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Navigating Success: First-Generation Pathways to Institutional Integration

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A dissertation presented in partial fulfillment for the degree of Doctor of Philosophy

at Virginia Commonwealth University.

by

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Abstract

NAVIGATING SUCCESS - FIRST-GENERATION PATHWAYS TO INSTITUTIONAL INTEGRATION

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

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Faced with declining numbers of college-going students and resulting shrinking budgets, institutions of higher education are directing increased focus on identifying strategies to yield, retain and graduate more students, particularly those who have faced inequitable outcomes, such as first-generation college students. Guided pathways mobile applications are one technology-based tool that colleges and universities have implemented in an attempt to educate and guide students through the myriad steps necessary to matriculate, integrate and successfully graduate from their institution at scale. Using Bourdieu's concepts of habitus and capital, Astin's model of student involvement and Tinto's model of student integration as a conceptual framework, and building upon the work of Slanger et al. (2015), this study investigated if the Educational Stress scale score from the College Student Inventory (CSI) can act as a measure of student habitus. In addition, this study used institutional data sets to investigate the relationships between habitus, first-generation student status and the utilization of the Navigate Student guided pathways mobile application on the matriculation, attempted credits and percentage earned credits for 4,771 first-time freshmen accepted to a large, public, high-research university

in 2019. Results indicate that first-generation college students had higher Educational Stress scale scores, were less likely to matriculate, attempted fewer credits, earned a smaller percentage of credits, and utilized the guided pathways application more than continuing-generation students. These preliminary results indicate that further research is warranted on utilization of the Educational Stress scale score as a measure of student habitus, as well as on usage patterns of the guided pathways mobile application and resulting impacts. Recommendations for further study are introduced.

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Chapter One: Introduction

After experiencing a 44% growth in enrollment between 2000 and 2010, 4-year degree-granting institutions in the United States have entered a period of declining enrollment. Between 2016 and 2027, 4-year degree-granting institutions are expected to see enrollment decrease by 2%, to a total of 10.6 million students (McFarland, 2018). This reflects a decrease of the total number of students enrolled in the K-12 system (Seltzer, 2016) due to a declining birth rate correlated with the Great Recession of 2008 (Grawe, 2018). In fall 2019, public 4-year institutions of higher education experienced a decrease of 1.2% from the previous year's enrollment (National Student Clearinghouse Research Center, 2019). As numbers decline, this smaller population of students is becoming increasingly diverse, due to a decrease in White and Black student enrollment and increase in Hispanic and Asian/Pacific Islands student enrollments (Bransberger and Michelau, 2016; Grawe, 2018). Furthermore, first-generation students made up approximately 33% of students enrolled in postsecondary institutions in 2011-12 (Cataldi et al., 2018). However, nearly 64% of college-going first-generation students did not earn an associate's, bachelor's or master's degree in comparison to 37% of their continuing-generation peers (Hoyer et al., 2017).

In addition, reductions in state appropriations for higher education have played a large role in the increases in tuition and fees seen at public institutions, which is also related to greater student loan debt (Zhao, 2019) and decreases in graduation rates overall (Zhang, 2009; U.S. Department of Education, 2012). In light of this prospective decrease in total enrollment, significant shift in demographics, increasing costs to students, and potential budgetary implications, postsecondary institutions are recognizing that it is in their best interest to place

increasing priority on yielding and retaining as many students as possible, since the number of potential enrollees available to replace a departing student has been reduced (Grawe, 2018; Whitley, et al., 2018).

These issues have also led postsecondary institutions to increase their analysis of enrollment, retention and graduation data to identify gaps in performance for differing populations of students in an attempt to develop better support systems for these populations of students in particular, and all students in general (Vuong, 2011). One such population of interest are first-generation students, which Peralta and Klonowski (2017) define as "individual[s] who...pursu[e] a higher education degree and whose parents or guardians do not have a postsecondary degree" (p. 635). This definition allows for the inclusion of students whose parent or parents may have started some postsecondary schooling but did not obtain a degree. This definition is also useful for campus-groups seeking to expand services to first-generation students; however, it is in conflict with the definition of first-generation students in use by the National Center for Educational Statistics (NCES).

The NCES defines first-generation college students "as students whose parents both have had no postsecondary education experience and have a high school education or lower level of educational attainment" (Hoyer & Redford, 2016, p. 3), which aligns with definitions by Ishitani (2006) and Chen (2005). Using this definition and NCES datasets, Chen (2005) found a 44 percentage point difference in bachelor degree completion rates between first-generation college students and students with at least one parent holding a bachelor's degree or higher (24% vs. 68%, respectively) (Hoyer & Redford, 2016, p. 2). Also, using NCES statistics, Tinto (2012) found that first-generation students were less successful in obtaining their bachelor's degree than their continuing-generation peers, even after controlling for

academic ability and socioeconomic status. Given this significant gap in degree attainment, Tinto called upon institutions to "provide students a coherent pathway that propels them to program completion. In doing so, institutions must also focus on the acquisition of knowledge and skills students require for life after college" (2012, p. 125).

A growing number of postsecondary institutions are actively developing these pathways with the explicit goal of increasing student degree attainment. In 2012, the American Association of Community Colleges (AAAC) launched a nationwide project focused on developing community colleges' ability to deliver academic and career pathways for their students. The 30 institutions comprising the AACC Pathways projects realized

> substantial gains in student outcomes by redesigning programs and services to improve the student experience along four dimensions: (1) create clear curricular pathways to employment and further education, (2) help students get on a path, (3) keep students on a path, and (4) ensure that students are learning along their path (AACC, 2017 p. 4).

Guided pathway projects "backward map" institutional programs and support services to ensure that students exit their programs of study prepared to thrive in employment and education at the next level (AACC, 2017). The maps or paths may be as simple as PDF documents that outline the specific courses in a sequential series that meet the requirements for a four-year graduation model. Other institutions add information such as gateway class indicators, which highlight key courses within the curriculum with minimum grade expectations for successful completion of the program. Some institutions also include career information such as salaries, job titles and employers that relate to specific majors. Sophisticated technology integrates the pathways to benefit student performance, identify off-track students, guide

students into better-fit majors, and predict student enrollment patterns to ensure courses are available to facilitate on-time student progression and graduation. Examples of these products, each with varying focuses, include; EAB's Navigate Student, Ellucian's DegreeWorks and Student Educational Planner, Hobson's Connect and Starfish, and Civitas' Degree Map.

According to Tinto (2012), students must receive explicit explanations about the expectations the institution has for them in order to be successful. These expectations are expressed concretely through advising, syllabi, orientation activities and interactions with faculty and staff. Because pathways projects are typically available online, they provide students with a written step-by step guide that they can access as needed to learn more about these expectations. As a result, increasing numbers of software vendors are entering the higher education marketplace to deliver technology solutions that automate the pathways process (The Ada Center, n.d.). These tools assist students by providing explicit instruction and information on the steps they need to take in order to successfully matriculate and complete their degrees, while also providing connections to resources. Technology can be utilized to engage and prepare students for matriculation, help them identify their end goals and find the curricular pathway to meet those goals, nudge students towards staying on their pathways, support learning in the classroom and continually improve the student experience (The Ada Center, n.d.).

Additionally, some institutions choose to include information about the student and professional organizations, resources and experiential activities that successful students engage in and utilize in their progression toward graduation and meeting their post-collegiate career and educational goals. The inclusion of this type of information may provide students with an additional level of support by helping them become more fully integrated in the university

through the acquisition of cultural capital. Tinto (2012) defines *integration* as "the degree to which a person integrates the values and norms of a community into his or her own value system," (p. 160) with the effect of the student perceiving or not perceiving themselves as being included and valued within that community. Integration is related to the concept of *engagement,* which Tinto defines as "the person's interaction with those values and norms and the individuals who share them" (p. 160). According to Tinto, students can be engaged in an institution, meaning that they participate in activities and courses without internalizing their commitment to the espoused values of that institution; such students are not truly integrated into the institution. Astin's (1984) *student involvement* is similar to Tinto's concept of engagement, in that it refers to student behaviors rather than the internal assimilation of culture, values and beliefs that occur during integration.

Many students start their postsecondary schooling without knowing what to expect from their interactions within the institution. In particular, first-generation and low-income students have been theorized to "lack the sorts of shared knowledge, or cultural capital, that more affluent students and those from college-educated families commonly possess about the nature of the college experience and what it takes to succeed" (Tinto, 2012, p. 11). Davis (2007) describes this situation as students being unfamiliar with the "culture" of college. Pathways projects that include detailed information about the academic, social, and professional expectations of the institution may help first-generation and low-income students persist to graduation by helping them become aware of and start acquiring cultural capital through increased engagement, which theoretically would then lead to greater levels of academic, social and institutional integration.

The beneficial effects of pathway projects may be greatest at large, public four-year institutions, where the size of the institution can allow for students of all types to fall through the cracks, and where first-generation students in particular may struggle with making the academic and co-curricular decisions needed to be successful (Davis, 2010). Pathways projects may provide a normalizing effect to first-generation students by providing them access to the same academic and social capital as their peers with college-going parents, without having to solely rely upon the traditional support services for first-generation students, such as TRIO or other campus-specific organizations which may have limited accessibility.

Problem Statement

Guided pathways projects have been implemented at a large number of two-year schools, and more recently at four-year schools. However, there have been few studies investigating the specific impacts these projects have on individual student success. Most studies have been institutional case studies that look at pathways projects as methods of inducing organizational change, or have been internal vendor produced studies. This study provides preliminary research on the utilization and impacts of guided pathways mobile applications on first-generation college students at a large public research institution. This information is necessary for colleges and universities to determine if investments of resources for the implementation and support of these tools is warranted. In addition, by employing the lens of habitus and student integration as theoretical models, this study contributes to those fields by helping to determine if the CSI Educational Stress Scale score can be used as a measure of habitus. Finally, this study will add to the well-established bodies of literature of first-generation student success.

Study Overview

This quantitative, descriptive and correlational study was designed to investigate an intervention in use on four-year college campuses created to help improve retention and graduation rates by increasing students' ability to navigate college and participate in high-impact practices through the acquisition of cultural capital and integration into the college habitus. The goals of this study were to:

- Investigate the relationship (if any) between first-generation student status and level of habitus as measured by the Noel Levitz College Student Inventory's Educational Stress scale score;
- Better understand student utilization of a guided pathways mobile application (app) at a large, selective research institution, and if the adoption and utilization rates vary by first-generation student status and habitus;
- Investigate the relationship (if any) between first-generation status and enrollment, and if this relationship is moderated by guided pathways app utilization and level of habitus, and;
- Inform practitioners and scholars on the utilization of a guided pathways mobile app and the potential impacts on first-generation student success in higher education.

Researcher's Background and Interest in the Study

Over the past 20 years, I have worked in both public and private high-research universities in a variety of administrative roles. I started my career as an academic advisor and then moved into career advising at a large, urban highly selective private institution. There, I saw the tremendous impact that access to the cultural capital of that institution could have on first-generation and low-income students' social mobility. By completing internships in their

field, and by building strong student and professional networks, many students graduated from our program with careers that placed them on a path to greater social mobility. As I moved into program administration, it became very clear to me that it was a department's responsibility to design the curriculum in a manner that facilitated equitable outcomes for all of our students. Within the department where I worked, internships and professional development were graduation requirements, and students were coached and mentored by faculty into the activities and programs that supported their career goals. In this small, well-resourced environment, it was relatively easy to connect students to the cultural capital they needed to be successful in their future careers and continued study.

Later, I moved to a large, urban, less-selective public institution as a Director of Advising. There, I saw how difficult it would be to adapt and scale the cultural capital acquisition model from my previous institution. First, the number of first-generation and low-income students at the public institution were significantly higher. Second, the institution had fewer resources available to support students. In particular, the tight-knit student-faculty mentoring relationships evident at the private institution were rarer at the public institution. Third, participation in the key activities needed to be successful in their fields of study were not formal parts of the curriculum or required activities. To complicate matters further, access to some of these resources was restricted by policy. For instance, some department policies restricted access to credit-bearing internships to students with high grade point averages (GPAs), while other departments did not allow for credit-bearing internships to count towards degree completion.

Later, I became involved in the development of a guided pathways project, and saw the potential to increase student engagement in the activities they need to do to be successful in

their careers, and the resulting deeper integration into the institution. By working with career development and faculty to create the guided pathways major maps, academic advisors were able to identify key organizations and activities that led to potential gainful employment in related careers for a particular major. Faculty also identified curricular stumbling blocks for students and worked to resolve them by reordering course sequencing and prerequisites. Upon completion of the guided pathways project, academic advisors had a tool to help all students successfully navigate their degrees from start to finish, and a methodology for all students to acquire the cultural capital necessary to be successful in their careers.

Next, I moved into a role responsible for publishing the pathway documents to the web, so that students, advisors, faculty, staff, parents and prospective students could access the information easily. After completion, I wanted to learn more about how the pathways were actually being used by students, and in particular by first-generation students. In fall of 2018, I interviewed four first-generation students to learn more about their interactions with the major maps. I wanted to learn more about how students used the maps, and what benefits they received by doing so. Through the interviews, I found that first-generation students preferred to use the maps with peers, particularly in peer mentoring relationships, and their first-generation counselor. They also considered using the maps as a conversation starter to approach and interact with faculty. Students thought that the maps were a helpful resource to direct them to activities that would maximize their time in college: “Oh man, I wish I would’ve thought to do that . . . I should be taking advantage of getting more experience” (Student One).

I also found that the guided pathways project provided a way for first-generation students to educate their family members about the activities, experiences and organizations they need to engage in in order to be successful. As one participant noted, “For them especially,

they could learn more about what I have to do as a college student to make sure that in the end, I'm going to have a job afterwards" (Student Two). As parents of first-generation students become armed with this data, they can provide an additional layer of support to their students, while also gaining a better understanding of the time and commitment their students must undertake to be successful in reaching their post-collegiate goals.

Student Two saw the value of the maps as part of the major decision-making process, and expressed interest in seeing the maps during the admissions process to the university:

> Definitely transfer students, because they could use this, for sure. Or prospective students. It should be highlighted a lot. A lot of people, they always come in as biology or chemistry, and then change after their first semester. They come in undeclared, **but you could come in as a declared major, because you'll have all the information that you need, and they could definitely pre-plan their whole entire four years here before they even get accepted** (emphasis mine). If they could see all this information, they could do the pros and cons of all the different majors and stuff like that, based off of their financial status or availability to rides and things like that.

The maps also provided an important sense of validation to Student Two, as she checked items off of her map as she completed them. "I saw that I did some things on here too. I feel pretty accomplished. I was like, "Okay. I did alternative spring break. I did all that stuff." Terenzini et al., (1994) and Rendon (1994) found that academic validation was particularly important for first-generation students, and that all new students need to be reassured that they can complete college-level work and be accepted by their faculty, staff and peers.

This research also provided some insights into the meaningful activities that first-generation students engage in as they strive to achieve their collegiate and post-collegiate

goals. Their experiences were varied, were in-line with their academic and career goals and provided practical experiences to support them post-graduation. This finding confirmed my belief that institutions should ensure that all majors have multiple opportunities for students to gain practical experiences directly related to their major/career field of study listed on the maps. This finding is supported by the research of Lohfink and Paulson (2005), who found that first-generation students were found to be more likely to persist if they participated in academic-related clubs and organizations, especially those that included faculty participation, whereas continuing-generation students were more likely to persist if they participated in campus clubs.

Ultimately, this small qualitative study convinced me that this issue is worthy to investigate on a larger scale to better understand the impacts that guided pathway projects have on first-generation student behavior in college. This research aligns well with my larger professional interest and goals, which remain focused on increasing persistence and graduation rates at the university for which I work. These goals cannot be achieved without eliminating the gap in first-generation student retention.

Significance

This study is significant because it contributes to three bodies of literature. The first is the literature that investigates factors related to first-generation student success in postsecondary environments. In particular, this research adds to a growing body of literature investigating first-generation student behavior during the transition year to college (Mu & Cole, 2019). In addition, it contributes by adding to the empirical research supporting theories of the impacts of habitus and the acquisition of social, academic and cultural capital on first-generation integration in postsecondary environments. Finally, it adds to the literature investigating the

impacts of the usage of technology-based outreach tools like texting and guided pathways on student matriculation and persistence. Higher education institutions invest significant time, effort and resources in deploying interventions like guided pathways and survey instruments such as the College Student Inventory. It is important to examine the effectiveness of these projects to determine if they are successful in helping students to successfully matriculate and be successful at their institutions. In particular, it is important to learn if these projects are successful in supporting an equitable experience for minority students in higher education, such as first-generation student learners.

Research Questions

The research questions that guided this study areas follows:

Research Question 1:	Is there a relationship between guided pathways mobile application utilization and Educational Stress scale scores?
Research Question 2:	Do educational stress stanine scores, number of credits attempted and percentage of credits earned vary by first-generation student status?
Research Question 2a:	Does the relationship between educational stress stanine scores and first-generation student status vary by levels of guided pathways mobile application utilization?
Research Question 2b:	Does the relationship between number of credits attempted and first-generation student status vary by levels of guided pathways mobile application utilization?

Research Question 2c:	Does the relationship between percentage of credits earned and first-generation student status vary by levels of guided pathways mobile application utilization?
Research Question 3:	Is there a relationship between first-generation student status and enrollment?
Research Question 4:	Is there an association between educational stress and enrollment?
Research Question 4a:	Is the relationship between levels of educational stress and enrollment moderated by first-generation student status?
Research Question 4b:	Is there a difference in mean educational stress scores between students who enroll versus those who do not enroll, and does this differ by first-generation status?
Research Question 4c:	Is the relationship between Educational Stress scale scores and enrollment moderated by guided pathways mobile application utilization?
Research Question 5:	Is there a relationship between levels of guided pathways mobile application utilization and enrollment?
Research Question 5a:	Does the relationship between levels of guided pathways mobile application utilization and enrollment status vary by first-generation student status?
Research Question 5b:	Is the relationship between levels of guided pathways mobile application utilization and enrollment moderated by each level of educational stress?

Summary of Methodology

In order to answer the research questions described in the previous section, the researcher conducted a quantitative, descriptive and correlational design using secondary data sets already gathered by a large, public research institution. Students' pre-college levels of cultural capital and habitus were measured using the Educational Stress scale score from the *Noel Levitz College Student Inventory Form B (CSI).* All incoming first-year students for the fall 2019 semester (*N*=4,771) were asked to complete the *Noel Levitz College Student Inventory Form B (CSI)* as part of orientation, which was held in June and July of 2019. Students were asked to complete the 30-45 minute, 100-question online survey prior to attending orientation using the students' own computer or mobile device. Students were emailed a link to the survey approximately 15 days prior to attending orientation on campus. They also received reminder emails to complete the survey five days and two days prior to their orientation date. Students who did not complete the survey prior to attending orientation were asked to complete the survey during a designated time on the first morning of a two-day residential orientation program. Students who failed to complete the CSI on their own or as part of orientation received reminder emails to complete the survey, since results from this survey inform the students' first required advising appointment on campus in the fall. Ultimately 4,151 students completed the CSI, for an 87% completion rate.

All students were also encouraged to download and utilize EAB's Navigate Student guided pathways mobile application to help them with the new student onboarding process. This app contains helpful tips, to-dos and timelines to complete the necessary steps to accept the offer of admission, obtain financial aid, enroll in classes in the fall, as well as tips on how to be successful on campus once classes have begun. Instructions to download the guided pathways

mobile app were included in the Admissions and Orientation checklists, as well as in the online orientation module students were expected to complete prior to attending orientation. Students were also guided to download and use the app to view their fall semester class schedule by their academic advisor on day two of orientation. Students were categorized as non, passive, low, medium or high-level users of the app based upon the following criteria: if they downloaded the app and the number of items that they indicated that they completed within the app prior to the first day of the fall semester.

The researcher obtained these data from the university along with additional demographic information added to the data set to provide context for generalizability of the data beyond this specific public research university. These data points included race/ethnicity, gender, first-generation student status and enrollment status (yes or no) at the start of the first fall semester. A detailed description of the methodology is outlined in Chapter Three.

Organization of the Study

This study is organized in five chapters and includes a reference section and appendix. The first chapter introduces challenges facing higher education institutions in meeting graduation outcomes in light of changing demographics of enrollment and decreased state funding. It then narrows its scope to investigate the challenges faced by first-generation students in particular, as they lag behind their continuing-generation peers in persistence and graduation measures. Next, it introduces how guided pathways may help bridge these gaps in persistence and graduation by helping first-generation students integrate into their institutions of higher learning. Finally, it provides key terms and definitions as reference.

Chapter Two presents a summary of the relevant literature related to first-generation student success in college and guided pathways projects, as well as an overview of how

Bourdieu's concepts of habitus and cultural capital can help explain why guided pathways projects may help students' integration on campus. Chapter Three contains descriptions of the participants, methods of data collection, variables of interest, the measurement instruments, including the College Student Inventory instrument, the statistical design and potential limitations of the study. Chapter Four presents the study data as analyzed and includes a summary of findings. Chapter Five provides conclusions and implications of the findings and recommendations for future research.

Definition of Terms

The following terms are defined here in order to ensure a common basis of understanding throughout the study.

College Student Inventory (CSI) Form B: a 100-item questionnaire, typically taken by first-time college freshman during orientation or during the first few weeks of classes, developed by Ruffalo Noel Levitz to assess students' pre-college predispositions, motivations and needs. Institutions use this information to design and deliver student-specific and cohort-level interventions aimed at increasing integration on campus and persistence to the next semester.

Continuing-generation student: an undergraduate who has at least one parent who completed bachelor's or higher degree.

Cultural capital: Tools and information about navigating systems that are transmitted to students. Examples of **Educational cultural capital** include the process of applying to college, navigating institutional bureaucracies, contacting faculty and employers. **Academic cultural capital** includes educational backgrounds, academic preparation, interpersonal skills, habits, manners and preferences. **Economic capital** includes money, material objects, owned goods,

and utilization of financial aid and resources. **Social capital** refers to the expectations, information, norms, and values that are shared via interpersonal relationships within a given context. Students with high levels of social capital receive powerful benefits associated with group membership (Padgett et al., 2012). Status-bridging cultural capital involve relationships with non-parental, college-educated adults that have the potential to provide connections to information or opportunities for social mobility.

Educational Stress Scale Score: One of four summary scale scores on the College Student Inventory that measures a student's general feeling of distress in the college environment. It was developed as a factor analysis of all of the CSI scales. This score factors in family support of the student, their receptivity to receiving counseling services as well as their previous educational experiences. Students scoring high on this scale tend to have previous unsatisfactory interactions with teachers, lower than average intent to finish college, and lower academic and study habits (Ruffalo Noel Levitz, 2019).

Enrollment: For the purposes of this study, enrollment is defined as being registered for one or: more credits as of the second census date of the fall semester.

First-generation student: As discussed earlier, first-generation students are defined in a wide variety of ways in the literature, which complicates analysis across studies. For the purpose of this study, the definition of a first-generation student will follow the definition used at the research location, which aligns with Peralta and Klonowski's (2017) definition. The institution for this study obtains the category first-generation from a calculated field within the Common Application that students complete as part of the application process. This is the same definition that is used by the federal government as described in the Higher Ed Act of 1965:

> The term ‘‘first-generation college student’’ means—

(A) An individual both of whose parents did not complete a baccalaureate degree; or

(B) In the case of any individual who regularly resided with and received support from only one parent, an individual whose only such parent did not complete a baccalaureate degree.

Habitus: "A web of perceptions about opportunities and the possible and appropriate responses in any situation" (Walpole, 2003, p. 49). Students use the varying forms of capital that they have acquired from previous experiences, families and mentors, to successfully navigate educational environments. Failure to deploy capital at the appropriate times results in negative feedback and alterations to a students' habitus (Gaddis, 2013). Habitus can be roughly summarized as how individuals within a group unknowingly perceive and react to their social environment in common ways through the manifestation of cultural capital.

Pivotal moment: The point when a student receives specific academic information that allows for an interruption of the process of cultural reproduction that discourages first-generation students from accessing educational systems. This transmission of information is transformational for students who have not yet had access to it from their family or community.

Pivotal moment educator: An individual who provides two sources of support to the student through the development of a trusting relationship: emotional encouragement and promotion of student interest, and knowledge transmission to enable navigation of bureaucracy, social networking, and decision making.

