be a successful student and identified as being first-generation was a more powerful experience than the growth mindset intervention.

Now that I have more closely analyzed my study's control group experience, I believe the theory of social belonging contributed to my findings. In Chapter II I highlighted a couple of studies in the social and psychosocial interventions section which included information about social-belonging interventions. Existing research indicated higher GPAs among students who heard messages that were intentionally highlighting similar backgrounds (Stephens et al., 2014; Walton & Cohen, 2011). When I created this study and even after I initially analyzed the results, I did not make the connection that the short question and answer session could have this type of impact. We trained the student staff for this session with the expectation that the question and answer was unstructured except for the beginning in which we asked them to share their experiences related to their personal first-generation identity in their transition to college. This is a social-belonging intervention; we reinforced

messages which highlight similar backgrounds. My research results align with the success outcomes of the previous studies using this theoretical framework, though this will also be a limitation to the study.

Implications for Practice

Less Selective Institution and First-Generation Students

When reviewing the literature, I found there had been previous research completed using a growth mindset intervention for new students during their transition to college, but the previous research was lacking important characteristics embodied by UNC. Specifically, I wanted to review the effect of a growth mindset intervention on first-generation college students who were attending a less selective institution. While other research indicated a successful nudge in first-semester success as a result of participation in a growth mindset intervention at Stanford University, Michigan State University, and an un-named but “high-quality” large public university (J. Aronson et al., 2002; Broda et al., 2018; Yeager, Romero, et al., 2016), my research did not align. I argued there were unique factors about institutional type and first-generation status when making the case to complete this study, and I believe those unique factors contributed to this result.

UNC’s institutional type differs from the others in published research by its lower selectivity defined by high acceptance rates, the higher number of students being awarded Pell grants, and much lower institutional graduation rates (National Center for Education Statistics, 2017). I narrowed this study to a specific population that had also never been specifically delineated in growth mindset research previously: first-generation students. First-generation students nationwide have a more

challenging time in persisting through college to graduation (Toutkoushian et al., 2018). The unexpected results could be the result of the intervention occurring in a different institutional type and/or with a different student demographic.

I recommend that others who are leading their institutional work on student transition should take careful consideration of their student demographics before fully implementing a growth mindset intervention that only a few other published studies at more selective institutions have found beneficial. My research suggests that other psycho-social theories, like social-belonging, that do more for this institutional type and first-generation status.

Control Group

I went back to the three studies I cited that implemented a growth mindset intervention at the point of transition to college and more closely reviewed the students in their control groups. The Yeager, Walton, et al. (2016) study, which was at an unnamed high-quality public university, had a control group which received nothing. The Broda et al. (2018) study at Michigan State included a control group in which participants received generic information about weather, wayfinding, and places to eat. Finally, the Aronson et al. (2002) study at Stanford had two control groups: one that participated but had a generic topic and one that received no intervention. This collection of research had more neutral control groups which allowed the researchers to make stronger claims about growth mindset.

Since my revelation that my control group was receiving a social-belonging intervention, I went back into the assessment data collected by New Student Orientation which was completed in 2016. When students were asked the open-ended question, “What did you like best about this workshop?”, the top themed response was

the small group conversation led by a current first-generation college student (P. Johnsen, personal communication, February 12, 2020). At the time this assessment was used to justify continuing the I'm First Workshop and now I believe it further reinforces that there was something powerful happening in the control group. An artifact of this study showed that a social-belonging intervention outperformed a growth mindset intervention in this study.

I recommend that other professionals supporting student transition at less selective institutions with a large first-generation student population consider a psycho-social intervention that uses the theory of social belonging. It is also an important recommendation for future research, as will be described further below. I unexpectedly came to this conclusion and there needs to be a more thorough design which includes a control group with a neutral experience.

Ineffectiveness of a Short Intervention

The final implication for practice that I am going to make is related to the student population and institution type. The short growth mindset intervention was not effective in this study in nudging first-semester GPA. I argue that there are many “nonacademic demands” on first-generation college students which influenced this result (Terenzini et al., 1996). These demands can include serious financial burdens, familial expectations for time, social belonging, microaggressions related to identities, confidence, and self-advocacy to name a few. There are also academic demands, as first-generation students on average come to college less academically prepared (Atherton, 2014). Atherton (2014) also found that first-generation students seemed to

lack awareness of the impact of lower high school GPAs and lower standardized test scores on their college academic outcomes.

Those pressures during the first semester of college mean first-generation college students need more support. I may have been too hopeful that an educational nudge in the form of a 35-minute growth mindset intervention would affect that point of student transition. A regular complaint in the student feedback for orientation is regarding the amount of information given during a short period of time (P. Johnsen, personal communication, February 12, 2020). It could be argued that social belonging was better retained because it is more about feeling. Growth mindset education in the context of first-generation students at a less selective institution during orientation may be too much. In my introduction I included some of the programs which provide additional time and resource intensive methods – federal TRiO programs and First Year Seminar courses. My recommendation for practice is to embed psycho-social theories like growth mindset into the longer term and resource intensive methods that are already working for first-generation students. Because there is so much to learn and be exposed to, especially for first-generation students during an orientation program, it seems like there could be better concept retention and subsequent higher first-semester GPA from students who heard the message at several points during their first-semester journey.