Levels of Guided Pathways Mobile Application Utilization Definitions:

- Did Not Download - student never downloaded the guided pathways mobile application
- Passive Use - student downloaded the guided pathways mobile application, but did not check off any to-do items in the app

- Low Use - student completed between 1 and 5 to-do items in the app
- Medium Use - student completed between 6 and 9 to-do items in the app
- High Use - student completed more than 10 to-do items in the app

Levels of Educational Stress Definitions

- Above Average - scores of 7, 8, 9
- Average - scores of 4, 5, 6
- Below Average - scores of 1, 2, 3

Chapter Two: Literature Review

As stated previously, first-generation students complete bachelor degrees at lower rates than their continuing-generation peers (Ishitani, 2006). Within six years of enrolling in a public or private four-year institution in 2003-4, only 65% of first-generation students had earned a bachelor's degree, in comparison to 83% of continuing-generation students (Cataldi et al., 2018). Even after controlling for demographic backgrounds, academic preparation and performance, first-generation status is significantly and negatively associated with lower bachelor's degree completion rates (Chen & Carroll, 2005). Most research on first-generation college students find that this group of students face significant struggles in their pursuit of college degrees. In this chapter, I will first present research describing first-generation students, their college enrollment, and persistence. Next, I will present the theoretical framework for my study, which integrates student integration theory with the concept of habitus as a possible explanation for why fewer first-generation students successfully complete their degrees. Finally, research on guided pathways and potential benefits to first-generation college students will be explored.

First-Generation College Students

Academic Preparation

In order to succeed in college, students must have or quickly acquire the academic skills and preparation needed to earn good grades in their classes. Unfortunately, researchers have found that first-generation students may be less academically prepared for success in college than their continuing-generation peers in a variety of ways. For example, first-generation students expressed less interest in taking the SAT/ACT in their sophomore year of high school

than their continuing-generation peers (Hoyer et al., 2017). Fewer first-generation students (18%) than continuing-generation students (44%) earned Advanced Placement or International Baccalaureate credits in 2003-04 (Cataldi et al., 2018). Cataldi et al. (2018) also found that first-generation students took advanced math courses at lower rates than their continuing-generation peers. Twenty-seven percent of first-generation students took precalculus in comparison to 43% of their peers. Only seven percent of first-generation students took calculus, in comparison to 22% of their peers.

First-generation students also did not perform as well in high school. First-generation students tend to have lower GPAs than continuing-generation students (Chen & Carroll, 2005; Stephens, Hamedani, & Destin, 2014). Forty-three percent of first-generation sophomores in 2002 had high school GPAs above a 3.0, in comparison to 56% of their continuing-generation peers (Cataldi et al., 2018). DeAngelo and Franke (2016) found that 23% of academically underprepared college students are first-generation, in comparison to just 15% of well-prepared college students. In turn, first-generation students were much less likely to attend a four-year institution than their continuing-generation peers (40% vs 70%) (Hoyer et al., 2017).

However, first-generation students with adequate college preparation fare as well as their continuing-generation peers. Warburton, Bugarin and Nunez (2001) found that first-generation students who are highly prepared for college make up nearly 80% of the students who persist to degree-completion. They found no difference in persistence towards graduation between first-generation and continuing-generation students who took rigorous coursework in high school. In addition, they found that first-generation students who scored in the lowest quartile of college examinations were more likely to leave their postsecondary studies in the second year. This finding was replicated by Ishitani (2006), who found that students with the lowest

academic rigor or school intensity were about 1.7 or 1.9 times more likely to depart than students with the most academic preparation or rigor. DeAngelo and Frank found that college readiness moderates first-year college retention for low-income and first-generation students (2016). These findings indicate that rigorous academic preparation in high school is an important first step towards successfully completing a college degree. Unfortunately, Cataldi et al. (2018) found that only 16% of first-generation students took an academically focused curriculum in high school, in comparison to 37% of continuing-generation students.

Postsecondary Enrollment Patterns

In 2002, first-generation students were less likely to enroll in postsecondary education directly after high school than their continuing-generation peers (58% versus 78%) and were much more likely to enroll in a public two-year institution than their continuing-generation peers (46% versus 26%) (Cataldi et al., 2018). Only 33% of first-generation students enrolled in postsecondary institutions were enrolled in four-year colleges, compared to 68% of continuing-generation students (Cataldi et al., 2018). Chen and Carroll (2005) also found that first-generation students were less likely than their continuing-generation peers to enroll in college within eight years after high school. In 1992, first-generation students made up 28% of 12th graders, yet made up only 22% of postsecondary enrollment in the years between 1992 -2000 (Chen & Carroll, 2005).

First-generation students lag behind their peers in accumulating credits toward their degrees. Chen & Carroll (2005) found that on average, first-generation students earned seven fewer credits during their first year (18) than their peers whose parents had a bachelor's degree or higher (25). This discrepancy continues throughout their entire enrollment, with first-generation students earning on average 66 credits compared to 112 credits earned by

continuing-generation students (Chen & Carroll, 2005). In addition, first-generation students withdrew or repeated 12% of their courses, in comparison to 5% of their continuing-generation peers (Chen & Carroll, 2005). Additionally, first-generation students tend to have lower grade point averages than continuing-generation students (Chen & Carroll, 2005; Stephens, Hamedani & Destin, 2014).

Time of Departure

First-generation students are more likely than their continuing-generation peers to drop out of college in any year of enrollment; however they were most likely to depart in the second year of college, when they are 8.5 times more likely to depart than their continuing-generation peers (Ishitani, 2006). This dropout risk waned over time after the second year. Low-income students were 2.3 times more likely than high income students to depart in their first year of college (Ishitani, 2006). DeAngelo and Franke (2016) found that continuing-generation students who were less prepared for college were retained at higher rates through their first year than similarly matched less ready first-generation students. Cataldi et al.,(2018) found similar departure patterns in students who enrolled in postsecondary education in 2003-2004, where 33% of first-generation students had departed by the third year, in comparison to just 14% of students whose parents had earned a bachelor's degree. Colleges and universities should be aware of this timing of departure and ensure that first-generation students receive purposeful interventions in the first semester of enrollment (Ishitani, 2003).

Racial/Ethnic Diversity

As stated previously, first-generation college students make up approximately 33% of the undergraduate enrollment on college campuses (Cataldi et al., 2018), and they play a large

role in the diversification of campuses. Hoyer et al. (2017) also found that first-generation students are more likely to be racially/ethnically diverse and non-native English speakers than their continuing-generation peers. White students make up 70% of the continuing-generation student population but only 49% of the first-generation student population. In contrast, Black & Hispanic students make up a larger proportion of first-generation students (14% & 27% respectively) than continuing-generation students (11% & 9% respectively). First-generation students are also more likely to be married and have children than their continuing-generation peers (Nunez & Cuccaro-Alamin, 1998).

Financial Demographics

Hoyer and Redford's (2017) study found that first-generation students were much more likely to come from lower-earning households than their continuing-generation peers who had at least one parent who earned at least a bachelor's degree. 77% of first-generation student families earned less than $50,000 per year, in comparison to just 29% of their continuing-generation peers. In addition, just 8% of first-generation students came from families earning more than $75,000 per year, while 48% of continuing-generation students did (Hoyer & Redford, 2017). According to these findings, first-generation students may face greater financial challenges in completing their degrees. Ishitani (2006) found that "students from family incomes ranging between $20,000 and $34,999 were 72% more likely to depart than were students with family incomes of $50,000 or higher. First-generation students also lack the necessary decision-making skills needed to navigate the student loan process (Lee &Mueller, 2014), which further complicates their ability to afford college.

This relationship between first-generation and low socio-economic status (SES) has additional implications for first-generation student integration on campus. Walpole (2003) found

that low-SES students interacted less with faculty than high-SES students and engaged in fewer student clubs or groups. These activities provide important opportunities for accumulating cultural capital such as letters of recommendation or social capital through increased networking with peers. Walpole (2003) also found that low SES students reported working for pay more, which enables their accumulation of economic capital, but depending upon the nature of their work, this economic capital may or may not be in line with their post-educational goals, and may jeopardize their accumulation of cultural or academic capital. Walpole also found that low-SES students report lower GPAs than their high-SES peers and devote less to time studying (2003).

Reasons for Not Completing Degrees

Nearly 64% of college-going first-generation students did not earn an associate's, bachelor's or master's degree in comparison to 37% of their continuing-generation peers (Hoyer et al., 2017), replicating earlier findings by Chen and Carroll (2005). Hoyer et al.(2017) also investigated why first-generation students did not complete a postsecondary credential. First-generation students were nine percentage points more likely to give a financial reason for non-completion than their first-generation peers. In addition, they were more likely to cite a change in family status as a reason to not complete their degrees (42% vs. 32%). More first-generation students report working full-time while enrolled in school than their continuing-generation peers (33% vs. 24%) (Nunez & Cuccaro-Alamin,1998). Additional reasons given for not completing degrees by first-generation students are shown in Table 1.

Graduation outcomes

Research indicates that first-generation students who persist to graduation enjoy some of the same benefits of degree completion as their continuing-generation peers. Four years after graduation from college, 2007-8 bachelor's degree receiving first-generation students were employed at statistically equivalent rates (57% and 59%) and salaries ($43,000-$45,500) to their continuing-generation peers (Cataldi et al., 2018). Nunez & Cuccaro found similar results in their 1998 study. These studies contradict findings by Walpole (2003), who found that low-SES students reported lower incomes than their high-SES peers. After completing their first bachelor's degree, first-generation students enroll in (41% versus 46%) and complete (57% versus 61%) additional degree-granting programs at lower rates than their continuing-generation peers (Cataldi et al., 2018; Nunez & Cucarro-Alamin, 1998; Walpole, 2003).

Table 1

Reasons for Not Completing a Post-secondary Credential

	First-generation	Continuing-generation
Couldn't afford to continue going to school* **	54%	45%
Would rather work and make money	46%	49%
Change in family status* **	42%	32%
Conflicting demands at home	31%	27%
Personal problems, injury or illness	25%	23%
Classes not available, or inconvenient	20%	16%
Job or military considerations	18%	19%
Difficulty completing requirements for program	16%	16%
Finished taking desired classes	10%	10%

Note: *** indicates significant differences between first-generation and continuing-generation behavior)

SOURCE: U.S. Department of Education, National Center for Education Statistics, Education Longitudinal Study of 2002 (ELS:2002), Third Follow-up, 2012. Restricted-Use Data File

Theoretical Framework

In the previous section, I explored the literature surrounding first-generation students in college. In this section of the chapter, I investigate how theories of cultural capital and student integration can be used to provide one possible explanation of why first-generation students face difficulties in completing college successfully.

Cultural Capital Models of Integration

While all students face some challenges transitioning from high school to college, many first-generation students arrive on four-year college campuses unfamiliar with the culture of college. According to Davis (2007), this status means that they are new to the "insider knowledge, the specific language, and the subtle verbal and nonverbal signals, that after one has mastered them, make one a member of any in-group, community or subculture" (p. 29). Failure to acquire this insider knowledge quickly may cause students to face a difficult transition into their college environments due to the lack of a feeling of belonging. Students who do not achieve this sense of belonging, or those who are unable to become comfortable on campus even in spite of not fitting in, may be at high risk of departure (Davis, 2007).

Students receive information about the culture of college from whomDavis (2007), calls *guides* or *experts*. Guides are individuals who can share stories about their on-campus experiences. These stories may cover topics like moving into the dorms and facing challenging conversations with roommates who hold different perspectives to how they recovered from their first failing grade. They may also encourage students to participate in activities and organizations that add to their social or cultural capital (Espinoza, 2011). In contrast, *experts* are individuals such as academic administrators, advisors, and faculty, who are so entrenched in the

official minutia and processes of college that they have a difficult time explaining how to behave in college but instead enforce the rules of college (Davis, 2007).

Continuing-generation students start receiving information from guides at a very young age, most likely this information is handed down to them from their parent(s) or connected social networks. Davis calls this *generational knowledge* (2007), and it situates continuing-generation students within the culture of college. First-generation students need access to this *guide information* (Davis, 2007) in order to become acclimated to and integrated within the college culture during the important first year (Somers, et al., 2004).

Bordieu's Theory of Social Reproduction (1977)

It is helpful to utilize Berger's (2000) review of Bordieu's Theory of Social Reproduction (1977) as a lens to understand how generational knowledge or guide information is created and transmitted, and how postsecondary institutions participate and perpetuate that process. Bordieu described several forms of capital, two of which were primary forces in the process of social reproduction: economic capital and cultural capital. Economic capital includes money, material objects, owned goods, and utilization of financial aid. Cultural capital includes educational backgrounds, academic preparation, interpersonal skills, habits, manners and preferences. Cultural capital is acquired throughout the lifetime, primarily through family relationships and secondarily by educational socialization (Berger, 2000). The acquisition of cultural capital enables individuals to be conversant with the dominant ideas and values that are rewarded within an educational system (Rothman, 2002). Other forms of capital exist including artistic, intellectual and social capital. Capital can be accumulated over a lifetime and passed on through generations.

Individuals with large amounts of capital (in its various forms) are able to use their capital for access to (and to limit others' access to) social and class standing. Through the careful acquisition of additional forms of capital, individuals are able to increase their social and class standing. While economic capital is typically a material resource, cultural capital is a symbolic resource (Berger, 2000) that is valued by individuals with access to similar levels and types of capital. Summarizing Bordieu, Berger (2000) states that:

> People who live similar lifestyles because of their common level of access to capital develop a shared worldview as a result of common experiences and interaction. This habitus fosters a common representation of the world in a class specific manner at a cognitive, taken-for-granted level. Thus certain preferences and tendencies become routinized as part of an individual's worldview. People unconsciously classify themselves with others based on common preferences and expectations. This also serves as a mechanism for marginalizing others who have access to different amounts and types of capital (p. 99).

Capital is a resource, but habitus is a lens to interpret the value of that capital. "Habitus is the set of dispositions that allow one to see opportunities as available or unavailable--habitus contributes to whether one sees an opportunity, such as accessing higher education, as available — or not — based on their life experiences" (Luedke, 2020).

Educational institutions can then be interpreted to have a habitus, a system of shared dispositions. As an example, according to *US News and World Report* (2020), UCLA and UC Berkeley are the number one and number two public colleges in the United States. They both enroll about 32,000 students per year, and cost about $14,000 per year for in-state students and $43,000 per year for out-of-state students. Based upon this information alone, one might

suppose that their student populations and habitus would be fairly equivalent. But instead, these institutions have different student bodies and campus feelings. Berkeley is often associated with student activism and intellectualism in the Bay Area of California, while UCLA is often associated with athletics and the entertainment industry, being that it is in Los Angeles.

These two institutions, while academically fairly equal, each have their own internal shared values (habitus), and it is the combination of the institution's recruitment of congruent students in conjunction with a student's choice to attend that simultaneously creates and reproduces the institution's habitus (Berger, 2000). This habitus unconsciously validates students with equivalent levels of capital and marginalizes students with differing levels of capital. Students with different levels of cultural capital may feel less fit with the institution, and therefore may feel less commitment or entitlement to earning a degree from that institution (Berger, 2000; Padgett et al., 2012). In contrast, students whose levels of cultural capital match the habitus of the educational institution may be able to achieve greater levels of integration with the school. Students with higher levels of access to cultural capital tend to participate in an educational habitus that assumes completion of a bachelor's degree as part of the bounded reality of that habitus (Berger, 2000).

The habitus of institutions of higher education is organized by and perpetuates the cultural norms and academic expectations of the continuing-generation and high-SES student (Stephens, Hamedani, & Destin, 2014). First-generation and low-SES students who enter this environment without sufficient support or preparation may experience emotional distress, a lack of sense of belonging, negative self-perception and fears of failure or lack of motivation (Jury et al., 2017). Rachel Gable's *The Hidden Curriculum* (2021) provides a detailed account of the many differences experienced by first-generation and continuing-generation students as part of

their transitions to an elite college. In particular, first-generation students arrived feeling less prepared for college and also did not know what to expect, while feeling alienated because of their prior life and educational experiences.

Lehman (2007) found that continuing-generation students were more likely to leave college due to academic failure (i.e. being forced out of the institution, not choosing to leave), whereas first-generation students were more likely to leave for non-academic reasons, mostly because of feelings of discomfort in their college environments. Lehman posits that this discrepancy is due to continuing-generation students participating in the bounded reality of the college-going habitus, while the first-generation students who decide to leave do so through the lens of the habitus of their pre-college selves, were college attendance may have less importance or value. Lehman also found that first-generation college student stop-outs were more likely to successfully re-enroll at institutions where they expected to feel "at home." For those first-generation students who chose to not re-enroll, they often justified their decision to drop-out because college just "wasn't for them."

As another example of this conflict of values, Stephens, Fryberg et al., (2012) posit that universities are likely to promote the independent values (such as learning on your own, working independently, learning how to promote yourself) valued by high-SES students instead of the interdependent values of learning how to work in teams and how to adjust to others' expectation, which are more congruent with low-SES students. When first-generation students are exposed to these independent values, they may feel less comfortable, experience stress, and may not perform to their potential, possibly leading to departure.

Shared habitus also fosters belongingness and inclusion, while marginalizing those outside of its sphere of unconscious influence. Students who inhabit the shared habitus of their

colleges or universities not only believe that they are entitled to a college education, but also believe that they are entitled to a degree from that institution. In contrast, students with mismatched levels of cultural capital may feel that they are less entitled to earn a degree from that institution. This lack of entitlement may cause the mismatched student discomfort and contribute to their decision to depart (Berger, 2000).

Student Involvement/Integration Models

Alexander Astin's 1991 Theory of Student Involvement, also known as the I-E-O College Impact Model, has served as the foundation of many student development models, particularly those that attempt to understand how students interact with institutional programs to achieve specific learning outcomes. Astin's (1991) I-E-O College Impact Model proposes that the Inputs (I) of the students interact with the Environment (E) they experience while enrolled in college to result in the Outputs (O). Inputs can be thought of as the context of the students: their previous academic preparation, their demographic background, any previous experiences, etc. Environment consists of all of the experiences that the student has while enrolled in college. This construct includes everything from the first letter the student receives upon point of admission and carrying on to include dorm life, classroom expectations, peer groups, campus climate, student organizations, academic advising, etc. Outputs or outcomes are the skills, knowledge, beliefs, traits, etc., that students have after completing college as a result of their participation in the Environment of the school. Astin's model remains a foundational theory for the importance of student co-curricular involvement in student retention and persistence in postsecondary education.

Student involvement on campus, both in and outside the classroom, leads to greater social and academic integration (Astin, 2012; Tinto, 2012). There is a large body of college

student development research showing that participation in educationally purposeful activities is the single best indicator of student learning and development (Mayhew et al., 2016). Academic integration, in particular, is a key indicator of first-generation success on campus (Filkins & Doyle, 2002; Lohfink & Paulsen, 2005). Lohfink and Paulsen's instrument measured academic integration as an index that measured how frequently the student had social contact with faculty, met with an academic advisor, talked with faculty about academic matters outside of class, or participated in study groups. Terenzini et al. (1996) found that all students benefit when they interact with other students and faculty on projects or activities that are intellectual in nature. However, first-generation students benefit more from activities that foster academic integration than their continuing-generation peers (Filkins & Doyle, 2002; Lohfink & Paulsen, 2005).

Lohfink & Paulsen (2005) also found that participating in social activities on campus did not have a significant effect on persistence for first-generation students. They proposed that this experience may be due to the clubs and organizations being "set up in ways that reinforce the values and priorities of continuing-generation students as well in ways that better accommodate their schedules" (p. 420). It may also be that first-generation students may not have knowledge of, access to, or understanding of the impact participation in these social activities may have on their persistence in college.

Additionally, it is widely accepted that certain institutional practices are known to lead to higher levels of student engagement (Mayhew et al., 2016). Chickering & Gamson's (1987) "Seven Principles for Good Practice in Undergraduate Education" may be the best known set of engagement indicators. Their principles include respect for diverse talents and ways of learning, high expectations, time on task, prompt feedback, active learning, cooperation among students, and student faculty contact. Institutions that steer students into these activities and are able to

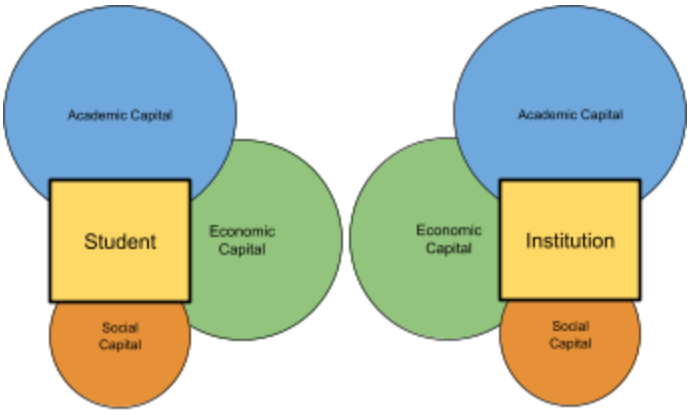
get them to participate at high levels of engagement may see the greatest educational gains by their students. Kuh et al. (2010) defined student engagement as having two components; the time and effort students put into educationally purposeful activities (what others call academic integration, as discussed previously), and the commitment that the institution places on organizing learning opportunities and student services that induce student participation and benefits. Institutions of higher education have direct control of the latter component and can implement curricular and co-curricular programs and experiences to influence the former.

Blending Student Integration and Social Reproduction Models

Tinto (2012 defines *integration* as "the degree to which a person integrates the values and norms of a community into his or her own value system" (p. 160) with the effect of students perceiving or not perceiving themselves as being included and valued within that community. Integration is related to the concept of *engagement,* which Tinto defines as "the person's interaction with those values and norms and the individuals who share them" (p. 160). According to Tinto, students can be engaged in an institution — meaning that they participate in activities and courses, etc. — but they will not have internalized their commitment to the espoused values of that institution, or have become integrated within that institution. Astin's (1984) *student involvement* is similar to Tinto's concept of engagement in that it refers to student behaviors rather than the internal assimilation of culture, values and beliefs that occur during integration.

Figure 1

Diagram of Compatible Habitus



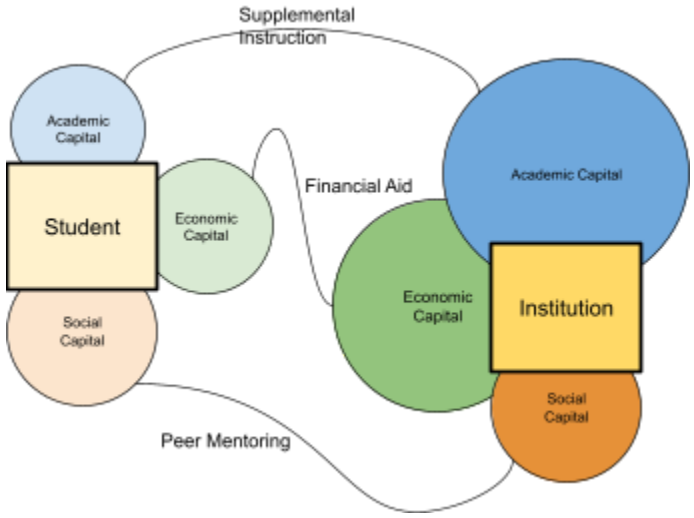
Student with compatible habitus to institution due to matched levels and types of capital

According to Bordieu's theory, students whose cultural capital does not match the organizational habitus of the college are likely to not fully integrate into the college environment (Berger, 2000). Children from homes with college-educated parents are more likely to have access to individuals and opportunities to develop skill sets in line with higher education administrators who run colleges (Espinoza, 2011), as shown in Figure 1. First-generation students, who have qualitatively different pre-college characteristics than their continuing-generation peers and who also lack the support of a college-going parent, are likely to enter college with differing levels of cultural capital than their continuing-generation peers. This example implies that many first-generation students' cultural capital may not match the habitus of the college, which tends to reflect the habitus of the continuing-generation student. First-generation students enrolled in public four-year institutions were more likely to report lower levels of academic integration than students whose parents earned at least a bachelor's degree (12.7% versus 15.5%) and also lower levels of social integration (10% versus 21.5% respectively) (Nunez & Cuccaro-Alamin, 1998). In the classroom, first-generation students

often defer to the "real" students during conversations with faculty (Davis, 2010). In addition, they often feel academically inadequate or falsely accepted into and by the institution, which leads to a decrease in classroom engagement, attendance and grades, while increasing likelihood of dropping out (Canning et al., 2020). This imposter syndrome felt by first-generation (and some continuing-generation students) is a psychological manifestation of habitus mismatch.

Figure 2

Diagram of Institutional Actions to Increase Student Capital



Proactive institutions can recognize this mismatch in capital and design programs and activities to help students quickly accumulate the missing capital so that they will have a better opportunity to integrate within the institution (see Figure 2). As an example, students with lower levels of academic capital than the institution's can be directed into programs to help build and support academic skills such as academic coaching, or first-year seminar courses so the student can gain the academic skills to successfully complete their coursework. In addition, first-generation college students must believe that people like them are able to belong and thrive at their institutions, so institutions highlight successful first-generation student stories (Stephens, Hamedani & Destin, 2014). These programs and activities make up the institution's

organizational habitus, and the more congruent a student's habitus is with the institution's organizational habitus, the more students will feel the institution is supportive of their needs (Berger, 2000).

As students become more and more integrated into the institution's habitus, they will reflect the routine college experience espoused by that institution (Berger, 2000). If the college sets and meets high persistence and graduation goals, integrated students will see that as a natural progression of their studies. Students with differing levels of cultural capital who are unable to integrate can still persist in this environment, but doing so will be much more difficult for them to do so. From a cultural capital perspective, a student's choice to depart from an institution can be interpreted as the student's inability to meet the social or academic expectations of the institution's organizational habitus (Berger, 2000).

Espinoza (2011) describes the transmission of capital as a *pivotal moment* and emphasizes the importance of the timing of this intervention in students' adjustment to higher education. Students who experience pivotal moments early in their higher education careers tend to have better adjustments to higher education, feel more supported, are confident in their ability to ask for help, participate in a variety of school activities, engage with a diverse array of individuals on campus, have high academic success and feel well integrated into the institution. In contrast, students who have pivotal moments later in their higher education experiences tend to have more difficult transitions, are reluctant to ask for help, feel uncomfortable participating in activities, have weak support networks and academic performance, and may feel marginalized on campus (Espinoza, 2011).

Individuals are key factors in the transmission of capital. Formal and informal mentoring relationships with non-parental adults, including coaches, educators, counselors and advisors,

and peers help students acquire the cultural capital to navigate educational pathways successfully (Dennis, Phinney & Chuateco, 2005; Espinoza, 2011; Walpole, 2003). However, in institutions with large undergraduate enrollments, the amount of time available from each educator for each student for the development of a mentoring-type relationship may be limited. Institutions with high student-counselor ratios may inadvertently restrict student access to the cultural capital needed to be successful on campus due to the lack of availability of possible institutional mentors or guides (Espinoza, 2011).

Criticisms of Bourdieu and Tinto's theories

It is important to note that scholars have criticized both Bourdeiu and Tinto for privileging a white, upper-class normative lens of interpretation that can be misinterpreted or misapplied to nondominant students. In particular, scholars have criticized both Bourdieu and Tinto's theories of cultural capital and habitus as being deficit-oriented and promotive of the development and maintenance of a high-class or elitist social framework that requires non-dominant student scholars to assimilate by shedding or disavowing their prior beliefs, habits and dispositions (Ives & Castillo-Montoya, 2020).

Other scholars have a much broader interpretation of cultural capital, as utilized by the "Collins tradition" of educational stratification theory. In the "Collins tradition" (Davies & Rizk, 2017), the theory of cultural capital is not limited to the pursuit and obtaining of high-status activities. Instead, cultural capital is embedded in our day-to-day activities, and specifically within the rituals, actions, basic vocabulary, terms, and activities that have value within any particular group. In this interpretation, all groups have differing cultural agility, regardless of social status. By holding or obtaining the specific capital for a particular group,

one becomes a member of that group or subgroup and can participate in the habitus of that group.

In this way, we can conceive of a concept of multicultural capital that does not overly value the dominant culture or negate students' cultural backgrounds and values, but instead serves to bridge the different habitus of college, home, work, religious, and personal lives, etc., of the typically marginalized student, such as first-generation students (Achinstein, Curry, & Ogawa, 2015). With this lens, institutions that value difference over homogeneity can successfully enact practices to foster the conditions to support historically marginalized students to thrive in their environments without negative labeling.

First-Generation Students and Cultural Capital

First-generation students often lack access to guides who are able to explain how to navigate the habitus of college. Their continuing-generation peers have access to specific cultural capital needed to successfully apply to, enroll in, and succeed in college. College-going parents pass on skills, such as how to determine which college to apply to, choose classes, speak with faculty, etc., to their children, which helps the students feel that college is a place where they belong (McDonough, 1997). Dumais and Ward (2010) suggest that according to Bourdieu's concept of habitus, first-generation students will be more likely than others to choose not to attend college because they feel as if they will not fit in. London (1989) found that this lack of college-going cultural capital may continue to contribute to first-generation students' difficulties adjusting to the new culture of a college environment, which replicates the dominant culture of the non first-generation student.

In their empirical study, Dumais and Ward (2010) utilized data from the 1998-2000 National Educational Longitudinal Study (NELS) and Postsecondary Education Transcript

Study (PETS) to investigate how cultural capital affects four-year college enrollment, bachelor's degree attainment and undergraduate grade point averages, and if/the degree to which these affects vary by first-generation student status. Measures of cultural capital were taken from the NELS survey (*N*=24,599 eighth graders in 1988), which included information about students' educational and extracurricular activities and future goals. Follow-up surveys were conducted in 1990, 1992, 1994 and 2000, and were combined with transcript information obtained via PETS in 2000. This study is significant because it measured cultural capital in two ways; 1) arts participation, and 2) strategic interaction, which measures students' and parents' navigation of the college application process. Strategic interaction variables included if the student received help with college applications at school, if the student received help with college essays, how often parents were in contact with their high school about post-high school educational opportunities, and how parents have helped their children make decisions about where to apply for further education after high school (Dumais & Ward, 2010).

Dumais and Ward (2010) found that first-generation students have lower odds of enrolling in bachelor's degree programs than continuing-generation students, even when controlling for academic achievement and family income. In addition they found that arts participation, the traditional variable for cultural capital, did not have an association with enrollment. However, strategic interaction variables did have positive associations with enrollment. In particular, receiving help with college essays had a large impact on successful enrollment, and each additional way in which a parent offered to provide information about college added to the positive effects. Ultimately, strategic interaction cultural capital was associated with access to higher education and graduation. The study helped to conceptualize first-generation status as a type of habitus (Dumais & Ward, 2010).

Collier and Morgan explored the role of the first-generation student habitus in their 2008 study. They posit that in order for students to be able to navigate the expectations of college successfully, students must master both implicit and explicit knowledge. Explicit knowledge is course-related knowledge. Implicit knowledge relates to "how to enact the college student role successfully" (p. 442). In their qualitative study, Collier and Morgan (2008) found that first-generation students were disproportionately affected by their lack of understanding of the college student role. This lack of understanding is not necessarily related to the content of the course, but instead is related to unspoken expectations about how many hours per week to study, writing styles, attendance and testing expectations, proper sources, etc. — all skills that continuing-generation students are more likely to inherit from their college-going parents.

Institutions interested in enrolling and retaining first-generation students at higher levels should investigate differing methods to ensure that first-generation students have an opportunity to learn these unspoken expectations and receive strategic interactions that help guide and support them as they transition to campus. Traditionally, institutions have developed new student orientation programs and first-year seminars to address student on-boarding and transition to campus. Collier and Morgan (2008) suggested that institutions should also investigate technological solutions that could provide coaching materials to help students better understand faculty expectations in order to help first-generation students garner the cultural capital necessary to acclimate to the campus environment. Given the resource constraints currently experienced by state-funded universities, technology-based outreach and support can provide an opportunity for institutions to provide holistic student support at scale (Castleman & Meyer, 2020).

Measuring Habitus with the Educational Stress Scale Score

Students with different levels and configurations of capital and habitus may have differing patterns of enrollment, persistence, transfer and drop out (Berger, 2000). In order for large institutions to provide appropriate outreach and support effectively, they must first identify students with this mismatch in need of support. Many colleges and universities use the College Student Inventory (CSI) for this purpose. It is designed for use with first-time freshmen, prior to enrollment, to identify students at risk for attrition in their first year. The Educational Stress scale score is one of four summary scales in the CSI, and was used in this study as a measure of students' pre-college habitus. Gaddis described habitus "as an individual's attitude about her own educational success and her belief about the value of school" (2013). Berger (2000) called for measures of habitus to reflect "students' beliefs about the status of degrees awarded by their institutions and their beliefs about the ability of those degrees to help them realize advanced educational degrees and high-status occupational positions" (p. 118).

The Educational Stress score was developed as a factor analysis of all of the CSI's scales and measures general feelings of distress in the college environment (Ruffalo Noel Levitz, 2019). Part of the scale focuses on the emotional aspects of academic life that are composed of earlier school experiences, including dissatisfaction with teachers in general, low desire to finish college, and study habits. It is a measure of students' anxiety or feelings of lack of preparedness for the college environment, inclusive of social and peer relations. Students with high Educational Stress scale scores also tend to have lower than average study habits (Ruffalo Noel Levitz, 2019). The other part of the scale consists of a low sense of family emotional support and high desire for counseling. This scale aligns with Bourdieu's definition of habitus, which is a measure of a student's negative disposition towards schooling (Gaddis, 2013).

In their 2015 study of 10 years of CSI Form B data from a Midwestern public land-grant university, Slanger et al. (2015) found that the Educational Stress scale score was statistically significant and linearly related to the ratio of credits earned to credits attempted, as well as highly predictive of retention, with most *p* values below .001. This result replicates an earlier finding by Slanger (2012) that educational stress was predictive of long-term retention in higher education (total semesters in four-year institutions). This result indicates that the Educational Stress scale score is a good predictor of retention and progression once matriculated in college.

As previously mentioned, first-generation students lag behind their peers in accumulating credits towards their degrees. Chen & Carroll (2005) found that on average, first-generation students earned seven fewer credits during their first year than their peers whose parents had a bachelor's degree or higher (18 credits vs. 25 credits). This discrepancy continues throughout their entire enrollment, with first-generation students earning on average 66 credits compared to 112 credits earned by continuing-generations students (Chen & Carroll, 2005). In addition, first-generation students withdrew or repeated 12% of their courses, in comparison to 7% of their continuing-generation peers (Chen & Carroll, 2005). This study differs from Slanger et al. (2015) in that it will investigate the scale's use as an indicator of successful first-time enrollment in college, not persistence, and if this varies by first-generation student status.

Oliver et al. (2010) found that low income African American and Hispanic first-generation students participating in an Early College Academy in high school had significantly higher Educational Stress scale scores than the freshman population enrolled in a participating college, and recommended that these students may need additional advising support in order to be successful on college campuses. In particular, they suggested that students with higher Educational Stress scale scores may have "insufficient information about college

and university culture" (p. 20) and recommended that colleges reach out to them prior to their first semester of enrollment to foster connections to the college environment and to help them establish a college identity. Oliver et al. (2010) went on to recommend that schools develop a mechanism to provide these students with repetitive reminders with concrete information about a variety of aspects of collegiate life. Dennis, Phinney and Chuateco (2005) found that students experiencing academic and adjustment distress feel a higher need for someone to provide them with help, guidance and/or emotional support. This finding indicates that students with higher levels of educational stress may benefit from additional support from their colleges and universities.

Guided Pathways to Support First-Generation Student Integration

How can large-enrollment institutions foster greater transmission of the cultural capital necessary for first-generation student success on campus, given the limited access to institutional mentors or guides, particularly during the initial enrollment process? Initial enrollment on campus requires students to adapt academically, culturally and socially to the institution (Nunez & Cuccaro-Alamin, 1998). To be successful on campus, students not only need access to the institution itself, but connection to the full resources of that university in order to realize the personal, social and economic benefits of degree completion (Pascarella et al., 2004). Large-enrollment universities often create programs tailored to assist first-generation students with their transition to campus. Such programs include learning communities, first-year seminars, supplemental instruction, peer-mentoring organizations and transition programs, intrusive advising, and participation in federally funded grant-based programs such as TRIO Student Support Services (Kuh et al., 2010). However, these programs can be costly to implement and administer and may not be able to reach all first-generation students. In addition,

identifying first-generation students can be challenging on some campuses, as many campuses have only recently started identifying and tracking them at an institutional level. Even with significant support from national organizations, like Achieving the Dream, the Lumina Foundation or the Bill and Melinda Gates Foundation, institutions struggle to scale up successful programs like these to beyond one-third of a target population (Bailey, Jaggers, & Jenkins, 2015).

Guided pathways may be able to help bridge this gap of support. They are typically published on websites and are accessible to all students. In this manner, they may serve as a method of making pivotal moments, implicit knowledge and unspoken expectations accessible and visible in order for all students to acquire the cultural capital needed to be successful on campus without the direct intervention of a parent or mentor who typically serves to transmit this cultural capital. As an example, a guided pathway may include timely information on and concrete steps to complete in order to apply for and complete the financial aid awarding process. Guided pathways also typically include information on program requirements, sample degree plans and career outcomes related to the degree. This information is very important to all students, but in particular for first-generation students. In their 1998 study, Nunez & Cuccaro-Alamin found that first-generation students were more likely to report that obtaining financial aid and knowing that they could finish their program in a short period of time were very important factors in selecting their first institution. First-generation students and parents are debt-adverse (Somers, Woodhouse & Cofer, 2004), so guided pathways tools can provide an opportunity to help educate first-generation students on the positive impacts of student loans on college completion rates, as well as the myriad nuances of financial aid policies and practices that may cause roadblocks to their ability to enroll in and successfully complete college.

In addition, guided pathways mobile applications may be an important tool in supporting first-generation students during their transitions to college, particularly by supporting them with the important process of major selection. Chen and Carroll (2005) found that nearly 33% of first-generation students had not identified a major at time of enrollment, in comparison to 13% of students whose parents had a bachelor's or advanced degree. Guided pathways typically offer major selection tools that provide important information on educational and career outcomes that can help students confidently identify a program of study that meets their goals.

Guided pathways mobile applications also benefit from being where students are at — online and on their phones. In 2018, 45% of teens said that they were online "almost constantly" in an ever-growing number of online platforms including YouTube, Instagram, Snapchat, and Facebook (Anderson & Jiang, 2018). By embracing a communication method that students are actively utilizing, guided pathways mobile applications may be well-positioned to influence student decision making by providing them with key information at pivotal moments via the technology that they use the most. Most colleges rely upon admitted student checklists to notify their accepted students of the steps they need to take to successfully matriculate. These checklists are typically posted to websites or are included in acceptance letters, which may be ineffective ways of reaching young people who are increasingly spending more and more time on their phones.

Cell phone use by teens in the United States has become almost ubiquitous. In 2012, 77% of teens owned a cell phone and one in four owned a smartphone. In 2012, 63% of teens said they exchanged text messages every day with people in their lives, but only 39% called their people, 29% utilized social messaging, and 6% emailed (Lenhardt, 2012). In 2019, 95% of teens said they have or have access to a smartphone and 72% reported that they often check for

messages or notifications as soon as they wake up (Schaeffer, 2019). In 2018, more teens had access to a cell phone than had access to the Internet at home (85%), and this gap is wider for Black teens (75%). Nearly 25% of teens did not have access to a computer at home (Anderson & Perrin, 2018). Given that American teens are more likely to have access to a cell phone than a computer, it makes sense for colleges to move to utilizing mobile technology to connect with their students.

During the summer between high school and college, many students lose access to their high school counselor who, for first-generation college students in particular, may have been one of their sole sources of information about the college application process. Unfortunately, the high school counselor's support typically ends shortly after a student's acceptance into college, even though the number of milestones needed to complete to successfully matriculate have not yet been reached (Castleman & Page, 2015). Texting campaigns deliver important cultural capital to students at the appropriate times, which for first-generation students in particular provide another method for their acquisition of the cultural capital needed for the development of a college-going habitus.

In 2020, Page et al. found that a personalized, data-informed automated FAFSA completion text messaging campaign to Texas high school seniors in 2017 resulted in a 6% higher FAFSA completion rate and a 3% higher college-going rate. Castleman and Page's 2015 study showed that just ten campus-specific text messages delivered near each enrollment task's deadline, accompanied by counseling support to text responses, resulted in a 7% increase in enrollment among students with less access to college-planning support.

College-going high school students in West Virginia who signed up to receive one to four text messages per month about college applications, financial aid, and academic support

during their senior year and through their first year of college study were found to increase their odds of completing the fall semester by a factor of 1.5, to enroll in the spring semester by a factor of 1.9 and to complete the spring semester by a factor of 1.7 (Castleman & Meyer, 2020). Castleman and Meyer also found that students receiving these text messages completed about 0.4 additional credits in the fall semester and attempted an additional credit and completed an additional 0.9 credits in the spring semester.

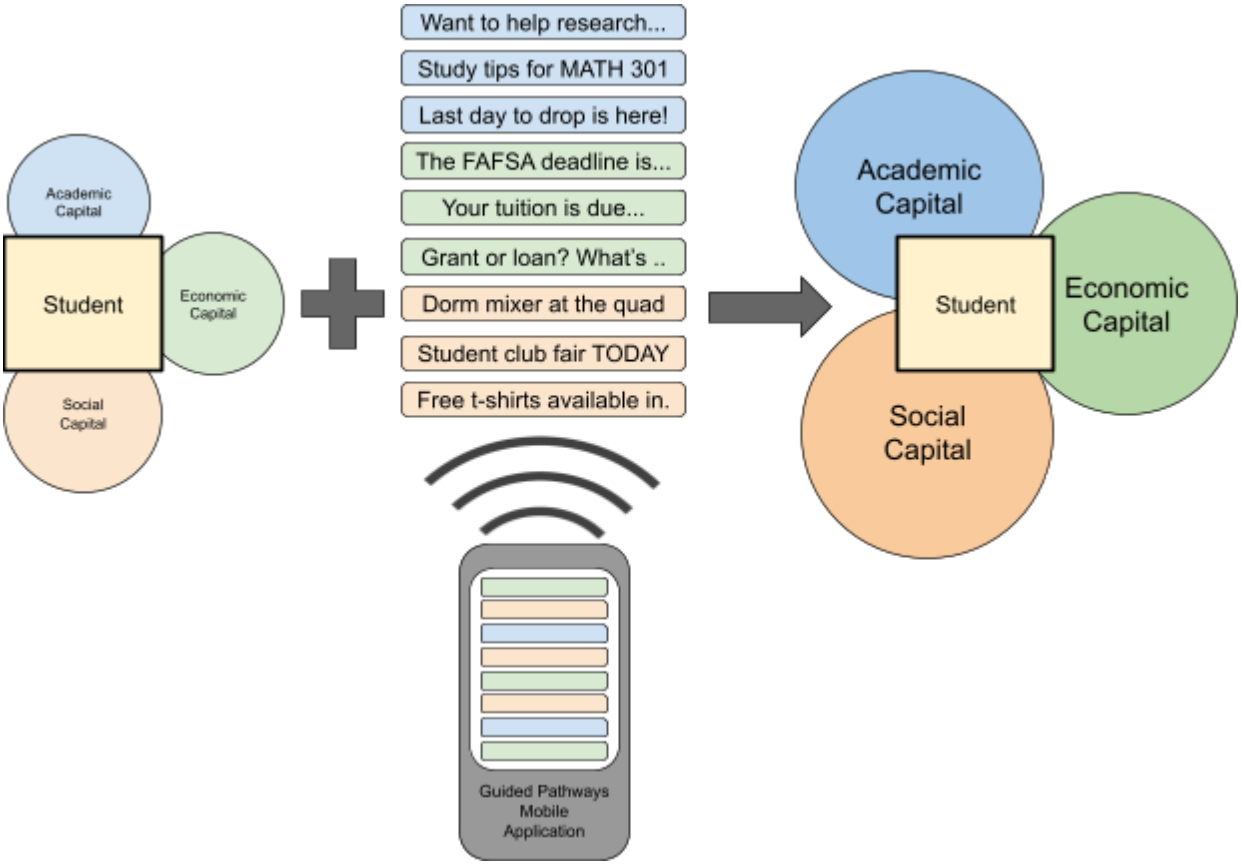
The text messages in Castleman and Page's research were designed to increase the state's overall college-going rate by delivering standardized information to students that would be applicable to attending any college. An example of this type of information would be how and when to apply for financial aid. This generic information is helpful for students to complete necessary steps, but does not help students become aware of and acclimate to the habitus of an institution because they do not deliver any institution-specific information. In 2017, four community colleges partnered with Persistence Plus as part of the Nudging to STEM Success (NTSS) initiative to study the impacts of college-specific texts on persistence. Text nudges to over 2,700 students in this controlled trial resulted in a 10 percentage point increase in persistence (Soricone & Endel, 2017). A second iteration of the study resulted in 62% of recipients who were students of color persisting to their second semester of enrollment in comparison to a 46% persistent rate for those who opted out. At Lorain College, both first-generation students and students over 25 who subscribed to the texts had a 16 percentage point increase in continuous enrollment (Soricone & Endel, 2017).

Guided pathways mobile applications provide a way for colleges and universities to automate the delivery of and segment messages to specific student subpopulations. By doing so, colleges are able to deliver the right content at the right time to the students who need to act

upon the information. In this way, guided pathways mobile applications serve as a method of transmitting and reproducing the college habitus to support student integration (see Figure 3).

Figure 3

Guided Pathways As a Method of Increasing Capital



The adoption of guided pathways mobile applications is slowly growing by institutions of higher education, which tend to lag behind other industries' utilization of technology due to a lack of resources and capacity (Klein et al. 2019). Research on the tools' effectiveness on student behavior and outcomes is just starting to be undertaken. To date, most research on these tools has been limited to internal vendor documents. The Educational Advisory Board (EAB)

publishes an annual case study compendium documenting use cases and outcomes from using its guided pathways mobile application, Navigate Student, from its partner institutions. Examples of results from these case studies include: after adopting Navigate student in 2019, Germanna Community College's applicant-to-enrollee rate increased by 14.5%, and students who created an academic plan within the application enrolled in 3.4 more credit hours per semester and were 12.7 percentage points more likely to persist; 94% of Robert Morris University's entering class downloaded the mobile application which contributed to a 2% increase in first-year retention in 2016; Danville Community College reported that their retention rate increased 25 percentage points for students who used Navigate Student to complete an academic plan; York Technical College students who create an academic plan in Navigate were more than twice as likely to reenroll in the spring semester (EAB, 2020).

Unfortunately, these case studies are not peer reviewed, and are often complicated by multiple confounding variables. With just this information available to users, it is difficult to determine the true impact guided pathways mobile applications may have on student enrollment and persistence. The researcher could not find any peer reviewed articles related to the utilization of Navigate Student. Over 1900 schools, colleges and universities have partnered with EAB to utilize services they provide (EAB, 2021), such as Navigate Student, at a significant annual contractual cost. In order for these institutions to be able to determine if their technology investment is sound, peer-reviewed research is needed to establish the validity of EAB's success claims.

Summary

In this chapter I provided a brief overview of the literature about first-generation students in college, with a focus on the challenges many face as part of their transitions to and

integration into college. Using the lenses of habitus and student integration theory, first-generation college students may face more difficulty integrating into college environments due to a mismatch in capital and differing habitus to their institutions. This mismatch may be an indicator of the potential for these students to fail to successfully matriculate to their institutions, or once on campus, fail to persist semester to semester. Researchers have struggled to quantify and measure habitus. However, the Educational Stress Scale score from the College Student Inventory may provide one such measure due to its evaluation of general feelings of distress in the college environment (Ruffalo Noel Levitz, 2019). This aligns with Gaddis' description of habitus "as an individual's attitude about her own educational success and her belief about the value of school" (2013).

Institutions use the Educational Stress scores from the College Student Inventory as one of many predictive measures of a student's predilection for attrition as part of their student onboarding process. These measures inform what supplementary supports should be provided by those colleges and universities to students in need. One such support gaining popularity in use due to its ability to provide pivotal information to students at the appropriate times, much like the information provided by mentors, guides and parents is the guided pathways mobile application, such as Navigate Student. First-generation students, who often lack access to an informed college-going guide, may benefit from utilization of these tools, which would provide them with the capital necessary to integrate within their college habitus. Unfortunately peer-reviewed research on the efficacy of these tools is absent from the literature.

In the next section of this paper, I will present the methodology for a study designed to contribute to the well-established literature of first-generation college students, and add

preliminary research to the emerging literature regarding the measurement of habitus and utilization of guided pathways mobile applications.

Chapter Three: Methodology

Research Design

This was a quantitative, descriptive and correlational design using secondary data sets and institutional data from a large, public research institution. Participants' pre-college habitus was measured by the Educational Stress scale score from the Noel Levitz College Student Inventory Form B (CSI) that was administered in summer 2019. Participants' guided pathways mobile application utilization rates was obtained from a report provided by the vendor. Institutional data was combined with these two datasets, prior to de identification and delivery to the researcher. This design was chosen for several reasons. First, secondary data sets do not allow for manipulation of the variables of interest, so assumptions of causality cannot be made. Second, a descriptive design is ideal for producing statistical information for policy and decision making, especially when conducting preliminary research on new phenomena.

Descriptive methods allow for early stage research to test hypotheses about relationships between variables (Mitchell & Jolley, 2013). Descriptive research also allows for the researcher to describe behavior. In this study, descriptive methods allowed the researcher to get a better understanding of student utilization of a guided pathways application, how often they used the application, and if a relationship between their utilization varied according to first-generation status and their pre-college habitus, and ultimately, if these factors have a relationship with enrollment. Data was analyzed using the Statistical Package for the Social Sciences (SPSS 26).