Limitations

This study had a number of limitations which may reduce the validity or generalizability of the results. The primary concern I have is that the control group received a social-belonging intervention. I also believe that the growth mindset questionnaire is dated and scores based on the questionnaire could use a psychometric

re-evaluation. The final limitation was the number of first-generation students who did not attend the I'm First Workshop.

Control Group and Social Belonging

As described in the implications for practice section, this study had a control group whose experience was not neutral. It was only after completing the research and questioning my results that I considered what had been done in previous years was actually driven by a psychosocial theory called social belonging. This is a limitation to the study.

Growth Mindset Scores

As was a concern in Chapter II and will be suggested as future research, the tool used to measure growth mindset is dated (Ying-yi et al., 1999). In my research I found that when using growth mindset scores alone, the growth scores added no explained variance in Fall 2019 GPA above and beyond high school GPA. Past research showing the effectiveness of the theory of growth mindset indicates it can be a useful tool. An updated psychometric examination of the concept could potentially add different or additional questions that elicit a greater range of responses which might better explain the variance of first-semester GPA in my study.

Sample Selection Bias

A limitation of this study is that there were fewer students who participated in the study from the I'm First workshop than expected for several possible reasons. There were 322 students who initially filled out the paperwork for this study, but only 308 who made it to the final dataset. Those lost students were analyzed in Chapter 3 and make up students whose ID number was unreadable or students who never started

the fall semester. UNC's Fact Book said there were 747 first-generation students who started in the Fall 2019 semester (University of Northern Colorado, 2020b). This means I had a 41% participation rate in this study. There was a higher than expected number of students who did not participate because they were under 18 years of age. The summer months when orientation occurs have quite a few students who have not yet turned of legal age though they become 18 near the beginning of their first semester. There could be numerous other influential reasons that students chose not to participate in the I'm First Workshop. Maybe students did not come because they were feeling well-prepared by their high school experience for college, or their parents did not attend but close family members had attended college and they already felt supported. Maybe students had important concerns that needed to be handled during the timeframe of the workshop, or maybe they failed to attend simply because the start time was at 8 a.m. The possible reasons are varied but the implication is there was sample selection bias from the first-generation students who chose to attend the I'm First Workshop, which reduces the generalizability to all first-generation college students at UNC.

Implications for Future Research

The first clear implication for future research is to explore a growth mindset intervention, a social-belonging intervention, and a control group with first-generation college students at less selective institutions. I encourage future research to ensure that the growth mindset questionnaire is as relevant today as it was in the past. I also argue this type of study should be further evaluated on other populations to refine and compare results. Qualitative or mixed methods research should be considered

regarding psychosocial interventions supporting students during their transition to college. This study provided interesting results which I hope will be further explored.

Growth Mindset and Social Belonging Interventions

The initial implication that has clearly arisen is the attempt to differentiate the benefit of a growth mindset intervention, a social-belonging intervention, and a neutral control group. My study ended up using two interventions, showing that a social-belonging intervention statistically benefitted the GPA of those that attended. Further research needs to be completed addressing the two types of interventions against a control group with first-generation college students at less selective institutions.

Growth Mindset Questionnaire

My research found that when using growth mindset scores alone, the growth scores added no explained variance of Fall 2019 GPA above and beyond high school GPA. This is an area for future research because it makes me wonder if the tool to assess growth mindset was accurate. In Chapter III I described the growth mindset questionnaire that I used in my research and how its scores were originally psychometrically supported in undergraduate students in 1999 (Ying-yi et al.). At that time, the researchers found scores from the measure to be reliable and valid. There have since been several researchers who have used the questionnaire in further studies (J. Aronson et al., 2002; Blackwell et al., 2007; Broda et al., 2018; Burnette et al., 2018). Because there have been no further psychometric examinations of the questions since over 20 years ago, I noted a concern about its relevancy to college students today. The original psychometric examination showed scores from the measure were independent of several variables including sex, age, social desirability, cognitive

ability, and comparison to a longer eight-item questionnaire (Ying-yi et al., 1999). In my research, I asked students if they had previously heard about growth mindset and 80 of the 308 said they had. This more widespread understanding of the concept could influence how students answer the questionnaire toward a more socially desirable “correct” answer while hiding their true beliefs.