Table 2

Research Questions and Statistical Analyses

1) Is there a relationship between guided pathways mobile application utilization and Educational Stress scores?	Chi-square test of independence
2) Do Educational Stress scores, number of credits attempted and percentage of credits earned vary by first-generation student status?	Independent samples *t*-tests
2a) Does the relationship between Educational Stress scores and first-generation student status vary by levels of guided pathways mobile application utilization?	ANOVA with Tukey post-hoc test, chi-square tests of independence
2b) Does the relationship between number of credits attempted and first-generation student status vary by levels of guided pathways mobile application utilization?	ANOVA with Tukey post-hoc test
2c) Does the relationship between percentage of credits earned and first-generation student status vary by levels of guided pathways mobile application utilization?	ANOVA with Tukey post-hoc test
3) Is there a relationship between first-generation student status and enrollment?	Chi-square test of independence
4) Is there an association between Educational Stress and enrollment?	Chi-square test of independence
4a) Is the relationship between levels of Educational Stress and enrollment moderated by first-generation student status?	Chi-square test of independence, ANOVA with Tukey post-hoc test
4b) Is there a difference in mean Educational Stress scores between students who enroll versus those who do not enroll, and does this differ by first-generation status?	Independent samples *t*-tests
4c) Is the relationship between Educational Stress scale scores and enrollment moderated by guided pathways mobile application utilization?	ANOVA with Tukey post-hoc test
5) Is there a relationship between levels of guided pathways mobile application utilization and enrollment?	Chi-square test of independence
5a) Does the relationship between levels of guided pathways mobile application utilization and enrollment status vary by first-generation student status?	Chi-square test of independence
5b) Is the relationship between levels of guided pathways mobile application utilization and enrollment moderated by each level of educational stress?	Chi-square test of independence

Instrumentation

College Student Inventory - Form B

The Noel Levitz College Student Inventory is designed to identify specific variables that are related to persistence and academic success in college, with the intent of assisting colleges in determining appropriate student-level and institutional-level interventions that may affect student behavioral changes towards optimal outcomes (Noel Levitz Inc., 2010). Institutions use this survey to provide advisors with a way to discuss students' pre-college motivations and identify the activities and resources on campus that can help them to be as successful as possible. It also allows institutions to better understand the motivational variables of the incoming cohort of students, and make comparisons to prior cohorts. The CSI Form B was first published in 1998, and is a 100-item questionnaire with the following scales:

- Academic Motivation (Study Habits, Reading Interests, Verbal and Writing Confidence, Math and Science Confidence, Commitment to College, Interactions with Previous Teachers)
- General Coping (Social Engagement, Family Support, Capacity for Tolerance, Career Plans, Financial Security)
- Request for Support Services (Academic Assistance, Personal Counseling, Social Engagement, Career Guidance, Financial Guidance)
- Supplementary Scales (Internal Validity)

These scales are then combined to form four compound percentile scales that help to explain student motivation:

- Dropout Proneness - measures a student's general feeling about dropping out of college before completing their degree

- Predicted Academic Difficulty - measures a student's estimation of earning low grades during their first year of enrollment
- Educational Stress - measures a student's general feeling of distress in the college environment prior to matriculating
- Receptivity to Institutional Help - measures how receptive a student might be to receiving and making use of institutional support resources

The College Student Inventory was selected for this study because it is designed for use with first-time freshmen prior to matriculation and was developed as a tool to predict attrition early in college. In addition, the Educational Stress scale provides a method of measuring habitus in line with Gaddis' (2013) definition.

Validity and Reliability of the College Student Inventory

The College Student Inventory is a highly utilized survey instrument in college retention literature. It has been completed by over 2.6 million students nationwide at over 1,400 institutions (Noel-Levitz Inc., 2010). In 2012, the instrument's norms were divided into two-year, four-year public and four-year private institution samples. Reliability coefficients measuring internal consistency for four-year public institutions across all subscales average .81 (Noel-Levitz, 2001, 2012), and validity studies have established relationships between the CSI and dropout behavior and college GPA (Slanger et al., 2015).

Guided Pathways Utilization Report

The vendor of the guided pathways mobile application provided weekly utilization reports that included information on the students who accepted terms and conditions for using the mobile application, including the number of steps completed and the initial date of logging into the application. The report showing application utilization as of the first day of class

(8/20/2019) was chosen for this study in order to provide a numerical value of application utilization prior to the student's significant interaction with the college environment. The number of steps completed by each student was categorized as a non, low, medium or high user of the application for analytical purposes.

Variables of Interest

First-Generation Student Status

This study used the student's self-disclosed first-generation student status as obtained from the institution's student information system. First-generation student status was obtained from the Common Application that students submitted as part of their admissions application to the university. The Common Application defines a first-generation student as "a student whose parent(s)/legal guardian(s) have not completed a bachelor's degree." The Common Application also states "If neither of your parents graduated from a four-year college or university, you qualify as first-generation college student."

Educational Stress Scale Score

The Educational Stress scale score is one of four summary scales in the College Student Inventory, and was used in this study as a measure of students' pre-college habitus. Gaddis described habitus "as an individual's attitude about her own educational success and her belief about the value of school" (2013). The educational stress score was developed as a factor analysis of all of the CSI's scales and it measures general feelings of distress in the college environment (Ruffalo Noel Levitz, 2019). This scale aligns with Bourdieu's definition of habitus, which is a measure of a student's negative disposition towards schooling (Gaddis, 2013).

The Educational Stress scale score is expressed by stanines from 1 to 9, "which are normalized standard scores with a mean of 5 and a standard deviation of 1.96" (Ruffalo Noel Levitz, 2019). Students with scores of stanine scores of 9 have the largest corresponding raw scores, and those with a score of 1 have the lowest scores, as shown in Table 3.

Table 3: Distribution of CSI Educational Stress Stanine Scores by Levels

Level 1	Level 2	Educational Stress Stanine Score	% Distribution of Scores
	Very High	9	4%
Above Average	High	8	7%
	Considerably Above Average	7	12%
	Slightly Above Average	6	17%
Average	Average	5	20%
	Slightly Below Average	4	17%
	Considerately Below Average	3	12%
Below Average	Low	2	7%
	Very Low	1	4%

Guided Pathways Mobile Application Utilization

This variable is an indicator of a student's engagement in completing the key pivotal moments needed to successfully enroll in classes and engage in the college life for their first fall semester. Students with high levels of utilization of the application were considered to have received information on and actively engaged in the habitus of the institution prior to enrollment. Students with no or low levels of utilization of the application can be considered to have not engaged in the habitus of the institution, or who may have received this socialization in other ways or formats, or individuals such as college-going peers, siblings, parents or mentors.

Students' level of utilization of the guided pathways mobile application was measured as of the first day of class of the fall 2019 semester through a report delivered by the guided pathways mobile application vendor. Each student was assigned a usage group of

non-downloader, passive, low, medium or high that correlated with the number of checklist items the student completed by the first day of class. Students who did not download the application were categorized as non-downloaders. Students who did not check off any items within the application were categorized as passive users, since they may have been using the app and receiving push notifications of pivotal moments and key information, but were not actively checking off to-do items. Students who checked off 1-5 items were categorized as low users, 6-9 items as medium users, and students who checked off more than 10 items were categorized as high users.

Enrollment

Students were classified as being enrolled or not enrolled through data obtained from the university's student information system (Banner). Enrollment was defined as being enrolled at the institution for one or more credits as of the institution's official enrollment reporting date, which at this institution is October 16 of every fall semester. This date was chosen because first-time freshmen who are not enrolled in coursework during their first semester at the institution as of this date are required to reapply to the institution if they wish to enroll in future semesters. Additionally, a small percentage of students enroll in courses at an institution and later choose to not attend, but neglect to drop their coursework prior to the start of their first semester. These students are identified and administratively dropped from their courses prior to this census date. Selecting this date to capture enrollment, instead of the first-day of the semester, allows the data set to most accurately represent students' intent on matriculation at the institution.

Number of credits attempted and percentage of credits earned

Students cannot earn degrees without earning credits, and two factors directly relate to how fast and how efficiently a student can earn their degree — the number of credits attempted and the percentage of credits earned each semester. Students who do not attempt (or earn) at least 15 credits per semester will miss an "on-time" four year graduation if they do not make up these credits through higher credit enrollments in subsequent semesters, or alternative semesters, such as summer or intersession. This study will use the number of credits attempted and the percentage of credits earned at the end of the semester from the university's student information system in order to learn more about credit accumulation patterns.

Data Collection

This study used institutional data and two secondary data sets already collected by a large, public high-research institution as part of the onboarding process for the first-year class that enrolled in the fall of 2019. All incoming first-year students were asked to complete the Noel Levitz College Student Inventory Form B (CSI) as part of orientation, which was held in June and July 2019. The CSI assesses student motivations, attitudes and receptivity to campus resources. Advisors use the results of this survey to help students set individualized goals for success in their first advising meeting. Institutions use the summary results to gain insights into the motivation and needs of the incoming cohort of students.

Students were asked to complete the 30-45 minute survey prior to attending orientation via email (see Appendix A). The survey could be completed online, on any computer or mobile device. Students were emailed a link to the survey approximately 15 days prior to attending orientation on campus. They also received reminder emails to complete the survey five days and two days prior to their orientation date. Students who did not complete the survey prior to

attending orientation were asked to complete the survey on the first morning of a two-day residential orientation program. Students who failed to complete the CSI on their own or as part of orientation received reminder emails to complete the survey, since results from this survey informed the students' first required advising appointment on campus in the fall. Overall, 87% of the population (4,150 out of the 4,771 students in the study) completed the CSI at some point prior to the first day of the start of the fall semester.

All first-year students were also emailed to download and utilize Navigate Student, a guided pathways mobile application (see Appendix B) to help them with the new student onboarding process. This mobile application contains helpful tips, to-dos and timelines (see Appendix C) to complete the necessary steps to obtain financial aid, enroll in classes, sign up for housing, etc., as well as tips on how to be successful on campus once classes have begun (see Appendix D). Instructions to download the guided pathways mobile application were included in the admissions and orientation checklists, as well as in the online orientation modules students were expected to complete prior to attending orientation. Students were also shown how to download and use the application to view their fall semester class schedule by their academic advisor on day two of orientation. Students were categorized as non, passive, low, medium or high-level users of the app based upon the following criteria: if they downloaded the app and the number of to-do list items that they completed within the app prior to the start of their first fall semester of enrollment. Eighty-three percent of the population (3,966 out of the 4,771 students in the study) downloaded the guided pathways mobile application at some point prior to the first day of the start of the semester.

Institutional demographic data was added to the data set to provide context for the generalizability of the data. These data points included race/ethnicity, gender, first-generation

student status, enrollment status (yes or no) at the start of the fall semester, number of credits attempted in the fall semester, and number of credits completed in the fall semester. The researcher used number of credits attempted and number of credits completed to calculate a credit completion rate for each student. The researcher received the data from the university in a de-identified excel spreadsheet which was imported into SPSS 26 for analysis.

Table 4

CSI Completion, Application Usage, Educational Stress and Enrollment

	First-Generation		Continuing Generation	
	(*n = 1,525)*		(*n* = 3,246)	
	Yes	No	Yes	No
Completed CSI Inventory	85.5%	15.5%	87.6%	12.4%
Downloaded Application	84.5%	16.5%	82.4%	17.6%
Enrolled in Fall semester	90.9%	9.1%	92.5%	7.5%

	First-Generation		Continuing Generation	
Application Usage	(*n = 1,525)*		(*n* = 3,246)	
Did Not Download	236	15.5%	569	17.5%
Passive Users	276	18.1%	712	21.9%
Low User	350	23.0%	734	22.6%
Medium User	364	23.9%	690	21.3%
High User	299	19.6%	541	16.7%

	First-Generation		Continuing Generation	
	(*n* = 1,269)		(*n* = 2,800)	
Educational Stress	5.41	*SD = 1.922*	5.28	*SD = 1.858*

	First-Generation		Continuing Generation	
	(*n = 1,386)*		(*n = 3,004*)	
Average Attempted Credits	14.92	*SD = 1.228*	15.09	*SD = 1.294*
Percentage of Credits Earned	86.3	*SD* = .242	88	*SD* = .229

Participants

The goal of this study was to obtain information that can be generalizable to first-year students enrolled in large, demographically diverse public, four-year research institutions. The sample population was all first-year students who accepted offers of admission to enter one large, public, four-year research institution in the Fall 2019 semester (N = 4,771). Summary demographic information on the sample, as well as demographic information on the two previous years' cohorts for comparison, are presented in Table 5. The sample was consistent with previous years' enrollment at that same institution. However, the sample was more ethnically diverse than the distribution of U.S. resident undergraduate students enrolled in public four-year institutions in 2017, and contains more female respondents.

Thirty-two percent of the sample were first-generation students. Sixty-three percent of the participants were female. The proportion of female participants in this study is significantly larger than the percentage of female students enrolled in U.S. public four-year institutions in 2017 (55%). In addition, a higher percentage of female students were first-generation college students (34.7%) than male students (27.1%) were first-generation college students, $\chi 2(2) = 29.724$, $p = .000$, $V = .079$.

The sample was much more racially and ethnically diverse than students enrolled in U.S. public four-year institutions in 2017, with approximately double the percentage of Asian, Black/African American students, and students who identify as having Two or More Races. The sample had fewer American Indian/Alaskan, Hawaiian/Pacific Islander, and White students than the 2017 U.S. student population. Fifty-one percent of Hispanic/Latino students, 42.4% of Black/African American students, 31.3% of Asian students and 30.7% of students of Two or

More Races were first-generation college students, in contrast to 21.8% of White students, $\chi 2(8) = 249.821$, $p = .000$, $V = .229$.

Table 5

Demographics of Institution, Sample and National Enrollment

	Institution 2019		Sample 2019		U.S. distribution at four-year public four-year institutions in 2017**
	N	%	N	%	%
Offers Accepted	4,606		4,771		
Final Enrolled Cohort Size	4,461		4390		
Gender					
Male	1,572	35.24%	1,724	36.20%	45%
Female	2,889	64.76%	3,045	63.80%	55%
Race/Ethnicity					
American Indian/Alaskan	9	0.20%	9	0.20%	0.60%
Asian	713	15.98%	754	15.80%	7.10%
Black/African American	892	20.00%	970	20.30%	10.80%
Hawaiian/Pacific Islander	1	0.02%	4	0.10%	0.20%
Hispanic/Latino	543	12.17%	604	12.70%	16%
Nonresident alien	77	1.73%	99	2.10%	6.10%
Two or More Races	379	8.50%	410	8.60%	3.80%
Unknown	90	2.02%	36	0.80%	-
White	1,756	39.36%	1885	39.40%	54.80%
First-Generation Status	1387	31.09%	1525	32%	33%

**SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Spring 2018, Fall Enrollment component. See *Digest of Education Statistics 2018*

Limitations to be Considered

This study examined first-year students who accepted offers of admission to one large, four-year public research institution for the fall 2019 semester. Assumptions of generalizability

should be limited to schools with similar demographics to the participating institution, as the sample's race/ethnicity and gender distribution differs significantly from the national average for four-year public research institution enrollment. Replication in other institutional settings would be ideal.

The variable, levels of guided pathways mobile application utilization, was measured by if a student downloaded the application, and for those who did download the application, how many to-do items they checked off as having completed in the application. At the time of data collection for this study, this was the best measure available to determine a level of usage of the mobile application, however, it presents several limitations to the study. While the number of completed to-do items in the application can act as a proxy for usage, it does not truly capture patterns of active usage. For example, a student may have used the mobile application daily, but never chose to check off items from the to-do list, therefore being miscategorized as a low-level user of the application. In contrast, a student may have logged into the application for one day only and checked several items off of the to-do list, but never have logged back into the application again. This second student would have been categorized as a high-level user of the application in this study.

Possible non-response bias was minimized by having students who had not completed the College Student Inventory or downloaded the guided pathways mobile application do so at orientation. While this practice facilitated a large response and completion rate for the CSI (87%) and a large download rate for the guided pathways mobile application (83%), it could not touch every student and eliminate the non-response bias. Students who did not attend orientation did not receive this extra prompt to complete the CSI or download the guided pathways mobile application.

The researcher's use of the College Student Inventory's Educational Stress scale scores as a measure of pre-college habitus is a theoretical construct that is supported by the work of Gaddis (2013) and is aligned with Bourdieu's definition, but is still an unproven concept. Most research on cultural capital and habitus have used proxy variables, as good measures have yet to be established (Berger, 2000). Additional construct validation that is outside of the scope of this project should be undertaken to validate this theoretical construct. Because this research design is not experimental, causality between variables cannot be determined. Instead, this study is meant to provide preliminary, descriptive data to inform future research studies.

Chapter Four: Results and Analysis of Data

This study investigated the relationship between habitus and first-generation student status on guided pathways mobile application utilization and enrollment. Ideally, every student admitted to college would successfully negotiate the myriad steps to complete the transition from high school to college. However, on college campuses nationwide, many students fail to complete this entire process for a wide variety of reasons. The 4,771 students in this study were guided to complete the following steps after accepting their offer of admission: complete the College Student Inventory, download the guided pathways mobile application, and successfully enroll in and complete credits in the fall semester. Most, but not all students completed each of these steps, as shown in Table 6. The following research questions provide additional information on some of the mitigating factors that may have affected students' ability to successfully complete the steps to enrollment.

Results

Research Question 1) Is there a relationship between guided pathways mobile application utilization and levels of educational stress?

This question aimed to determine if students with differing levels of educational stress utilized the guided pathways mobile application differently. A chi-square independence test was performed to examine the relationship between levels of guided pathways mobile application usage and levels of educational stress. The relationship between these variables was found to be statistically significant, but weak, $\chi 2(4) = 9.220$, $p = .056$, $V = .033$. This indicates that there is a small association between educational stress and mobile application usage. Of all of the students who completed the College Student Inventory ($n = 4150$), 68.5% were active users of the mobile application, 21% were passive users, and 10.5% did not download the application.

Twenty-seven percent of students had above average stress scores, 55.8% had average educational stress scores and 17.2% had below average educational stress scores.

Table 6

CSI Completion, Application Usage, and Enrollment for All Students

	All Students (n = 4,771)			
	Yes		No	
Completed CSI Inventory	4150	87.0%	621	13.0%
Downloaded Application	3966	83.1%	805	16.9%
Enrolled in Fall semester	4390	92.0%	381	8.0%

Application Usage	All Students (n = 4,771)	
Did Not Download	805	16.9%
Passive Users	988	20.7%
Low User	1084	22.7%
Medium User	1054	22.1%
High User	840	17.6%

	Enrolled Students (n = 4,390)	
Average Attempted Credits	15.04	*SD = 1.2756*
Percentage of Credits Earned	87.5	*SD* = .2335

The standardized residuals showed that for students with above average levels of educational stress, slightly more students than expected did not download the application (see Table 7). For students with average levels of educational stress, slightly fewer students than expected were passive users of the application. Slightly fewer than expected students with below average scores did not download the application, and slightly more students than expected were passive users of the application.

Table 7

Cross Tabulation of Application Utilization by Levels of Educational Stress

	Level of Educational Stress											
	Above Average				Average				Below Average			
Application Utilization	*n*	% App Usage	% EdStress	SR	*n*	% App Usage	% EdStress	SR	*n*	% App Usage	% EdStress	SR
Did Not Download	131	30.0%	11.7%	**1.2**	245	56.2%	10.6%	0.1	60	13.8%	8.4%	**-1.7**
Passive User	246	28.2%	21.9%	0.7	460	52.8%	19.9%	**-1.2**	166	19.0%	23.2%	**1.3**
Active User	744	26.2%	66.4%	-0.9	1610	56.7%	69.5%	0.6	488	17.2%	68.3%	0
Total	1121	27.0%	100.0%		2315	55.8%	100.0%		714	17.2%	100.0%	

Research Question 2) Do educational stress stanine scores, number of credits attempted and percentage of credits earned vary by first-generation student status?

This question was designed to investigate if first-generation college students had different precollege dispositions (habitus) than their continuing-generation peers, as measured by the Educational Stress scale score. Additionally, the goal was to determine if first-generation students had similar academic credit accumulations to continuing-generation students. Independent samples *t*-tests were used to determine if the means for Educational Stress scale scores, number of credits attempted in the fall semester and percentage of credits earned differed for first-generation and continuing-generation students. First-generation students (n = 1305) were compared to continuing-generation students (n = 2845). As shown in Table 8, Educational Stress stanine scores were slightly higher for first-generation students (M = 5.42, SD = 1.93) than for continuing-generation students (M = 5.28, SD = 1.86), $t(4148) = 2.178$, p = .029, d = 0.07). First-generation students attempted slightly fewer credits (M = 14.94, SD = 1.23) than continuing-generation students (M = 15.09, SD = 1.29, $t(2826) = -3.630$, p = .000, d = -0.12). Levene's test indicated unequal variances (F = 4.177, p = .041), so degrees of freedom

were adjusted from 4388 to 2826. First-generation students also earned a smaller percentage of credits in the fall semester (M = 86.30%, SD = 0.24) than continuing-generation students (M = 88.08%, SD= 0.23, $t(2569) = -2.35$, $p = .022$), $d = -0.08$). Levene's test indicated unequal variances ($F = 9.283$, $p = .002$), so degrees of freedom were adjusted from 4,388 to 2,569.

Table 8

Educational Stress, Number of Credits Attempted and Percentage of Credits Earned

	First-generation			Continuing-generation			*df*	*t*	*p*	*Cohen's d*
	N	*M*	*SD*	*N*	*M*	*SD*				
Educational Stress Stanine	1305	5.42	1.928	2845	5.28	1.858	4148	2.178	0.029	0.07
Number of Credits Attempted	1386	14.94	1.228	3004	15.09	1.294	2826	-3.63	0.000	-0.12
Percentage of Credits Earned	1386	0.86	0.242	3004	0.88	0.229	2569	-2.35	0.022	-0.08

Research Question 2A) Does the relationship between educational stress stanine score and first-generation student status vary by levels of guided pathways mobile application utilization?

This question was designed to see if first-generation students' usage of the guided pathways mobile application differed from continuing-generation students' usage at similar levels of educational stress. The results of a 2 x 5 ANOVA showed that there was no significant interaction effect between first-generation status and guided pathway mobile application usage on Educational Stress Scores ($F(4, 4140) = 0.718$, $p = .579$, $\eta 2 = .001$) (see Figure 4). However, the main effects were significant for both first-generation status ($F(1, 4140) = 6.722$, $p = .010$, $\eta 2 = .002$) and levels of guided pathways mobile application usage ($F(4, 4140) = 5.439$, $p = .000$, $\eta 2 = .005$). First-generation students had slightly higher educational stress stanine scores

(M = 5.465, 95% CI [5.36, 5.57]) than continuing-generation students (M = 5.292, 95% CI [5.22, 5.36]) (see Table 9).

Figure 4

Mean Educational Stress Stanine Scores by Mobile Application Utilization Level

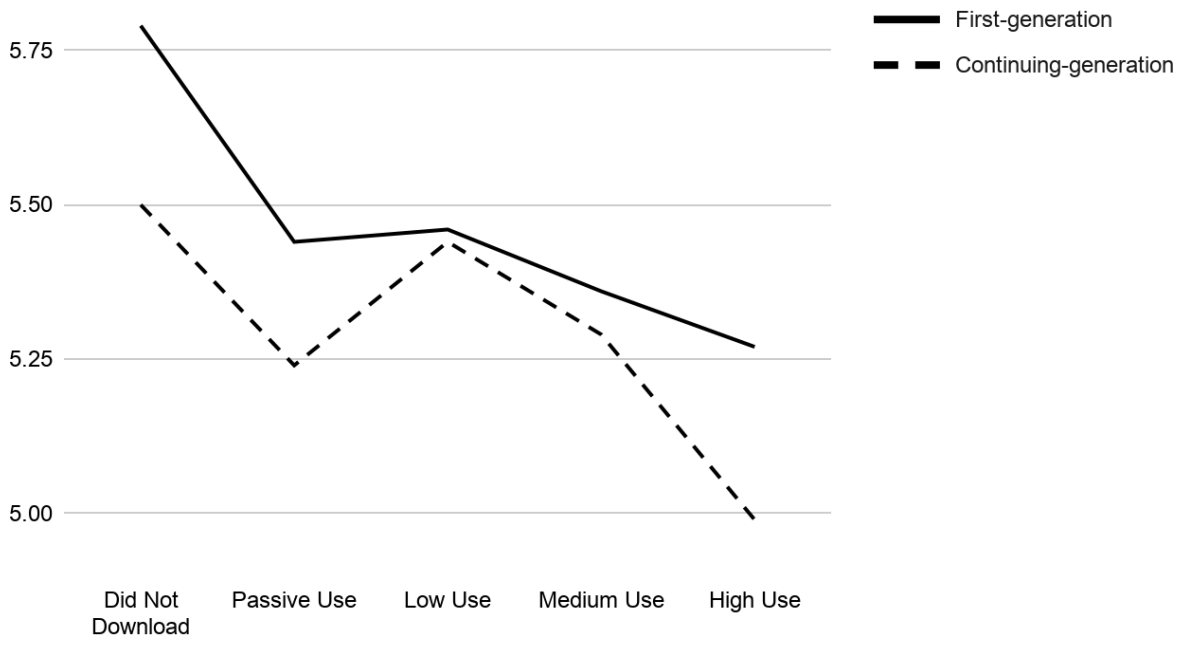


Table 9

Mean Educational Stress Stanine Scores by Mobile Application Utilization Level

	First-generation			Continuing-generation			All students		
Utilization Level	N	*M*	*SD*	N	*M*	*SD*	N	*M*	*SD*
Did Not Download	120	5.79	1.85	316	5.50	1.87	436	5.58	1.86
Passive Use	234	5.44	2.09	638	5.24	1.85	872	5.30	1.92
Low Use	316	5.46	1.85	687	5.44	1.90	1003	5.45	1.88
Medium Use	344	5.36	1.88	669	5.29	1.79	1013	5.31	1.82
High Use	291	5.27	1.96	535	4.99	1.85	826	5.09	1.89
Total	1305	5.42	1.93	2845	5.28	1.86	4150	5.33	1.88

A Tukey post-hoc test revealed that Educational Stress scale scores were statistically significantly higher for students who did not download the application (5.58 ± 1.86pts, $p < .00$) or who were low users of the application (5.45 ± 1.88, $p < .00$) than for high users of the application (5.09 ± 1.89, $p < .00$). Students with high levels of use of the application had Educational Stress scale scores that were 0.36 points lower than students who were low users of the application, and 0.49 points lower than students who did not download the application at all. This indicates that for all active users of the application, as educational stress levels rise, students utilized the guided pathways mobile application less.

Next, a chi-square independence test was performed to examine the relationship between levels of guided pathways mobile application usage and first-generation student status. The relationship between these variables was found to be statistically significant, but weak: $\chi 2(4) = 18.317$, $p = .001$, $V = .062$. This indicates that first-generation students had somewhat different application utilization patterns than continuing-generation students.

Table 10

Application Utilization by First-Generation Student Status

Application Utilization	Continuing-generation				First-generation				Total		
	#	Exp. #	%	SR	#	Exp. #	%	SR	#	Exp. #	%
Did Not Download	569	547.7	17.5%	0.9	236	257.3	15.5%	-1.3	805	805	16.9%
Passive Use	712	672.2	21.9%	1.5	276	315.8	18.1%	**-2.2**	988	988	20.7%
Low Use	734	737.5	22.6%	-0.1	350	346.5	23.0%	0.2	1084	1084	22.7%
Medium Use	690	717.1	21.3%	-1	364	336.9	23.9%	1.5	1054	1054	22.1%
High Use	541	571.5	16.7%	-1.3	299	268.5	19.6%	**1.9**	840	840	17.6%
Total	3246	3246	100.0%		1525	1525	100.0%		4771	4771	100.0%

Notes: SR = Standardized Residuals

Investigation of the standardized residuals in Table 10 shows that higher percentages of first-generation students than continuing-generation students downloaded the mobile application

(84.9% vs. 82.5%). Only 0.4% more first-generation students were low-level users of the application when compared to continuing-generation students (23.00% vs. 22.60%). Higher percentages of first-generation students than continuing students were Medium (23.90% vs. 21.30%) or High (19.60% vs. 16.70%) users of the application. These numbers indicate that a larger percentage of first-generation students (66.5%) were active users of the guided pathways application than continuing-generation students (60.6%).

A second chi-square test (see Appendix E) was conducted to investigate if there were statistically significant differences in usage levels of guided pathways mobile application usage by first-generation student status, and if that usage varied by educational stress level. In order to obtain sufficient cell counts, educational stress stanine scores were grouped as follows: scores of 1, 2, or 3 were grouped as Below Average; scores of 4, 5, or 6 were grouped as Average; scores of 7, 8, or 9 were grouped as Above Average. The association between guided pathways mobile application usage by first-generation student status and educational stress was found to be statistically significant, but very weak: $\chi 2(4) = 20.168$, $p = .000$, $V = .070$. Breaking this down further, the association was also statistically significant, but weak for students with Above Average educational stress scores $\chi 2(4) = 9.862$, $p = .043$, $V = .094;$ as well as for students with Average educational stress scores $\chi 2(4) = 17.048$, $p = .002$, $V = .086.$

An examination of the standardized residuals indicated that more first-generation students than expected were high users of the application and fewer first-generation students than expected were passive users of the application. Interestingly, slightly more continuing-generation students were passive users of the application than expected.

An examination of the standardized residuals for each of the educational stress levels indicated that for students with Above Average educational stress scores, more first-generation

students than expected were high users of the application, and slightly more continuing students than expected were low users of the application. For students with Average educational stress scores, more continuing-generation students were passive users than expected, while fewer first-generation students were passive users.

A third chi-square test was conducted to investigate if there were statistically significant differences in the different usage levels of guided pathways mobile application usage by student status (whether first-generation), and if that relationship varied at each educational stress level (for results, see Appendix F). In order to compensate for small cell sizes, students with scores of 1, 2, or 3 were collapsed together. The association was found to be statistically significant: $\chi 2(4) = 20.168$, $p = .000$, $V = .070$. However, a small statistically significant difference was found between first-generation and continuing-generation students who received a 5 on the Educational Stress Scale Stanine score: $\chi 2(4) = 11.040$, $p = .026$ $V = .117$. By examining the standardized residual for students with educational stress scores of 5, we can see that slightly fewer first-generation students than expected were passive users of the application, and slightly more first-generation students than expected were medium users of the application.

Nearly significant differences were found between first-generation and continuing-generation students who received a 4 on the Educational Stress Scale Stanine score, $\chi 2(4) = 8.367$, $p = .079$, $V = .114$; a 6 on the Educational Stress Scale Stanine Score, $\chi 2(4) = 8.286$, $p = .082$, $V = .098$, as well as between first-generation and continuing-generation students who earned Educational Stress Scale Stanine scores of 9, $\chi 2(4) = 8.670$, $p = .070$, $V = .210$.

At educational stress levels of 4, 5, and 6, a higher percentage of first-generation students were low, medium or high app users than continuing-generation students. This finding

indicates that at average levels of educational stress, a higher percentage of first-generation students were active users (meaning they completed at least one to-do item) of the guided pathways mobile application than continuing-generation students. The differences between participation rates are greatest for students with Educational Stress scale scores of 5, where 75.90% of first-generation students were active users of the mobile application, in comparison to 65.30% of continuing-generation students. However, at an educational stress score of 9, only 60% of first-generation students were active users of the mobile application, in comparison to 64.70% of continuing-generation students. This indicates that at the highest level of educational stress, a lower percentage of first-generation students were active users of the guided pathways mobile application than continuing-generation students.

Research Question 2B) Does the relationship between number of credits attempted and first-generation student status vary by levels of guided pathways mobile application utilization?

This question was designed to determine if differing levels of usage of the guided pathways mobile application had an effect on the number of credits attempted in the fall semester, and if there were differences between first-generation and continuing-generation students. The results of the ANOVA show that there was no significant interaction effect between first-generation status and guided pathway mobile application usage on the number of credits attempted in the fall semester, $F(4, 4380) = 0.188$, $p = .945$, $\eta 2 = .000$. However, the main effects were significant for both first-generation status ($F(1, 4380) = 13.382$, $p = .000$, $\eta 2 = .003$) and levels of guided pathways mobile application usage ($F(4, 4380) = 8.324$, $p = .000$, $\eta 2 = .008$). First-generation students attempted 0.160 fewer credits ($p = .000$) ($M = 14.903$,

95%, CI [14.83, 14.97]) in the fall semester than their continuing-generation peers (*M* = 15.063, CI [15.02, 15.11]).

The ANOVA also indicated that there were significant differences in the number of credits attempted between the different levels of mobile application usage. A post-hoc test was conducted to interpret the pattern of mean differences for the effect of guided pathways mobile application usage on the number of credits attempted in the fall semester. Tukey's post hoc test showed statistically significant differences in the numbers of credits attempted between users who did not download the application (*M* = 14.729) and all other levels of use of the application (see Table 11). In addition, passive users of the application had significantly lower credits attempted than high users of the application.

Table 11

Pairwise Comparisons for the Number of Credits Attempted by Application Use

(I) App Usage	(J) App Usage	*N*	*M*	Mean Difference (I-J)	Std. Error	*p*	95% Confidence Interval for Difference b	
							Lower Bound	Upper Bound
Did Not Download	Passive Use	977	15.019	-.291*	0.08	0.00	-0.448	-0.134
	Low Use	1066	15.091	-.359*	0.078	0.00	-0.513	-0.206
	Medium Use	1035	15.604	-.352*	0.078	0.00	-0.505	-0.198
	High Use	835	15.162	-.450*	0.08	0.00	-0.608	-0.293
Passive Use	Did Not Download	477	14.729	.291*	0.08	0.00	0.134	0.448
	Low Use	1066	15.091	-0.068	0.061	0.265	-0.189	0.052
	Medium Use	1035	15.604	-0.061	0.061	0.325	-0.181	0.06
	High Use	835	15.162	-.159*	0.064	0.014	-0.286	-0.033

Based on estimated marginal means

* The mean difference is significant at the .05 level.

b Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Research Question 2C) Does the relationship between percentage of credits earned and first-generation student status vary by levels of guided pathways mobile application utilization?

This question was designed to determine if differing levels of usage of the guided pathways mobile application had an effect on the percentage of credits earned at the end of the fall semester, and if there were differences between first-generation and continuing-generation students. The results of the ANOVA show that there was no significant interaction effect between first-generation status and guided pathway mobile application usage on the percentage of credits earned in the fall semester, $F(4, 4380) = 0.205$, $p = .936$, $\eta 2 = .000$. However, the main effects were significant for both first-generation status ($F(1, 4380) = 7.647$, $p = .006$, $\eta 2 = .002$) and levels of guided pathways mobile application usage ($F(4, 4380) = 8.002$, $p = .000$, $\eta 2 = .007$). This indicates that there are significant differences in percentage of credits earned between levels of mobile application usage. In addition, as seen previously, first-generation students had lower percentages of credits earned ($M = 0.856$, 95% CI [0.843, 0.869]) than continuing-generation students ($M = 0.878$, 95% CI [0.870, .887]).

A post-hoc test was conducted to interpret the pattern of mean differences for the effect of guided pathways mobile application usage on the percentage of fall credits earned. By analyzing Tukey's HSD, we can determine which levels of application usage were statistically different by analyzing the differences in the means of the percentage of credits earned (see Table 12).

Students who did not download the application had significantly lower percentages of credits earned than those who were low, medium or high users of the application. Passive users' percentage of credits earned were also significantly lower than medium and high users of the

Table 12

Pairwise Comparisons for the Percentage of Credits Earned by Application Use

(I) App Usage	(J) App Usage	*N*	*M*	Mean Difference (I-J)	Std. Error	*p*	95% CI for Difference	
							Lower Bound	Upper Bound
Did Not Download	Passive Use	977	0.854	-0.027	0.015	0.062	-0.056	0.001
	Low Use	1066	0.873	**-.046***	0.014	0.001	-0.074	-0.018
	Medium Use	1035	0.883	**-.057***	0.014	0.000	-0.085	-0.029
	High Use	835	0.9	**-.073***	0.015	0.000	-0.102	-0.044
Passive Use	Did Not Download	477	0.826	0.027	0.015	0.062	-0.001	0.056
	Low Use	1066	0.873	-0.019	0.011	0.092	-0.041	0.003
	Medium Use	1035	0.883	**-.030***	0.011	0.009	-0.052	-0.008
	High Use	835	0.9	**-.046***	0.012	0.000	-0.069	-0.023
Low Use	Did Not Download	477	0.826	**.046***	0.014	0.001	0.018	0.074
	Passive Use	977	0.854	0.019	0.011	0.092	-0.003	0.041
	Medium Use	1035	0.883	-0.011	0.011	0.325	-0.032	0.011
	High Use	835	0.9	**-.027***	0.011	0.018	-0.049	-0.005

Based on estimated marginal means

* The mean difference is significant at the .05 level.

b Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

application. In addition, low users of the application had significantly lower percentages of credits earned than high users of the application.

Research Question 3: Is there a relationship between enrollment and first-generation student status?

The results of a Chi-Square Test of Independence indicated a significant but weak association between enrollment and first-generation student status, $\chi 2(1) = 3.888$, $p = .049$, $V = 0.029$. As shown in Table 13, slightly more first-generation students than expected (9.1%) and

slightly fewer continuing-generation students (7.5%) than expected did not enroll in the fall semester. Overall, first-generation students made up 32% of the sample; however, they made up 36.5% of the number of students who did not enroll.

Table 13

Cross Tabulation of First-Generation Student Status by Enrollment

Student Status	Enrollment Status													
	Not Enrolled					Enrolled					Total			
	#	Exp. #	% within Student Status	% within Enrolled	SR	#	Exp. #	% within Student Status	% within Enrolled	SR	#	Exp. #	% within Student Status	% within Enrolled
Cont-Gen.	242	259	7.5%	63.5%	-1.1	3004	2987	92.5%	68.4%	0.3	3246	3246	100.0%	68.0%
First-Gen	139	122	9.1%	36.5%	**1.6**	1386	1403	90.9%	31.6%	-0.5	1525	1525	100.0%	32.0%
Total	381	381	8.0%	100.0%		4390	4390	92.0%	100.0%		4771	4771	100.0%	100.0%

Note: SR = Standardized Residual

Research Question 4: Is there an association between educational stress and enrollment?

In order to obtain satisfactory cell count, Educational Stress Scores were grouped as follows: Scores of 1-3 = Below Average, Scores of 4-6 = Average, Scores of 7-9 = Above Average. The results of a Chi-Square Test of Independence indicated a non-significant association between educational stress and enrollment, $\chi 2(2) = 4.303$, $p = .116$, $V = 0.032$. Even though the results were not significant, by analyzing the standardized residuals, we can see that slightly more students than expected with above average levels of educational stress than expected did not enroll in the fall semester (see Table 14). Of the students who did not enroll, 37% had above average levels of educational stress, in comparison to only 27% of students who did enroll.

Table 14

Cross Tabulation of Educational Stress Levels by Enrollment Status

Educational Stress Level	Enrollment Status									
	Not Enrolled					Enrolled				
	#	Exp. #	% within Ed. Stress	% within Enrollment	SR	#	Exp. #	% within Ed. Stress	% within Enrollment	SR
Above Average	30	22	2.7%	37.0%	**1.7**	1091	1099	97.3%	26.8%	-0.2
Average	38	45	1.6%	46.9%	-1.1	2277	2270	98.4%	56.0%	0.2
Below Average	13	14	1.8%	16.0%	-0.3	701	700	98.2%	17.2%	0
Total	81	81	2.0%	100.0%		4069	4069	98.0%	100.0%	

Research Question 4A: Is the relationship between levels of educational stress and enrollment moderated by first-generation student status?

A chi-square test was run to see if the proportion of levels of educational stress differed by enrollment status, and if those differences varied by first-generation student status. In order to obtain satisfactory cell count, Educational Stress Scores were grouped as follows: Scores of 1-3 = Below Average, Scores of 4-6 = Average, Scores of 7-9 = Above Average. The proportion of educational stress scores in each level (Below Average, Average, and Above Average) did not differ significantly between all enrolled and unenrolled students ($\chi 2(2) = 4.303$, $p = .116$, $V = 0.032$), nor for enrolled and unenrolled first-generation students ($\chi 2(2) = 1.924$, $p = .382$, $V = 0.038$), nor for enrolled and unenrolled continuing-generation students ($\chi 2(2) = 2.116$, $p = .347$, $V = 0.027$). Full results from the chi-square, including standardized residuals can be found in Table 15.

Table 15

Educational Stress Levels by Enrollment Status

		Educational Stress														
		Above Average				Average				Below Average				Total		
Student Status	Enrolled	#	Exp. #	%	SR	#	Exp. #	%	SR	#	Exp. #	%	SR	#	Exp. #	%
Cont.-Gen.	No	16	12	35.6%	1.2	22	25	48.9%	-0.7	7	8	15.6%	-0.3	45	45	100.0%
	Yes	727	731	26.0%	-0.2	1584	1581	56.6%	0.1	489	488	17.5%	0	2800	2800	100.0%
	Total	743	743	26.1%		1606	1606	56.4%		496	496	17.4%		2845	2845	100.0%
First-Gen	No	14	10	38.9%	1.1	16	20	44.4%	-0.8	6	6	16.7%	0	36	36	100.0%
	Yes	364	368	28.7%	-0.2	693	689	54.6%	0.1	212	212	16.7%	0	1269	1269	100.0%
	Total	378	378	29.0%		709	709	54.3%		218	218	16.7%		1305	1305	100.0%
Total	No	30	22	37.0%	**1.7**	38	45	46.9%	-1.1	13	14	16.0%	-0.3	81	81	100.0%
	Yes	1091	1099	26.8%	-0.2	2277	2270	56.0%	0.2	701	700	17.2%	0	4069	4069	100.0%
	Total	1121	1121	27.0%		2315	2315	55.8%		714	714	17.2%		4150	4150	100.0%

Note: SR = Standardized Residual

To follow up, a two-way ANOVA was run to investigate the relationship between educational stress and enrollment status and first-generation student status. Levene's test indicated that the error variance of educational stress level was equal across groups: $F(3, 4146) = 1.154$, $p = .326$. The interaction effect between first-generation student status and enrollment for fall on Educational Stress scale scores was not significant: $F(1, 4146) = 0.046$, $p = .831$). Additionally the main effects on Educational Stress scale scores were not significant for first-generation student status: $F(1, 4146) = .179$, $p = .672$, and enrollment for fall, $F(1, 4146) = 1.991$, $p = .158$.

Research Question 4B: Is there a difference in mean educational stress scores between students who enroll versus those who do not enroll, and does this differ by first-generation status?

In order to determine if there is a difference in Educational Stress scale scores between students who successfully matriculate to their first semester and those who do not enroll, the researcher ran an independent samples *t*-test to determine if the difference between the two groups' averages is unlikely to have occurred because of random chance. Results of the independent samples *t*-test indicated that the mean educational stress scores did not statistically differ between the 4,069 students who successfully enrolled in the fall semester ($M = 5.32$, $SD = 1.879$) and the 81 students who did not ($M = 5.64$, $SD = 1.97$), ($F = 0.991$, $p = .32$), $t(4148) = -1.530$, $p = .126$, $d = -0.17$).

The same independent samples *t*-test was conducted again, split by first-generation student status, in order to determine if educational stress scores differed significantly for first-generation students and continuing-generation students by enrollment status. Mean educational stress scores did not differ significantly between the 36 first-generation students ($M = 5.67$, $SD = 2.165$) and the 45 continuing-generation students who did not enroll in the fall semester ($M = 5.62$, $SD = 1.825$), ($t(79) = 0.100$, $p = .920$, $d = 0.03$). However, as shown in Table 16, mean educational stress scores did differ significantly between the 1269 first-generation students and 2800 continuing-generation students who did enroll in the fall semester ($t(4067) = 2.13$, $p = 0.033$), although the effect size was very small $d = 0.07$).

Table 16

Educational Stress Scores by Enrollment Status and First-Generation Status

	First-generation			Continuing-generation						
	N	*M*	*SD*	*N*	*M*	*SD*	*df*	*t*	*p*	*Cohen's d*
Enrolled	1269	5.41	1.922	2800	5.28	1.858	4067	2.13	0.033	0.07
Not Enrolled	36	5.67	2.165	45	5.62	1.825	79	0.10	0.920	0.03

Research Question 4C: Is the relationship between Educational Stress scale scores and enrollment moderated by guided pathways mobile application utilization?

A two-way ANOVA was run to investigate the relationship between educational stress scores, enrollment status and levels of guided pathways mobile application utilization. Levene's test indicated that the error variance of educational stress level was equal across groups: $F(9, 4140) = 0.786$, $p = .630$. The main effects on Educational Stress scores were significant for mobile application utilization: $F(4, 4140) = 4.034$, $p = 0.003$, but not for enrollment, $F(1, 4140) = 0.583$, $p = 0.445$.The interaction effect between enrollment and mobile application usage on Educational Stress scale scores was also significant: $F(4, 4140)=2.635$, $p =.032$) (see Figure 5).

Table 17

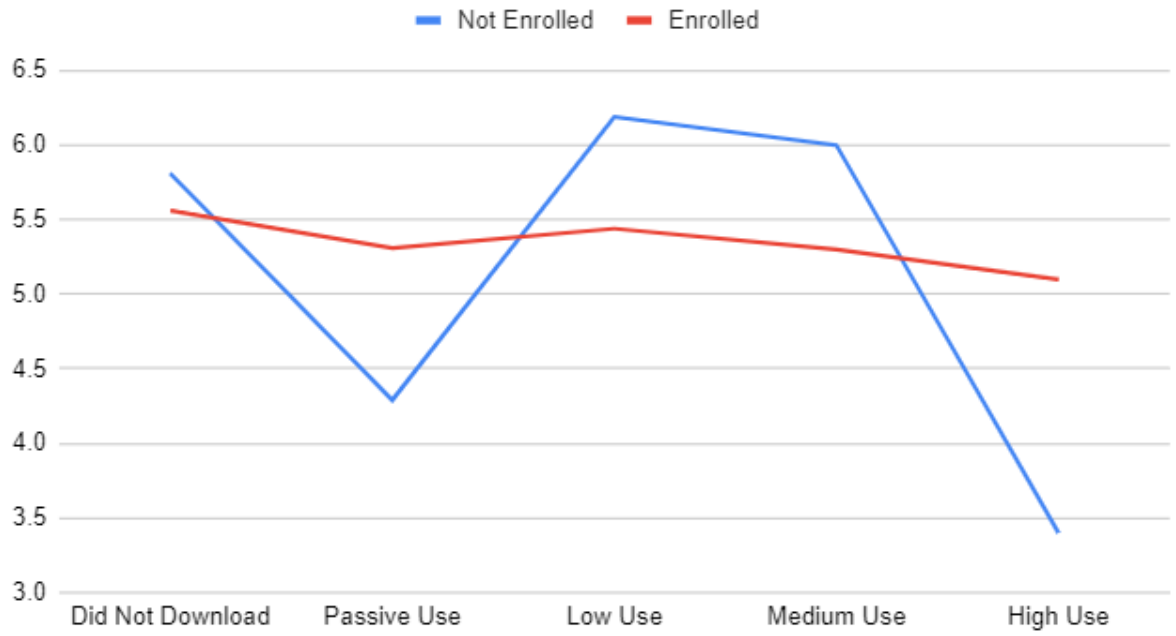
Mean Educational Stress Scale Scores by Enrollment and Application Use

Enrolled	App Usage	N	*M*	*SD*
No	Did Not Download	37	5.81	1.898
	Passive Use	7	4.29	1.113
	Low Use	16	6.19	1.834
	Medium Use	16	6	2.129
	High Use	5	3.4	1.517
	Total	81	5.64	1.97
Yes	Did Not Download	399	5.56	1.861
	Passive Use	865	5.31	1.924
	Low Use	987	5.44	1.882
	Medium Use	997	5.3	1.817
	High Use	821	5.1	1.889
	Total	4069	5.32	1.879
Total	Did Not Download	436	5.58	1.863
	Passive Use	872	5.3	1.921
	Low Use	1003	5.45	1.883
	Medium Use	1013	5.31	1.824
	High Use	826	5.09	1.891
	Total	4150	5.33	1.881

A Tukey post hoc test revealed that educational stress scores were statistically significantly higher ($p < 0.000$) for students who did not download the application ($M = 5.58$) and for low users of the application ($M = 5.45$) than for high users of the application ($M = 5.09$). All means can be viewed in Table 17.

Figure 5

Mean Educational Stress Scale Scores by Enrollment Status



Research Question 5: Is there a relationship between levels of guided pathways mobile application utilization and enrollment status?

A Chi-square test was run to determine if there was a relationship between levels of guided pathways mobile application utilization and enrollment status in the fall semester. An association between levels of guided pathways mobile application usage and enrollment status was observed: $\chi 2(4) = 1415.518$, $p < .000$. The effect size for this finding was large: .545

(Cohen, 1988).