As described in Chapter IV, my research demonstrated that statistically different growth mindset scores did nothing to explain the variance of first-semester college success as indicated by GPA. I argue additional questions could have better indicated students’ understanding of growth mindset through a wider spread of scores. The original instrument had three questions that were assessing fixed mindset, “You have a certain amount of intelligence and you really can’t do much to change it”; “Your intelligence is something about you that you can’t change very much”; and “You can learn new things, but you can’t really change your basic intelligence.” Additional questions could be included, like one with an example that is specific to academic subjects, “If someone is bad at math or art, there is not much that can be done to change that.” I think students will respond with greater variance to education topics that are more polarizing. My research found an average score of 4.5 on the scale of 1-6 with a standard deviation close to one. Perhaps a newly revised measure could widen the range of scores, which could better indicate student success as evidenced by first-semester GPA. My research problematizes the commonly used measure of the growth mindset theory and I would suggest that others be cautious of using the three-item questionnaire until there is a renewed psychometric evaluation of questions for 2020 or beyond.

Less Selective Institutions and First-Generation Students

The categories of less selective institutions and first-generation college students were my initial motivation to explore the growth mindset concept further; it was a clear gap in the previously published literature about this psychosocial intervention. My study provided more data to support that this population is unique. Future research should explore the differences between less selective institutions and first-generation college students. These were two areas I found previously unexplored and future research could separately consider those variables to truly understand what effect, if any, these interventions have on student success. Using the less selective institutional framework, the largest set of less selective institutions are community colleges. I have not read any research that explores the use of growth mindset or social belonging intervention during student transition to community college and believe this should be investigated.

Qualitative or Mixed Methods Research

There is an opportunity for future research to directly ask students about their ability to implement growth mindset or social belonging concepts in their college experience through participation in individual interviews or focus groups. This future study would be most interesting as mixed methods so the data could support whether there were differences in first-semester GPA as well as why the students believed the intervention was useful or not. Much of the previous research has been based on interventions exploring effects quantitatively. GPA, however, is not the only measure of student success and learning (Thorsen & Cliffordson, 2012; Vulperhorst et al., 2018). Students could be asked to explain how they believe the concepts introduced to

them during their transition was or was not relevant to their first-semester experience during several points of the semester. The analysis would be able to provide a deeper look at the intervention through exploring both its perceived impact as well as its success indicated by first-semester GPA.

Conclusion

College degree completion nationwide is at a low 60 percent six-year rate and institutions have been increasingly incentivized to improve those rates through performance-based funding (McFarland et al., 2018; Ziskin et al., 2018). Beyond incentivization through funding models, it has been my experience that there are good people working in higher education who are also personally motivated to support as many students as possible through to graduation. There is research which indicates that first-semester GPA is a strong early predictor of subsequent graduation (Gershenfeld et al., 2016). While there are a number of well-known programs that have been proven to support students through their first semester, many of them are time and resource intensive. Educational nudges can be another direction for institutions to pursue – asking administrators and faculty to consider small changes can push students in a direction of positive academic outcome (Damgaard & Nielsen, 2018). There are researched small but effective changes that could be made to benefit students.

Growth mindset is one example of this type of nudge that has been researched in the college environment (J. Aronson et al., 2002; Bostwick & Becker-Blease, 2018; Broda et al., 2018; Fink et al., 2018; Mills & Mills, 2018; Yeager, Walton, et al., 2016). The past research about students transitioning to college was specific to selective institutions and a broad student demographic. This study brought the concept

to a less selective institution to examine its effectiveness with a growing population of first-generation college students.

I demonstrated statistically significant changes in growth mindset scores for student participants in a growth mindset intervention. My research did not find higher first-semester GPA for students who participated in the intervention, after controlling for high school GPA. With closer inspection, I identified a confounding variable – my control group was not neutral. The students in the control participated in the session New Student Orientation had in place for years, a simple social-belonging intervention. My study found that students who participated in the control/social-belonging intervention had statistically significant higher GPAs than students who participated in the growth mindset intervention.

The study design did not align with my original intended research question. Instead of analyzing participation growth mindset intervention or not, my data shows that students who are from less selective institutions and identify as first-generation have higher first-semester success when they receive a social-belonging intervention compared to those receiving a growth mindset intervention. This is important for institutions to consider when wanting to improve college graduation rates for more vulnerable populations like first-generation college students. Both social-belonging and growth mindset interventions are simple. My study shows that a social-belonging intervention was significant to improving the first-semester GPA for first-generation students and there are important implications to the national conversation about ultimately improving college graduation rates.

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APPENDIX A
INSTITUTIONAL REVIEW BOARD APPROVAL



Institutional Review Board

DATE: May 21, 2019

TO: Erin Datteri-Saboski
FROM: University of Northern Colorado (UNCO) IRB

PROJECT TITLE: [1399098-2] Growth Mindset for Incoming College Students
SUBMISSION TYPE: Amendment/Modification

ACTION: APPROVAL/VERIFICATION OF EXEMPT STATUS
DECISION DATE: May 21, 2019
EXPIRATION DATE: May 21, 2023

Thank you for your submission of Amendment/Modification materials for this project. The University of Northern Colorado (UNCO) IRB approves this project and verifies its status as EXEMPT according to federal IRB regulations.

We will retain a copy of this correspondence within our records for a duration of 4 years.

If you have any questions, please contact Nicole Morse at 970-351-1910 or nicole.morse@unco.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Northern Colorado (UNCO) IRB's records.