Table 18

Cross Tabulation of Enrollment Status by Application Utilization Level

App Usage Level	Not Enrolled					Enrolled				
	#	Exp. #	% within App Usage	% within Enrolled For Fall	SR	#	Exp. #	% within App Usage	% within Enrolled For Fall	SR
Did Not Download	328	64	40.7%	86.1%	32.9	477	741	59.3%	10.9%	-9.7
Passive Use	11	79	1.1%	2.9%	-7.6	977	909	98.9%	22.3%	2.3
Low Use	18	87	1.7%	4.7%	-7.4	1066	997	98.3%	24.3%	2.2
Medium Use	19	84	1.8%	5.0%	-7.1	1035	970	98.2%	23.6%	2.1
High Use	5	67	0.6%	1.3%	-7.6	835	773	99.4%	19.0%	2.2
Total	381	381	8.0%	100.0%		4390	4390	92.0%	100.0%	

Note: SR = Standardized Residual

As shown in Table 18, the main difference in usage patterns between enrolled and unenrolled students was seen in the grouping of students who did not download the application. Of the students who did not download the mobile application, only 59.3% enrolled in the fall semester. Over 98% of Passive, Low, Medium and High Users of the application enrolled in the fall semester. 86.1% of students who did not enroll in fall did not download the guided pathways mobile application, in comparison to 10.9% of students enrolled in the fall.

Research Question 5A) Does the relationship between levels of guided pathways mobile application utilization and enrollment status vary by first-generation student status?

A chi-square was run to see if enrollment patterns differed depending upon the level of usage of the mobile application between first-generation and continuing-generation students. In order to obtain sufficient cell counts, Mobile Application Usage Levels were collapsed into Did

Not Download, Passive User, and Active User. The Passive User grouping had insufficient cell counts for Non-Enrolled First-Generation students, so statistics for this group will be ignored. The results of the chi-square analysis indicated a statistically significant but weak association between enrollment and first-generation student status by levels of mobile application usage: ($\chi2(1) = 3.888$, $p = .049$, $V = 0.029$). Statistically significant relationships between enrollment and student status were also found for students who did not download the mobile application ($\chi2(1) = 5.469$, $p = .019$, $V = 0.082$) and for students who were active users of the application ($\chi2(1) = 12.349$, $p = .000$, $V = 0.064$). Table 19 shows that 61.9% of continuing-generation students who did not download the application enrolled in the fall semester, in comparison to 53% of first-generation students who did not download the application. 99.1% of continuing-generation students who were active users of the application enrolled in the fall semester, in comparison to 97.5% of first-generation students who were active users. Examination of the standardized residuals in Table 19 shows that fewer continuing-generation students at all levels of usage of the app except for passive use than expected did not enroll for the fall semester, and more than expected did enroll for fall. The inverse relationship existed for first-generation students.

Table 19

Cross Tabulation of Enrollment Status by First-Generation Student Status by Application Utilization Level

Usage Level	Student Type	Enrolled For Fall							
		Not Enrolled				Enrolled			
		#	Exp. #	% within App Usage	SR	#	Exp. #	% within App Usage	SR
Did Not Download	Cont.-Gen	217	231	38.1%	-1	352	337	61.9%	0.8
	First- Gen	111	96	47.0%	1.5	125	140	53.0%	-1.3
	Total	328	328	40.7%		477	477	59.3%	
Passive User	Cont.-Gen	8	7	1.1%	0	704	704	98.9%	0
	First- Gen	3	3	1.1%	0	273	273	98.9%	0
	Total	11	11	1.1%		977	977	98.9%	
Active User	Cont.-Gen	17	27	0.9%	-2	1948	1937	99.1%	0.2
	First- Gen	25	14	2.5%	2.8	988	999	97.5%	-0.3
	Total	42	42	1.4%		2936	2936	98.6%	
Total	Cont.-Gen	242	259	7.5%	-1.1	3004	2987	92.5%	0.3
	First- Gen	139	121	9.1%	1.6	1386	1403	90.9%	-0.5
	Total	381	381	8.0%		4390	4390	92.0%	

Note: SR = Standardized Residual

Research Question 5B: Is the relationship between levels of guided pathways mobile application utilization and enrollment moderated by levels of educational stress?

A Chi-square test was run to determine if the relationship between levels of guided pathways mobile application utilization and enrollment status in the fall semester was moderated by levels of educational stress. An association between levels of guided pathways mobile application usage and enrollment status was observed for all groupings of educational stress: $\chi2(2) = 109.569$, $p < .000$, $V = .162$, as well as at each individual grouping: Above Average, $\chi2(2) = 46.730$, $p < .000$, $V = .204$; Average $\chi2(2) = 40.569$, $p < .000$, $V = .132$ and

Below Average $\chi 2(2) = 24.538$, $p < .000$, $V = .185$. An examination of the standardized residuals (see Appendix G) for each of the significant levels indicated that the main cause of the relationship was found in the students who did not download the application and who did not enroll in the fall semester for all levels of educational stress.

Summary and Analysis

Demographics

This study supports the work of Cataldi (2018) and Hoyer et al. (2017) in showing that first-generation students play a large role in the diversification of college campuses. For this campus, even though the total percentage of first-generation students (32%) was very similar to the national average (33%), the demographic make-up of the first-generation population was significantly more diverse than Hoyer's distribution. In this study, White students made up only 26.9% of the first-generation student population, whereas Hoyer found that they represented 49% of the first-generation population. Similarly, Black/African American students comprised a much larger percentage of the first-generation population in this study (27%) than in Hoyer's (14%). Hispanic students made up a smaller percentage of this study's first-generation population (20.3%) than Hoyer's findings (27%).

Educational Stress

If first-generation students were found to have different levels of Educational Stress, this information may support the theory that first-generation students have a different habitus than continuing-generation students. This study investigated if first-generation students enter college with different levels or types of cultural capital than their continuing-generation peers (Davis, 2007; Tinto, 2012). The study found that first-generation and continuing generation students had similar distributions of educational stress levels according to enrollment status.

Overall, this study found no significant interaction effect by first-generation student status on the relationship between educational stress and enrollment.

However, Educational Stress stanine scores were slightly significantly higher for first-generation students than for continuing-generation students (see Table 6). This finding is consistent with Oliver et. al. (2010), who found that low-income, African American and Hispanic first-generation students participating in an Early College Academy in high school had significantly higher Educational Stress scale scores than the freshman population enrolled in a participating college. Oliver et al. posited that these students may not think that they need help adjusting to the college environment because they may think they are better prepared than they actually are. Because they do not know what they do not know, Oliver et al suggested that colleges deliver multiple emails to students as a way to provide "concrete and repetition information" about adjusting to college norms and supporting the development of belonging on campus. In this study, the guided pathways mobile application took the place of multiple emails in order to meet students where they are at - online and on their phones (Schaeffer, 2019) — to deliver this concrete and repetitive information in support of their acquisition of the capital needed to be successful on college campuses.

Usage Patterns of the Guided Pathways Mobile Application

The study investigated if students with varying levels of cultural capital used a guided pathways mobile application designed to help them with the onboarding process to college at varying levels, and if this utilization varied by first-generation status. The majority of students downloaded the guided pathways mobile application (3,886, 85.1%) and were either passive (988, 20.7%) or active users (2978, 62.4%). Only 16.9% of the students (805) did not download the application.

This study found statistically significant, but weak, differences in how first-generation students used the guided pathways mobile application. Continuing-generation students were more likely to not download or be passive users of the application than first-generation students (39.5% vs. 33.6%). Higher than expected numbers of first-generation students (43.5%) were medium or high-level users of the application, and fewer than expected continuing-generation students (38.0%) were medium or high users of the application. These results indicate that more first-generation students use the application — and more actively — than continuing-generation students.

Students will only use a mobile application actively if they find it engaging or helpful. According to Espinoza (2011), children from homes with college-educated parents are more likely to have access to ways to develop college-going skillsets than their first-generation peers. This information may help to explain why fewer than expected continuing-generation students were medium or high users of the application, and more than expected did not download the application at all. Because continuing-generation students already possess or have access to the college capital presented in the mobile application, they may not find the application particularly helpful because the information presented in the application is part of their habitus which they already share with the college environment.

In contrast, first-generation students were more often found to be medium or high-level users of the application, and fewer than expected were passive users or did not download the application. First-generation students may have utilized the mobile application more because they found the tips and to-dos to be more helpful and informative. The mobile application may have served in lieu of a parental or other college-going mentor to help first-generation students acquire the cultural capital necessary to navigate the onboarding process. This finding is in line

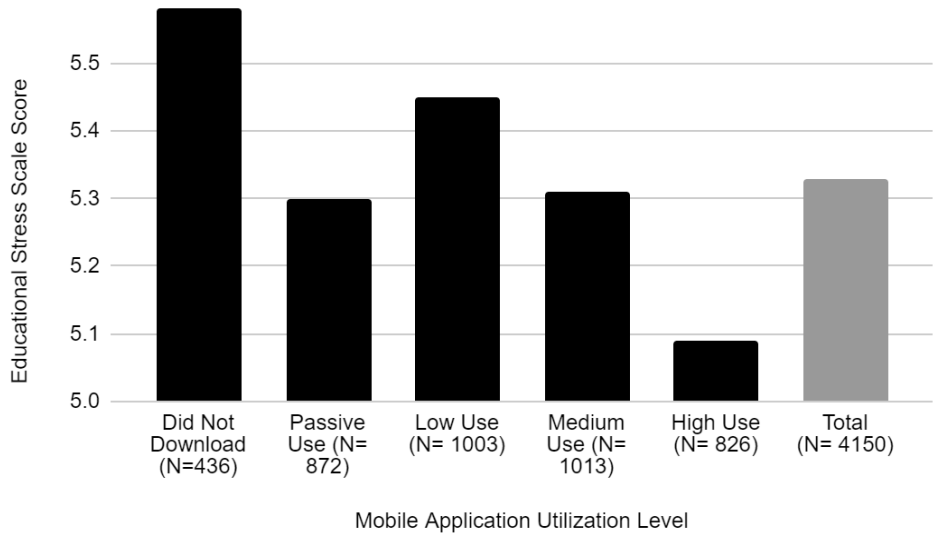
with Dumais and Ward's 2010 study that found that strategic interaction cultural capital, like the information found in the guided pathways mobile application, had positive associations with first-generation college student enrollment and graduation.

Educational Stress and Usage of the Application

This study found that Educational Stress scale scores were higher for students who did not download the application (5.58 ± 1.86pts, p <.000) or who were low users of the application (5.45 ± 1.88, p = .00) than for high users of the application (5.09 ± 1.89, p <0.00) (see Figure 6). Students with high levels of use of the application had Educational Stress scale scores that were 0.36 points lower than students who were low users of the application, and 0.49 points lower than students who did not download the application at all. This data indicates that for active users of the application, as educational stress levels rise, students utilized the guided pathways mobile application less.

Figure 6

Mean Educational Stress Scores by Application Utilization Level



Care must be taken in making interpretations of these findings in determining their practical implications. An average score of 5.58 is effectively the same as an average score of 5.09 on the College Student Inventory. In addition, these scores are stanine scores, which is a way to convert any test score to a single-digit score to aid in the assignment to group membership. If we think about how these scores would be utilized in a university setting, an average score of 5.9 is not practically different from a score of 5.2, as these students would effectively be seen as having received the same stanine score of 5.

A statistically significant, but very weak, relationship was found between levels of guided pathways mobile application usage and levels of educational stress. 27% of students who completed the College Student Inventory had above average stress scores or 7,8 or 9, 55.8% had average educational stress scores or 4, 5, or 6, and 17.2% had below average educational stress scores of 1,2, or 3. Examination of the standardized residuals showed that for students with above average levels of educational stress, slightly more students than expected did not download the application. For students with average levels of educational stress, slightly fewer students than expected were passive users of the application. Slightly fewer than expected students with below average scores did not download the application, and slightly more than expected were passive users of the application.

Usage differences by educational stress and first-generation status

This study found small differences in patterns of utilization by Educational Stress Scores for first-generation students. The association between guided pathways mobile application usage by first-generation student status and educational stress was found to be statistically significant, but very weak, $\chi 2(4) = 20.168$, $p = .000$, $V = .070$. Breaking this down further, the association was also statistically significant, but very weak for students with Above Average

educational stress scores $\chi2(4) = 9.862$, $p = .043$, $V = .094$; as well as for students with Average educational stress scores $\chi2(4) = 17.048$, $p = .002$, $V = .086$. More than expected first-generation students with Above Average educational stress scores were high users of the application.

In contrast, fewer continuing-generation students with Above Average levels of educational stress were high users of the application. These findings indicate that as educational stress levels increase for first-generation students, they may be more likely to utilize the guided pathways application, perhaps as a way of mediating that increased level of educational stress or as a way of acquiring a sufficient level of habitus. Fewer first-generation students with Average levels of educational stress than expected were passive users of the mobile application, whereas more than expected continuing-generation students were passive users of the application. This information may indicate that continuing-generation students, due to their already established similar habitus or knowledge of how-to-do college, did not view the information in the application as helpful as their first-generation peers.

This finding is consistent with those of Dennis, Phinney and Chuateco (2005), who found that students experiencing academic and adjustment distress feel a higher need for someone to provide them with help, guidance and/or emotional support. Oliver et al. (2010) suggested that students with higher levels of educational stress may lack sufficient information about college and university culture, and that colleges and universities must develop a mechanism to help these students mitigate their stress by providing them with a mechanism to learn how to negotiate college life successfully. In the absence of an individual to guide them, first-generation students with higher levels of educational stress may have turned to the guided pathways mobile application for help in acquiring that knowledge. In 2008, Collier and Morgan

suggested that colleges investigate technological solutions to help first-generation students accumulate the cultural capital necessary to acclimate to the campus habitus. Guided pathways mobile applications may be one way for institutions of higher education to provide this support at scale (Castleman & Meyer, 2020).

It is important to note that as educational stress levels rose above average levels, first-generation students became less likely to be active users of the application, whereas continuing students stayed consistent in their usage patterns. This finding may suggest that at a certain point of educational stress, first-generation students may believe that any barriers or troubles they may be experiencing are insurmountable, and instead of utilizing resources available to help them (such as the guided pathways mobile application), they instead elect not to continue.

By completing the College Student Inventory, participants begin to get a glimpse of the habitus of college life. Questions such as “I would like to attend events where I can meet new friends,” “Going to college is definitely the most satisfying thing I could do at this point,” “My previous teachers respected me and treated me fairly,” “I take notes in class and review them carefully, “I would like to find out more about student leadership and activities,”and “I don’t enjoy reading serious books and articles and only do it when I have to,” begin to relay the unspoken values and expectations of the college environment. Other questions ask students to reflect upon their own preparation for and commitment to college: “I consider my academic ability to be…” I would like help in effective ways to take college exams,” “I have great difficulty concentrating on coursework and often get behind,” “I have the financial resources I need to finish college,” If society didn’t pressure people to go to college, I’d be doing other things”, and “I’m prepared to make the effort and sacrifices needed to achieve my educational

goals" (Noel Levitz, 2010).

First-generation students, who have not received consistent information from their parents and peers about the expectations of college, as well as signaling of their own potential for success within college, may be deterred from continuing the enrollment process as they begin to sense their own unfamiliarity with and possible dissociation from the college habitus evidenced in the questions of the CSI. This mismatch in habitus may help to explain why more first-generation students with above average educational stress scores did not go on to download the mobile application due to their own perceptions of their abilities and constraints. DeAngelo and Franke (2016) stated that "higher education institutions act as a lever of reproduction during the first college year, sorting out students who lack the desired markers of academic potential recognized by college communities" (p. 1610). This study supports their findings and also supports the theory that this weeding out begins even earlier than the first-year, but during the on-boarding process itself.

Enrollment

This study investigated if different levels of cultural capital are related to students' successful matriculation at college, and if matriculation varied by first-generation status and application utilization. Did utilization of a guided pathways mobile application help students to matriculate by providing them with access to missing cultural capital? Ultimately, 8% of the population (381 students) failed to enroll in the fall semester. This study found a significant but very weak association between enrollment and first-generation student status ($\chi 2(1) = 3.888$, $p = .049$, $V = 0.029$). Slightly more first-generation students than expected (9.1%) than continuing-generation students (7.5%) did not enroll in the fall semester. Overall, first-generation students made up 32% of the sample, however, they made up 36.5% of the

number of students who did not enroll. This finding supports previous research by Cataldi et al. (2018), Dumais and Ward (2010), and Chen and Carroll (2005) who found that first-generation students were less likely to enroll in college.

Mobile Application Usage and Enrollment

This study found that the level of usage of the mobile application had a significant and large relationship with enrollment. Over 98% of students who were passive, low, medium or high users of the application enrolled in their first semester, in comparison to only 59.3% of students who did not download the application. Downloading and using the application has a clear correlation with enrollment in the fall, however, future studies will need to investigate this to determine why. Most students (86.1%) who did not enroll in the fall semester did not download the guided pathways mobile application, which stands in stark contrast to just 10.9% of students enrolled in the fall who did not download the application. Future studies should look at the 24.9% of students who did download the application but failed to enroll to learn more about the factors that may have influenced these students who at least took initial steps towards matriculation to not enroll.

This study found interesting differences in enrollment patterns between first-generation and continuing-generation students who did not download the guided pathways mobile application. Sixty-two percent of continuing-generation students who did not download the application enrolled in the fall semester, compared to 53% of first-generation students. This is interesting because if we assume that the students did not download the application because of a lack of interest in following the steps to enroll in the fall semester, continuing-generation students were more likely to enroll than their first-generation peers. Continuing-generation students are often expected to go to college. According to habitus theory, this status is an

assumed expectation for them, whereas for first-generation students, that assumption and belief may not be as strong, and may even be at odds with familial expectations. This explanation may indicate why more continuing-generation students than expected at all levels of application usage (including not downloading the application) successfully enrolled in the fall semester.

In contrast, more than expected first-generation students who were active users of the application failed to enroll in the fall semester, while fewer than expected continuing-generation students did the same. In this scenario, these students can be assumed to have the same commitment to attending college; as active users of the application, they are trying to complete the checklists of items needed to successfully matriculate. Yet, first-generation students are negatively impacted more than continuing-generation students.

Due to the design of this study, it is impossible to determine if a causal relationship exists between usage of the mobile application and enrollment, because this study did not control for other factors that may have influenced a student's decision or ability to enroll. For example, a student may not have downloaded the application because they were uncommitted to attending college, or they may not exhibit help seeking behavior. There was no way for this study to determine if the first-generation students faced greater challenges to successful enrollment than their continuing-generation peers, however, many studies have found that financial, familial and other challenges are great barriers for first-generation students hoping to enroll in college.

Educational Stress and Enrollment

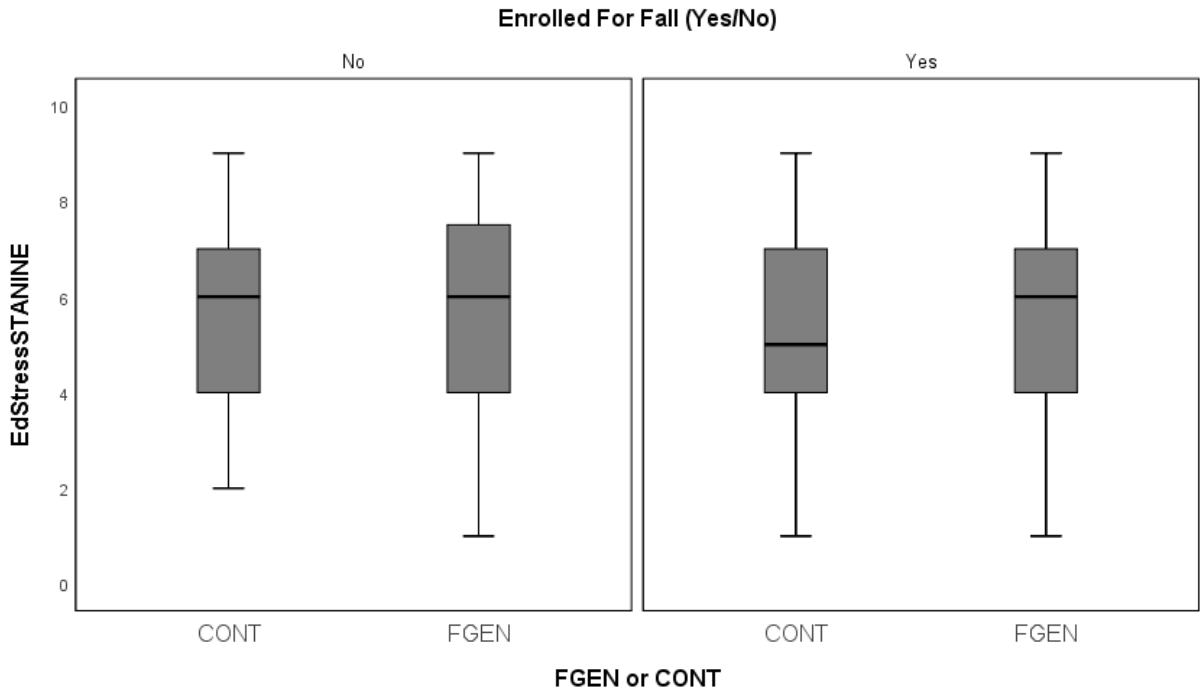
The results of a Chi-Square Test of Independence indicated a non-significant association between educational stress and enrollment ($\chi 2(2) = 4.303$, $p = .116$, $V = 0.032$). Even though the results were not significant, by analyzing the standardized residuals, we can see that slightly

more students than expected with above average levels of educational stress than expected did not enroll in the fall semester. Of the students who did not enroll, 37% had above average levels of educational stress, in comparison to only 27% of students who did enroll.

Stress scores were slightly higher for first-generation students who enrolled in the fall semester than continuing-generation students who enrolled in the fall semester (see Figure 7), which helps to support Jury' et al.'s (2017) theory that first-generation and low-SES students are more apt to experience psychological distress in the college environment than continuing-generation students. However, there were no differences in educational stress scores between first-generation and continuing-generation students who did not enroll in the fall semester. Effect sizes for all of these findings were very small. There were no significant differences in the distribution of educational stress scores for enrolled and unenrolled students, and this did not vary for first-generation or continuing-generation students.

Figure 7

Educational Stress Stanine Scores by Enrollment Status by Student Status



Number of Credits Attempted

As shown previously in the literature, first-generation students accumulate fewer credits than their continuing-generation peers annually (Chen & Carroll, 2005), so it is important to learn more about patterns of credit accumulation in order to better support first-generation student persistence to graduation. Of those students who enrolled in the fall, students on average attempted 15.04 credits (*SD* = 1.28). This study found that first-generation students attempted slightly fewer credits (*M* = 14.94, *SD* = 1.23) than continuing-generation students (*M* = 15.09, *SD* = 1.29, *t*(2826) = -3.630, *p* = .000). However, again, the practical significance of this finding was small (*d* = -0.12). While not completely aligned with Chen and Carroll's study, the findings of this study provide a possible partial explanation why first -generation students accumulate

fewer credits annually. By starting a semester enrolled in fewer credits, students limit the number of credits they can earn, regardless of their successful future completion of those credits.

Mobile Application Usage and Number of Credits Attempted

The study found significant differences in the number of credits attempted for all students by different levels of mobile application utilization ($F(4, 4380) = 8.324$, $p = .000$), with non-users of the application attempting significantly fewer credits ($M = 14.729$) than all other users of the application and passive users of the application ($M = 15.019$) attempting significantly fewer credits than high-level users ($M = 15.162$). The practical significance of this finding was minimal ($\eta 2 = .008$). There was no interaction effect between first-generation status and level of guided pathways mobile application utilization on the number of credits attempted.

It is tempting to use the significance of this finding to support a claim that usage of the application has a correlation with the number of credits attempted in the fall semester, however the small effect size and large sample size cautions against this. One must consider what other explanatory variables may be at play (Khalilzadeh & Tasci, 2017). This study was not able to control for other variables that may explain this small difference in attempted credits, which could include items like pre-college academic preparation, availability of courses at the point of registration, or advisor bias.

Percentage of Credits Earned

Students enrolled in the fall semester earned, on average, 87.5% of the number of credits attempted. This study did not differentiate between courses that were failed or those from which students withdrew from. First-generation students earned a significantly lower percentage of

credits in their first semester of enrollment than continuing-generation students (86.3% vs 88.08%), which aligns with Chen & Carroll's (2005) findings.

According to this finding, if we assume that a typical student attempts 15 credits in their first semester, first-generation students would earn 12.84 of those credits in contrast to their continuing-generation peers, who would earn 13.17 credits. At the end of the first year of study, a first-generation student who maintained this credit accumulation rate would have earned 25.68 credits, in comparison to 26.34 credits earned by their continuing-generation peers. While this does not seem like a large difference, if a student does not improve these credit completion rates, at the end of four years of study attempting 15 credits per semester, a first-generation student would have earned 102.72 credits, while their continuing-generation peers would have earned 105.36 credits — approximately 2.65 credits more. This seemingly small difference in percentage of credits earned adds up over the multiple semesters needed to earn a degree, ultimately causing greater costs for first-generation students as they pay to retake more credits than their continuing-generation peers.

Mobile Application Usage and Percentage of Credits Earned

The main effect for level of guided pathways mobile application utilization on percentage of credits earned in the fall semester was significant ($F(4, 4380) = 8.002$, $p = .000$, $\eta 2 = .007$). Students who did not download the application had significantly lower percentages of credits earned ($M = 82.6\%$) than those who were passive ($M = 85.4\%$), low ($M = 87.3\%$), medium ($M = 88.3\%$) or high users ($M = 90\%$) of the application. No significant interaction effect was found between first-generation status and guided pathway mobile application usage on percentage of credits earned in the fall semester.

If we assume that students typically attempt 15 credits per semester, these data indicate that high-level users of the application would earn 13.5 credits in comparison to students who did not download the application, who would earn 12.39 credits in their first semester of enrollment. Again, if students do not improve their credit accumulation rate, over the course of eight semesters of enrollment, the high user of the application would earn 108 credits in comparison to the student who did not download the application, who would earn 99.12 credits — a difference of over eight credits. This difference is approximately one-half semester of enrollment that non-downloaders may need to retake.

It is important to note that we can not determine if the correlation between the percentage of earned credits was caused by the different levels of usage of the application, or if other mitigating factors influenced those outcomes. For example, high users of the application may be more likely to be actively involved in their education and seek out help when needed, than students who did not download the application. Future studies should investigate these outcomes through matched sampling procedures.

Table 20
Research Questions and Findings

RQ1	**Is there a relationship between guided pathways mobile application utilization and Educational Stress scale scores?**
	The relationship between these variables was found to be statistically significant, but weak, $\chi 2(4) = 9.220$, p = .056, V = .033. ● Slightly more students than expected with Above Average levels of educational stress did not download the application. ● Slightly fewer students than expected with Average levels of educational stress were passive users of the application. ● Slightly fewer than expected students with Below Average levels of educational stress did not download the application. ● Slightly more students than expected with Below Average levels of educational stress were passive users of the application.
RQ2	**Do educational stress stanine scores, number of credits attempted and percentage of credits earned vary by first-generation student status?**
	Educational Stress stanine scores were slightly higher for first-generation students (M = 5.42, SD = 1.93) than for continuing-generation students (M = 5.28, SD = 1.86), $t(4148) = 2.178$, p = .029, d = 0.07). ● First-generation students attempted slightly fewer credits (M = 14.94, SD = 1.23) than continuing-generation students (M = 15.09, SD = 1.29, $t(2826) = -3.630$, p = .000, d = -0.12). ● First-generation students also earned a smaller percentage of credits in the fall semester (M = 86.30%, SD = 0.24) than continuing-generation students (M = 88.08%, SD= 0.23, $t(2569) = -2.35$, p = .022), d = -0.08)
RQ2a	**Does the relationship between educational stress stanine scores and first-generation student status vary by levels of guided pathways mobile application utilization?**
	The results of a 2 x 5 ANOVA showed that there was no significant interaction effect between first-generation status and guided pathway mobile application usage on Educational Stress Scores ($F(4, 4140) = 0.718$, p = .579, η2 = .001). However, the main effects were significant for both first-generation status ($F(1, 4140)$ = 6.722, p = .010, η2 = .002) and levels of guided pathways mobile application usage ($F(4, 4140) = 5.439$, p = .000, η2 = .005).
	The relationship between levels of guided pathways mobile application usage and first-generation student status was found to be statistically significant, but weak: $\chi 2(4) = 18.317$, p = .001, V = .062. ● Fewer first-generation students than expected either did not download the application or were passive users of the application. ● More than expected first-generation students were medium or high users of the application.
	The association between guided pathways mobile application usage by first-generation student status and educational stress was found to be statistically significant, but very weak: $\chi 2(4) = 20.168$, p = .000, V = .070 . ● For students with Above Average educational stress scores, more first-generation students than expected were high users of the application, and slightly more continuing students than expected were low users of the application. ● For students with Average educational stress scores, more continuing-generation students were passive users than expected, while fewer first-generation students were passive users.
RQ2b	**Does the relationship between number of credits attempted and first-generation student status vary by levels of guided pathways mobile application utilization?**
	The results of the ANOVA show that there was no significant interaction effect between first-generation status and guided pathway mobile application usage on the number of credits attempted in the fall semester, $F(4, 4380) = 0.188$, p = .945, η2 = .000. However, the main effects were significant for both first-generation status ($F(1, 4380) = 13.382$, p = .000, η2 = .003) and levels of guided pathways mobile application usage ($F(4, 4380) = 8.324$, p = .000, η2 = .008). ● First-generation students attempted 0.160 fewer credits (p = .000) (M = 14.903, 95%, CI [14.83, 14.97]) in the fall semester than their continuing-generation peers (M = 15.063, CI [15.02, 15.11]).

	● Tukey's post hoc test showed statistically significant differences in the numbers of credits attempted between users who did not download the application (M = 14.729) and all other levels of use of the application. ● In addition, passive users of the application (M = 15.019) had significantly lower credits attempted than high users of the application.
RQ2c	**Does the relationship between percentage of credits earned and first-generation student status vary by levels of guided pathways mobile application utilization?**
	The results of the ANOVA show that there was no significant interaction effect between first-generation status and guided pathway mobile application usage on the percentage of credits earned in the fall semester, $F(4, 4380) = 0.205$, $p = .936$, $\eta 2 = .000$. However, the main effects were significant for both first-generation status ($F(1, 4380) = 7.647$, $p = .006$, $\eta 2 = .002$) and levels of guided pathways mobile application usage ($F(4, 4380) = 8.002$, $p = .000$, $\eta 2 = .007$), but with weak effects. ● Students who did not download the application had significantly lower percentages of credits earned than those who were low, medium or high users of the application. ● Passive users' percentage of credits earned were also significantly lower than medium and high users of the application. ● Low users of the application had significantly lower percentages of credits earned than high users of the application.
RQ3	**Is there a relationship between first-generation student status and enrollment?**
	The results of a Chi-Square Test of Independence indicated a significant but weak association between enrollment and first-generation student status, $\chi 2(1) = 3.888$, $p = .049$, $V = 0.029$. ● Slightly more first-generation students than expected (9.1%) and slightly fewer continuing-generation students (7.5%) than expected did not enroll in the fall semester. ● Overall, first-generation students made up 32% of the sample; however, they made up 36.5% of the number of students who did not enroll.
RQ4	**Is there an association between educational stress and enrollment?**
	The results of a Chi-Square Test of Independence indicated a non-significant association between educational stress and enrollment, $\chi 2(2) = 4.303$, $p = .116$, $V = 0.032$.
RQ4a	**Is the relationship between levels of educational stress and enrollment moderated by first-generation student status?**
	Results were not significant. The proportion of educational stress scores in each level (Below Average, Average, and Above Average) did not differ significantly between: ● all enrolled and unenrolled students ($\chi 2(2) = 4.303$, $p = .116$, $V = 0.032$); ● nor for enrolled and unenrolled first-generation students ($\chi 2(2) = 1.924$, $p = .382$, $V = 0.038$); ● nor for enrolled and unenrolled continuing-generation students ($\chi 2(2) = 2.116$, $p = .347$, $V = 0.027$).
RQ4b	**Is there a difference in mean educational stress scores between students who enroll versus those who do not enroll, and does this differ by first-generation status?**
	● Mean educational stress scores did differ significantly between the 1269 first-generation students and 2800 continuing-generation students who did enroll in the fall semester ($t(4067) = 2.13$, $p = 0.033$), although the effect size was very small $d = 0.07$). ● Mean educational stress scores did not differ significantly for those students who did not enroll.
RQ4c	**Is the relationship between Educational Stress scale scores and enrollment moderated by guided pathways mobile application utilization?**
	A two-way ANOVA found that the main effects of Educational Stress scores were significant for mobile application utilization: $F(4, 4140) = 4.034$, $p = 0.003$, but not for enrollment, $F(1, 4140) = 0.583$, $p = 0.445$. The interaction effect between enrollment and mobile application usage on Educational Stress scale scores was also significant: $F(4, 4140) = 2.635$, $p = .032$)

RQ5	**Is there a relationship between levels of guided pathways mobile application utilization and enrollment?**
	An association between levels of guided pathways mobile application usage and enrollment status was observed: $\chi 2(4) = 1415.518$, $p < .000$. The effect size for this finding was large: .545 (Cohen, 1988). ● The main difference in usage patterns between enrolled and unenrolled students was seen in the grouping of students who did not download the application. Of the students who did not download the mobile application, only 59.3% enrolled in the fall semester. This is in comparison to over 98% of Passive, Low, Medium and High Users of the application who enrolled in the fall semester. ● 86.1% of students who did not enroll in fall did not download the guided pathways mobile application, in comparison to 10.9% of students who did enroll in the fall.
RQ5a	**Does the relationship between levels of guided pathways mobile application utilization and enrollment status vary by first-generation student status?**
	The results of the chi-square analysis indicated a statistically significant but weak association between enrollment and first-generation student status by levels of mobile application usage: ($\chi 2(1) = 3.888$, $p = .049$, $V = 0.029$). Statistically significant relationships between enrollment and student status were also found for students who did not download the mobile application ($\chi 2(1) = 5.469$, $p = .019$, $V = 0.082$) and for students who were active users of the application ($\chi 2(1) = 12.349$, $p = .000$, $V = 0.064$). ● Fewer than expected first-generation students successfully enrolled in the fall semester. ● More first-generation students than expected did not enroll in the fall semester. ● The inverse relationship existed for continuing-generation students. ● 99.1% of continuing-generation students who were active users of the application enrolled in the fall semester, in comparison to 97.5% of first-generation students who were active users. ● 61.9% of continuing-generation students who did not download the application enrolled in the fall semester, in comparison to 53% of first-generation students who did not download the application.
RQ5b	**Is the relationship between levels of guided pathways mobile application utilization and enrollment moderated by each level of educational stress?**
	An association between levels of guided pathways mobile application usage and enrollment status was observed for all groupings of educational stress: $\chi 2(2) = 109.569$, $p < .000$, $V = .162$, as well as at each individual grouping: Above Average, $\chi 2(2) = 46.730$, $p < .000$, $V = .204$; Average $\chi 2(2) = 40.569$, $p < .000$, $V = .132$ and Below Average $\chi 2(2) = 24.538$, $p < .000$, $V = .185$. ● The main cause of the relationship was found in the students who did not enroll in the fall semester and who did not download the application for all levels of educational stress.

Chapter Five: Implications and Recommendations

Four-year public colleges and universities continue to struggle to make gains in decreasing the persistent gaps in the retention and graduation rates of their increasingly diverse student populations, while enrollment rates are expected to continue to decrease (Grawe, 2018). The COVID-19 pandemic that began in early 2020 caused unexpected decreased enrollment in colleges nationwide, increasing the financial pressures on institutions to both yield and retain students at higher levels. Some of these institutions had previously implemented guided pathways applications in an effort to meet these goals. Understanding how these applications are used by different types of students, and the outcomes of this use are important data points for institutions as they evaluate the effectiveness of these products and make decisions about the allocation of financial and personnel resources needed to implement and maintain the programs.

This study investigated how one group that has faced reduced persistence and graduation outcomes (first-generation college students) differed from the dominant college going group (continuing-generation college students) in their levels of pre-college stress (habitus), utilization of a guided pathways mobile application, and enrollment. By doing so, this study contributed to the research and implementation of programs for first-generation college students, guided pathways and habitus theory, as described below.

Implications for First-Generation Research & Practice

This study found that first-generation students were more likely to use the guided pathways mobile application, but slightly less likely to successfully enroll in college than continuing-generation students. Those students who successfully enrolled had higher levels of educational stress, attempted fewer credits and earned a smaller percentage of those credits than continuing-generation students, which is in line with previous findings. However, all of these

findings had very small practical significance, so using these findings to determine implications for institutional practice is contraindicated. Instead, this study should be treated as preliminary research and a starting point for continued study on the effects guided pathways mobile applications may have on supporting first-generation students. The next section of this chapter will present some recommendations for future research.

Implications for Guided Pathways Research & Practice

This study found that more than expected first-generation college students than continuing-generation students were active users of the guided pathways application, and that enrolled first-generation users of the application had higher levels of educational stress. Institutions may want to consider tailoring content in the application to meet the needs of first-generation students, and by doing so, better meet the needs of all students. In particular, institutions should consider including content to improve academic readiness for the college environment (DeAngelo & Franke, 2016). By doing so, institutions meet the needs of these students, while also providing content that may increase utilization of the application.

Downloading and using the application seems to be a key indicator that a student is likely to enroll in the fall semester. This finding may have been influenced by the structure of this study itself, as students who had not downloaded the application were asked to do so at orientation. Attendance at orientation is one of the largest positive indicators of freshman persistence, by positively impacting students' social integration and commitment to the institution (Pascarella, Terenzini & Wolfe, 1986). In their study, Pascarella et al. suggested that the indirect benefits of orientation attendance should be extended throughout the freshman year in order to enhance students' ability to successfully integrate into the "campus academic and social systems" (i.e., habitus). This extension of a traditional orientation program can be time-

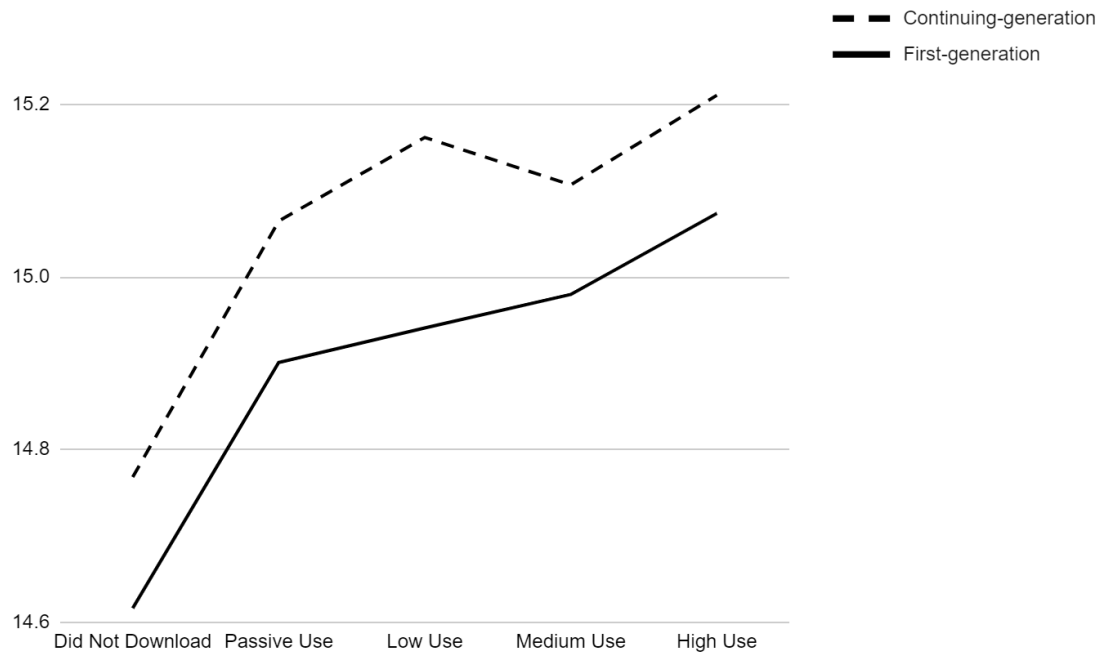
and cost-prohibitive for many institutions. However, the utilization of a mobile application to distribute key information at pivotal moments may be a realistic scalable achievement. The guided pathways mobile application could extend the orientation experience throughout the first year, with potential positive impacts on enrollment and retention outcomes.

In addition, by supplementing orientation through this virtual, mobile environment, first-generation students would not have to repeatedly face the decision of either disclosing their first-generation identity in a public setting and enduring any potential bias, or choosing to try to blend in with their continuing-generation peers (Gable, 2021). By providing information through the application colleges may be able to minimize some of the negative impacts imposter syndrome may have on the still developing college-going habitus of first-generation college students.

Future studies should examine the relationship between first-generation student status, application usage and enrollment. The gap in enrollment was largest for students who did not download the application; 61.9% of continuing-generation students who did not download the application enrolled in the fall semester, in comparison to 53% of first-generation students who did not download the application. This gap shrunk considerably for active users of the applications: 99.1% of active user continuing-generation students enrolled in the fall semester, in comparison to 97.5%. Even though it is tempting to assume that utilization of the mobile application succeeded in helping first-generation students to enroll, this study is not able to determine if a causal relationship exists between application utilization and successful enrollment. Students may have chosen to not download the application because they knew that their attendance in the fall was unlikely.

Figure 8

Credits Attempted by Guided Pathways Mobile Application Utilization Level

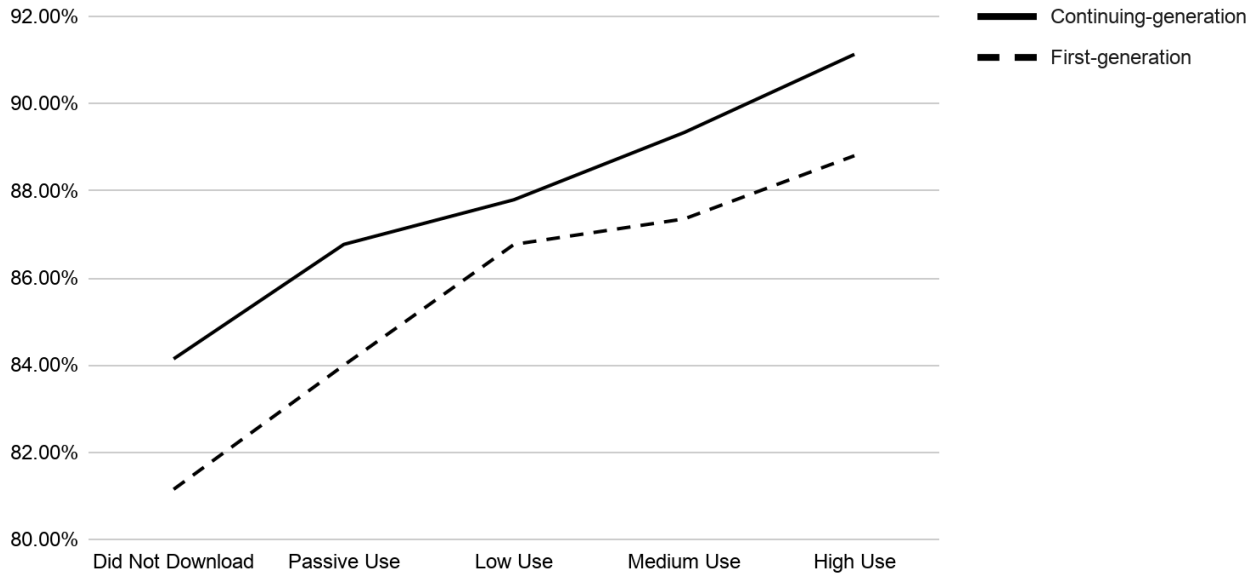


In addition, students who did not download the application attempted fewer credits in their first semester of enrollment than users of the application — particularly high-level users of the application (see Figure 9). The number of credits a student takes in their first semester, and the percentage of credits they earn at the end of that semester is important in establishing a momentum of credit accumulation that contributes to on-time degree completion. In this study, students who did not download the application attempted 14.729 credits in their first semester on average, which is below the 15 credits typically needed to be earned each semester to complete a bachelor's degree in four years. Students who did not download the application earned 82.6% of the credits at the end of their first semester of enrollment, which is significantly smaller than the 90% earned by their peers who used the application at high levels (See Figure 8). Recognizing this finding, institutions can provide additional support resources to

students who did not download the application to either encourage downloading, or connect them to resources that may help their successful completion and accumulation of credits, such as advising, academic coaching or tutoring.

Figure 9

Percentage of Credits Earned by Guided Pathways Mobile Application Utilization



Implications for Habitus Theory

While this study did find that first-generation students had statistically significantly higher levels of educational stress than their continuing-generation peers, the finding was not practically significant. However, this study also found that first-generation students who successfully matriculated into the fall semester, had slightly significantly higher educational stress scale scores than their enrolled continuing-generation peers. In contrast, no difference in educational stress scores was found for those students who did not enroll.

While unclear, this finding suggests that higher education practitioners should be aware that enrolled first-generation students may have more financial, familial and academic stress

than their continuing-generation peers, and that these stressors could contribute to a sense of alienation even before their arrival on campus. In their 2010 study, Oliver et al. recommended that colleges reach out to first-generation students prior to their first semester of enrollment to foster connections to the college environment and help them establish a college identity through repetitive reminders with concrete information about a variety of aspects of collegiate life. The guided pathways mobile application may serve as a mechanism for the repetitive distribution of important information in a format that is appealing to students, particularly given their affinity for mobile phone usage.

Colleges should also consider providing content within the application to help first-generation students psychologically acclimate to their particular college habitus. Such content might include validation and self-affirmation exercises to reduce stereotype threat and imposter syndrome, learning how to positively reframe goals, and difference education such as including profiles and testimonials from first-generation students on how they have affirmed their backgrounds and values while transitioning to campus (Jury et al., 2017). Stephens et al. (2014) found that a difference-education intervention helped first-generation students understand how their different backgrounds matter and better prepared them for the transition to college. This was achieved by increasing their overall sense of comfort and providing them with tools and strategies to address background-specific obstacles that they were likely to encounter.

It is interesting to note that both first-generation and continuing-generation students who did not download the mobile application had higher Educational Stress scale scores than their peers who downloaded the application. This data may hint at a correlation between high levels of educational stress having an effect upon a student's desire or ability to commit to

completing the steps necessary to successfully navigate the matriculation process. Institutions using the College Student Inventory should be aware of this fact and consider that high Educational Stress Scale scores on the CSI may indicate a potential lack of engagement in the college onboarding process due to a habitus mismatch or lack of access to capital resources. Institutions using both the CSI and guided pathways mobile applications may want to strongly encourage students with high educational stress scores to download the application (or provide alternate programs) in hopes of engaging them in the onboarding process and successfully yielding the student.

Institutions of higher education must become aware of and embrace their responsibility to provide students with the necessary information, social, academic and cultural capital to be successful on their campuses. The increased diversity of the American college-going population brings a plethora of capital resources to colleges. However, colleges have assumed for too long that students will be able to use and translate their personal capital into the college habitus on their own. Instead, student success-focused campuses identify and acknowledge gaps in capital while developing and implementing equitable systems to ensure that students with differing levels and types of capital receive this information and support early and often — even before arriving on campus. This study builds upon the research of Castleman and Meyer (2020) who documented the beneficial effects of regular text-messaging on the persistence of rural college-going seniors. Guided pathways mobile applications may similarly help large public institutions implement personalized technology-based advising support at scale to help students navigate the still dominant college culture that rewards the knowledge passed down to continuing-generation students and places undue burdens of knowledge upon first-generation students.

In addition, student success-focused institutions must move beyond treating students in monolithic groups, with interventions designed to address gaps in various forms of capital to assimilate students into the dominant habitus of an institution (Destin, Rosario & Vossoughi, 2021). Instead, colleges need to provide marginalized students opportunities to discover their differences as valuable contributors to the college environment, not as deficits hindering their success. By doing so, these institutions support personal authenticity and true belonging in the university environment.

Recommendations for Further Research

Methodological suggestions

As stated previously in the Limitations section, at the time of data collection, the ability to measure level of guided pathways mobile application utilization was limited to the number of items checked off on the application's to-do list. The range of the number of items checked off on the list was quite limited, varying from 1-25, with an average of 7.14 items completed. If mobile application usage was a critical factor in facilitating student enrollment, one would have expected to see greater differences in enrollment patterns between passive and active mobile application users. Future studies would benefit from a better measure of active use, rather than just the simple count of completed to-do items in the map. Having a better measure of active use, by including measures like total number of log-ins, frequency of log-ins, total amount of time spent within the application, and number of click-throughs to embedded resources would provide a higher level of detail to better understand if the application itself was a key factor in the student's enrollment and successful completion of their first semester of enrollment.

From this study, it was impossible to determine if a causal relationship existed between level of guided pathways mobile application usage, enrollment, number of attempted credits and

percentage credits earned, even though the study did demonstrate relationships between these variables. Future research designs could attempt to determine if a causal relationship exists. Students who elected to download and utilize the guided pathways mobile application on their own may have greater academic interests or help-seeking behavior than students who chose to not download the application, and that behavior may have continued into the fall semester, which ultimately could have affected the percentage of credits earned. Future studies should investigate ways to control for this self-selection bias, perhaps by creating matched samples or by reducing bias introduced by variables such as if the student attended orientation, date of download of the mobile application and a metric of academic preparation such as standardized test scores or high school GPA. Scholars could also utilize hierarchical linear modeling to better understand the interplay of habitus between student level dispositions and institutional level structures (Cockerham & Hinote, 2007).

Qualitative approaches

First-generation students were found to use the mobile application more than continuing-generation students, however this study was not set up to determine why. Future research may want to investigate this phenomena through a qualitative study to learn more about any differences in the overall perceived usefulness of the application, and what specific information in the application was found to be useful to each group. This research could then inform revisions to the content of the application to make it more useful and relevant to all students.

While there was a large gap between the percentage of non-enrolled first-generation students (53%) who did not download the application and non-enrolled continuing-generation students (61.9%) who did not download the application, that gap was closed for students who

were active users of the application. 99.1% of continuing-generation students who were active users of the application enrolled in the fall semester, in comparison to 97.5% of first-generation students who were active users. According to Berger (2000), choosing to attend college is governed by a student's accumulation of capital. Was the gap in first-generation student enrollment closed by their utilization of the mobile application? Or did these first-generation students overcome any obstacles to enrollment on their own prior to downloading the application?

Future studies may want to investigate this issue qualitatively in order to better understand the usefulness of the guided pathways mobile application in helping students surmount barriers to enrollment. Qualitative studies provide rich data, in ways that quantitative studies often can not expect. In particular, researchers may want to learn more about the experiences of first-generation students who did download and use the mobile application but did not successfully enroll. These students may have important insights on what institutional supports or application content changes or additions may be necessary to support their successful enrollment and integration into campus. For example, these students may have important insights to share on how the university's messaging through the application portrays its habitus, and how that messaging did or did not provide them with the cultural capital needed to complete the steps to enrollment, or to feel affinity with the institution.

Refining the Measurement of Habitus

This study did find a significant relationship between educational stress and first-generation student status. However, this finding alone does not establish the CSI Educational Stress Scale Score as a measure of college student habitus. Future studies may want to continue to investigate different operational definitions of habitus using other measurements

in the CSI. Importantly, future researchers may want to move beyond just using the composite measure of Educational Stress as a measure of habitus, and instead dive deeper into the individual measures within the CSI that closely align with first-generation student literature, such as Financial Security, Family Support, Commitment to College, and Interactions with Previous Teachers.

While this study did look at enrollment, number of credits attempted and percentage of credits completed as outcome variables for guided pathways mobile application utilization, these variables do not directly address the question if usage of the mobile application helps students to align their habitus with that of the institution. In order to do that, the study would need to be set up as a pre-post study design to measure educational stress (or another measure of habitus) again, early in the student's first semester to be able to compare the measure of habitus post-utilization of the guided pathways mobile application. Future researchers could consider re-administering a portion of the CSI at the start of the academic year to see if there is a change in habitus expressed in the educational scale stress scores over the summer months preceding enrollment. Qualitative or mixed method studies would also be valuable to learn more details about student usage of the application, and the changes to their habitus that students may have perceived by using the app.

Summary

As the pressure to recruit and retain students continues to mount through the enrollment cliff threatening to reduce the number of four-year college-going students by 20% over the next decade (Grawe, 2018), institutions of higher education will continue to seek for and implement solutions to address their enrollment headaches. While Grawe argues that most institutions will turn to increasingly competitive recruitment practices to garner as much of a share of the

dwindling college-going population as they can, he also suggests that institutions will need to plan on deploying new forms of student support in order to better retain this more diverse, but shrinking pool of students.

This study investigated a tool currently being utilized on college campuses to increase the recruitment, retention and graduation of students, EAB's Navigate Student, a guided pathways mobile application. Guided pathways are designed to steer students through the pivotal moments, courses and tasks of college while also providing key information and insights needed by all students, but unknown to many, that allow students to succeed at their institutions by integrating into their campuses' habitus. Building upon the research of Slanger et al. (2015) and Oliver et al. (2010), this study utilized the College Student Inventory's Educational Stress scale score, which measures feelings of distress in the college environment as a measure of student habitus. Based on the literature on first-generation college students, I expected to find that first-generation students would have higher Educational Stress scores than continuing-generation students, and that they would use the guided pathways mobile application differently.

In line with Oliver et al. (2010), first-generation students were found to have higher Educational Stress scale scores than continuing generation students, although the distribution of those scores within each group were very similar. In addition, first-generation students were found to be more likely to use the guided pathways mobile application, especially at high levels of educational stress than their continuing generation peers. This indicates that if Educational Stress can be used as a measure of habitus, it would appear that first-generation students do exhibit slight differences from continuing generation students. These findings support a hypothesis that first-generation college students have a different habitus than continuing

generation students due to their different backgrounds and pre-college preparation, which is evidenced by their higher rates of Educational Stress, and higher rates of use of the guided pathways mobile application, perhaps as a way of mediating that stress in pursuit of the capital needed to meet the college's habitus.

Also in line with previous research, first-generation students were found to attempt fewer credits, earn fewer credits, earn a smaller percentage of credits and enroll at lower rates than continuing-generation students. These findings contribute to a voluminous body of research on first-generation college students with similar findings. Where this study differs is that preliminary information has been gathered on the relationship between usage of the guided pathways mobile application and the number of credits attempted and earned, as well as on enrollment. Weak relationships were found between usage of the guided pathways mobile application and credits attempted, earned and percentage of credits earned. A clear link was found between usage of the mobile application and enrollment. However, this correlation may be confounded by attendance at orientation, which in of itself is a major predictor of matriculation.

Students who did not download the application were much more likely to not enroll in the fall semester than students who did download the application. It was interesting to find that of the students who did not download the application, continuing-generation students were much more likely than first-generation students to enroll in the fall. This finding supports habitus theory, as the continuing-generation students would be likely to have more similar forms and levels of capital to that of the institution. The continuing-generation student lives within a habitus formed by the unspoken (and often quite spoken) expectation of college attendance and within a sphere of college-going support. This habitus seems to enable many of those

continuing-generation students who did not complete the required steps for enrollment a successful fall matriculation. In contrast, first-generation students, whose habitus are more likely to differ from that of the institution, do not benefit from that alignment of capital and face lower odds of matriculating in the fall.

There is reason to suspect that these findings support habitus theory, however these findings are preliminary and additional research is needed. As stated previously, a major limitation of this study involves the variable measuring usage of the guided pathways mobile application. Future versions of this study should take advantage of the recent release of more sophisticated measurements of usage, which hopefully will provide greater insights into the student usage patterns of guided pathways mobile applications, and the resulting effects on enrollment and persistence.

Despite this limitation, and the others mentioned previously, this study has made contributions to the study of first-generation college students and habitus theory, and has important implications for the practices of higher education institutions. While beyond the scope of this study, it must be mentioned that first-generation students are often faced with a significant mismatch of economic capital that is difficult to address through the actions of a mobile application alone, however helpful the information provided may be. Institutions intent on enrolling and retaining students with economic capital mismatch must complement the financial information offered within the guided pathways mobile application with counseling and significant financial support, or else this mismatch will continue to burden these students inequitably. Institutions professing goals of equitable outcomes for all student populations on their campuses must find ways to address these habitus mismatches. As an example, colleges with significant endowments are able to address economic mismatches in capital by meeting

100% of students' financial needs, leaving the "easier" tasks of matching academic and social capital to relevant student support services.

The guided pathways mobile application seems to provide a scalable, technology-based method for supporting students' arrival to campus and success on campus. Given first-generation students' diverse backgrounds and proclivity to using the application, and the correlations found between use and increased numbers of attempted and earned credits as well as enrollment, campuses intent on achieving equitable outcomes and maintaining their enrollments may find these applications to be helpful in bridging the differing habitus these students bring to campus. With more nuanced measurements of application utilization now available, future studies can move beyond this preliminary research to deeply investigate the correlation between guided pathways utilization and student success measures. As more studies of this type are completed, a more nuanced understanding of the benefits of guided pathways mobile applications will come to light.

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Appendices

Appendix A - Emails To Students To Complete College Student Inventory

Introduction Email

Subject: CSI at INSTITUTION NAME is here. INSTITUTION NAME wants to know more about you {first name}!

{first name}

By completing the College Student Inventory before you attend orientation, we will be able to create your own personalized student success plan for your first year here at INSTITUTION NAME and beyond.

We will share results of the inventory with the entering class at NSO, so you need to make sure you complete it before you attend. Take a few minutes to take the CSI today, and you can check it off your to-do list!

CSI Survey Reminder Email #1

Subject: {first name}, we can't wait to meet you at orientation this summer!

{first name}, we can't wait to meet you at orientation this summer!

In order to get to know you a bit better, please complete this questionnaire before attending orientation.

Information from the College Student Inventory will help your academic advisor, professors and other student services offices across campus develop programming specifically for you!

We hope to share what we learn about the incoming class at orientation, so please take the questionnaire soon. You can finish it on your phone or on a computer in about 20 minutes.

We can't wait to see what you all have to say about yourselves. Thanks for taking the time to let us know more about you. Click here to get started.

Appendix B - Email to Students to Download Guided Pathways Mobile Application

Subject: That feeling when everything falls into place

Whether you're overwhelmed by college or excited about what's ahead, life is better when *your* to-dos are organized and at your fingertips. That's why we've brought you Navigate, a mobile advisor that gets you from orientation to graduation.

Resolve holds so you can register on time
Discover supportive resources - including directions to key offices on campus
Get reminders and alerts about important deadlines
Research potential careers and majors
Sync your class schedule with your phone calendar
Locate and reach out to your advisors and professors in seconds
Make your own to-do lists and set reminders
Schedule appointments with your advisor and other support offices across campus

Available now in the App and Android Store

Appendix C - Sample Guided Pathways Mobile Application To-Do List

To-Dos and Events

Today:

PAYING FOR COLLEGE - Overdue on Mon, Feb 17
Overdue: Understand the ins and outs of your financial aid package.

ACADEMIC PLANNING - Due Wed, Feb 26
Having trouble keeping yourself on track? Make an appointment to meet with your advisor.

CAMPUS LIVING - Due Sat. Feb 1
Ready to race into sophomore year? Get set with a major mixer fair.

Upcoming:

KEY DATES - Sun, Mar 8 - Sun, Mar 15
University Closed - Spring Break

CAMPUS LIVING - Tues, Mar 10
Submit your housing application before March 25 to get priority room preference.

GETTING A JOB - Wed, Mar 18
Unsure of your professional pathway? Career Advisors are here to help you find your path.

ACADEMIC PLANNING - Fri, Mar 27
Get your ideal fall schedule by registering on time!

Appendix D - Sample Guided Pathways Mobile Application To-Do Item

To-Do

PAYING FOR COLLEGE - Due on Mon, Feb 17
Understand the ins and outs of your financial aid package.

Do you have to maintain a specific GPA, or always be enrolled full-time? Will your scholarship pay for summer classes? Are you required to regularly update your scholarship provider with your academic progress? Your financial counselor can answer these questions and more - just make an appointment to get started.

Click here to find out more about your financial aid package

Appendix E - Crosstabulation of Guided Pathways Mobile Application Utilization by First-Generation Student Status by Educational Stress Level

Educational Stress	Application Utilization	Continuing-generation				First-generation				Total		
		#	Exp. #	%	SR	#	Exp. #	%	SR	#	Exp. #	%
Above Average	Did Not Download	90	86.8	12.1%	0.3	41	44.2	10.8%	-0.5	131	131	11.7%
(Scores of 7,8,9)	Passive Use	169	163	22.7%	0.5	77	83	20.4%	-0.7	246	246	21.9%
	Low Use	204	194.2	27.5%	0.7	89	98.8	23.5%	-1	293	293	26.1%
	Medium Use	173	174.3	23.3%	-0.1	90	88.7	23.8%	0.1	263	263	23.5%
	High Use	107	124.6	14.4%	**-1.6**	81	63.4	21.4%	**2.2**	188	188	16.8%
	Total	743	743	100.0%		378	378	100.0%		1121	1121	100.0%
Average	Did Not Download	179	170	11.1%	0.7	66	75	9.3%	-1	245	245	10.6%
(Scores of 4,5,6)	Passive Use	351	319.1	21.9%	**1.8**	109	140.9	15.4%	**-2.7**	460	460	19.9%
	Low Use	376	386.4	23.4%	-0.5	181	170.6	25.5%	0.8	557	557	24.1%
	Medium Use	389	406.5	24.2%	-0.9	197	179.5	27.8%	1.3	586	586	25.3%
	High Use	311	324	19.4%	-0.7	156	143	22.0%	1.1	467	467	20.2%
	Total	1606	1606	100.0%		709	709	100.0%		2315	2315	100.0%
Below Average	Did Not Download	47	41.7	9.5%	0.8	13	18.3	6.0%	-1.2	60	60	8.4%
(Scores of 1,2,3)	Passive Use	118	115.3	23.8%	0.2	48	50.7	22.0%	-0.4	166	166	23.2%
	Low Use	107	106.3	21.6%	0.1	46	46.7	21.1%	-0.1	153	153	21.4%
	Medium Use	107	113.9	21.6%	-0.6	57	50.1	26.1%	1	164	164	23.0%
	High Use	117	118.8	23.6%	-0.2	54	52.2	24.8%	0.2	171	171	23.9%
	Total	496	496	100.0%		218	218	100.0%		714	714	100.0%
Total	Did Not Download	316	298.9	11.1%	1	120	137.1	9.2%	-1.5	436	436	10.5%
	Passive Use	638	597.8	22.4%	1.6	234	274.2	17.9%	**-2.4**	872	872	21.0%
	Low Use	687	687.6	24.1%	0	316	315.4	24.2%	0	1003	1003	24.2%
	Medium Use	669	694.5	23.5%	-1	344	318.5	26.4%	1.4	1013	1013	24.4%
	High Use	535	566.3	18.8%	-1.3	291	259.7	22.3%	**1.9**	826	826	19.9%
	Total	2845	2845	100.0%		1305	1305	100.0%		4150	4150	100.0%

SR = Standardized Residual

Appendix F - Student status by Application Utilization by Educational Stress Level

Educational Stress Level	Application Utilization	CONT				FGEN				Total		
		#	Exp. #	%	SR	#	Exp. #	%	SR	#	Exp. #	%
1, 2 or 3	Did Not Download	47	41.7	9.5%	0.8	13	18.3	6.0%	-1.2	60	60	8.4%
	Passive Use	118	115.3	23.8%	0.2	48	50.7	22.0%	-0.4	166	166	23.2%
	Low Use	107	106.3	21.6%	0.1	46	46.7	21.1%	-0.1	153	153	21.4%
	Medium Use	107	113.9	21.6%	-0.6	57	50.1	26.1%	1	164	164	23.0%
	High Use	117	118.8	23.6%	-0.2	54	52.2	24.8%	0.2	171	171	23.9%
	Total	496	496	100.0%		218	218	100.0%		714	714	100.0%
4	Did Not Download	45	48	9.6%	-0.4	21	18	11.9%	0.7	66	66	10.2%
	Passive Use	101	91.7	21.4%	1	25	34.3	14.2%	-1.6	126	126	19.5%
	Low Use	111	109.2	23.6%	0.2	39	40.8	22.2%	-0.3	150	150	23.2%
	Medium Use	126	123.8	26.8%	0.2	44	46.2	25.0%	-0.3	170	170	26.3%
	High Use	88	98.3	18.7%	-1	47	36.7	26.7%	1.7	135	135	20.9%
	Total	471	471	100.0%		176	176	100.0%		647	647	100.0%
5	Did Not Download	64	57.5	11.7%	0.9	20	26.5	7.9%	-1.3	84	84	10.5%
	Passive Use	126	114.3	23.0%	1.1	41	52.7	16.2%	-1.6	167	167	20.8%
	Low Use	131	132	23.9%	-0.1	62	61	24.5%	0.1	193	193	24.1%
	Medium Use	112	125.2	20.4%	-1.2	71	57.8	28.1%	1.7	183	183	22.8%
	High Use	115	119	21.0%	-0.4	59	55	23.3%	0.5	174	174	21.7%
	Total	548	548	100.0%		253	253	100.0%		801	801	100.0%
6	Did Not Download	70	64.3	11.9%	0.7	25	30.7	8.9%	-1	95	95	11.0%
	Passive Use	124	113.1	21.1%	1	43	53.9	15.4%	-1.5	167	167	19.3%
	Low Use	134	144.9	22.8%	-0.9	80	69.1	28.6%	1.3	214	214	24.7%
	Medium Use	151	157.8	25.7%	-0.5	82	75.2	29.3%	0.8	233	233	26.9%
	High Use	108	107	18.4%	0.1	50	51	17.9%	-0.1	158	158	18.2%
	Total	587	587	100.0%		280	280	100.0%		867	867	100.0%

7	Did Not Download	40	37.5	10.1%	0.4	16	18.5	8.2%	-0.6	56	56	9.5%
	Passive Use	97	91.1	24.6%	0.6	39	44.9	20.0%	-0.9	136	136	23.1%
	Low Use	100	100.4	25.3%	0	50	49.6	25.6%	0.1	150	150	25.4%
	Medium Use	98	96.4	24.8%	0.2	46	47.6	23.6%	-0.2	144	144	24.4%
	High Use	60	69.6	15.2%	-1.2	44	34.4	22.6%	1.6	104	104	17.6%
	Total	395	395	100.0%		195	195	100.0%		590	590	100.0%
8	Did Not Download	31	30.5	13.4%	0.1	13	13.5	12.6%	-0.1	44	44	13.1%
	Passive Use	50	47.1	21.6%	0.4	18	20.9	17.5%	-0.6	68	68	20.3%
	Low Use	63	60.9	27.2%	0.3	25	27.1	24.3%	-0.4	88	88	26.3%
	Medium Use	58	59.6	25.0%	-0.2	28	26.4	27.2%	0.3	86	86	25.7%
	High Use	30	33.9	12.9%	-0.7	19	15.1	18.4%	1	49	49	14.6%
	Total	232	232	100.0%		103	103	100.0%		335	335	100.0%
9	Did Not Download	19	18.3	16.4%	0.2	12	12.7	15.0%	-0.2	31	31	15.8%
	Passive Use	22	24.9	19.0%	-0.6	20	17.1	25.0%	0.7	42	42	21.4%
	Low Use	41	32.6	35.3%	1.5	14	22.4	17.5%	-1.8	55	55	28.1%
	Medium Use	17	19.5	14.7%	-0.6	16	13.5	20.0%	0.7	33	33	16.8%
	High Use	17	20.7	14.7%	-0.8	18	14.3	22.5%	1	35	35	17.9%
	Total	116	116	100.0%		80	80	100.0%		196	196	100.0%
Total	Did Not Download	316	298.9	11.1%	1	120	137.1	9.2%	-1.5	436	436	10.5%
	Passive Use	638	597.8	22.4%	1.6	234	274.2	17.9%	-2.4	872	872	21.0%
	Low Use	687	687.6	24.1%	0	316	315.4	24.2%	0	1003	1003	24.2%
	Medium Use	669	694.5	23.5%	-1	344	318.5	26.4%	1.4	1013	1013	24.4%
	High Use	535	566.3	18.8%	-1.3	291	259.7	22.3%	1.9	826	826	19.9%
	Total	2845	2845	100.0%		1305	1305	100.0%		4150	4150	100.0%

Notes: SR = Standardized Residual

Appendix G - Cross Tabulation Application Utilization by Enrollment by Educational Stress Level

Educational Stress Level	Application Usage Level	Enrolled												
		No					Yes					Total			
		#	Exp. #	% within App Usage	% within Enrolled	SR	#	Exp. #	% within App Usage	% within Enrolled	SR	#	Exp. #	% within App Usage	% within Enrolled
Above Average	Did Not Download	15	3.5	11.5%	50.0%	**6.1**	116	127.5	88.5%	10.6%	-1	131	131	100.0%	11.7%
	Passive User	0	6.6	0.0%	0.0%	-2.6	246	239.4	100.0%	22.5%	0.4	246	246	100.0%	21.9%
	Active User	15	19.9	2.0%	50.0%	-1.1	729	724.1	98.0%	66.8%	0.2	744	744	100.0%	66.4%
	Total	30	30	2.7%	100.0%		1091	1091	97.3%	100.0%		1121	1121	100.0%	100.0%
Average	Did Not Download	16	4	6.5%	42.1%	**6**	229	241	93.5%	10.1%	-0.8	245	245	100.0%	10.6%
	Passive User	5	7.6	1.1%	13.2%	-0.9	455	452.4	98.9%	20.0%	0.1	460	460	100.0%	19.9%
	Active User	17	26.4	1.1%	44.7%	-1.8	1593	1583.6	98.9%	70.0%	0.2	1610	1610	100.0%	69.5%
	Total	38	38	1.6%	100.0%		2277	2277	98.4%	100.0%		2315	2315	100.0%	100.0%
Below Average	Did Not Download	6	1.1	10.0%	46.2%	**4.7**	54	58.9	90.0%	7.7%	-0.6	60	60	100.0%	8.4%
	Passive User	2	3	1.2%	15.4%	-0.6	164	163	98.8%	23.4%	0.1	166	166	100.0%	23.2%
	Active User	5	8.9	1.0%	38.5%	-1.3	483	479.1	99.0%	68.9%	0.2	488	488	100.0%	68.3%
	Total	13	13	1.8%	100.0%		701	701	98.2%	100.0%		714	714	100.0%	100.0%
Total	Did Not Download	37	8.5	8.5%	45.7%	**9.8**	399	427.5	91.5%	9.8%	-1.4	436	436	100.0%	10.5%
	Passive User	7	17	0.8%	8.6%	-2.4	865	855	99.2%	21.3%	0.3	872	872	100.0%	21.0%
	Active User	37	55.5	1.3%	45.7%	-2.5	2805	2786.5	98.7%	68.9%	0.3	2842	2842	100.0%	68.5%
	Total	81	81	2.0%	100.0%		4069	4069	98.0%	100.0%		4150	4150	100.0%	100.0%
Notes: SR = Standardized Residual															

Appendix H - Crosstabulation of Educational Stress Level by Application Utilization by First-Generation Student Status

		Guided Pathways Mobile Application Utilization																					
		Did Not Download				Passive Use				Low Use				Medium Use				High Use				Total		
	Educational Stress	#	Exp. #	%	SR	#	Exp. #	%	SR	#	Exp. #	%	SR	#	Exp. #	%	SR	#	Exp. #	%	SR	#	Exp. #	%
Continuing -generation	Above Average	90	82.5	12.1%	0.8	169	166.6	22.7%	0.2	204	179.4	27.5%	1.8	173	174.7	23.3%	-0.1	107	139.7	14.4%	**-2.8**	743	743	100.0%
	Average	179	178.4	11.1%	0	351	360.2	21.9%	-0.5	376	387.8	23.4%	-0.6	389	377.6	24.2%	0.6	311	302	19.4%	0.5	1606	1606	100.0%
	Below Average	47	55.1	9.5%	-1.1	118	111.2	23.8%	0.6	107	119.8	21.6%	-1.2	107	116.6	21.6%	-0.9	117	93.3	23.6%	**2.5**	496	496	100.0%
	Total	316	316	11.1%		638	638	22.4%		687	687	24.1%		669	669	23.5%		535	535	18.8%		2845	2845	100.0%
First-generation	Above Average	41	34.8	10.8%	1.1	77	67.8	20.4%	1.1	89	91.5	23.5%	-0.3	90	99.6	23.8%	-1	81	84.3	21.4%	-0.4	378	378	100.0%
	Average	66	65.2	9.3%	0.1	109	127.1	15.4%	-1.6	181	171.7	25.5%	0.7	197	186.9	27.8%	0.7	156	158.1	22.0%	-0.2	709	709	100.0%
	Below Average	13	20	6.0%	-1.6	48	39.1	22.0%	1.4	46	52.8	21.1%	-0.9	57	57.5	26.1%	-0.1	54	48.6	24.8%	0.8	218	218	100.0%
	Total	120	120	9.2%		234	234	17.9%		316	316	24.2%		344	344	26.4%		291	291	22.3%		1305	1305	100.0%
All students	Above Average	131	117.8	11.7%	1.2	246	235.5	21.9%	0.7	293	270.9	26.1%	1.3	263	273.6	23.5%	-0.6	188	223.1	16.8%	**-2.4**	1121	1121	100.0%
	Average	245	243.2	10.6%	0.1	460	486.4	19.9%	-1.2	557	559.5	24.1%	-0.1	586	565.1	25.3%	0.9	467	460.8	20.2%	0.3	2315	2315	100.0%
	Below Average	60	75	8.4%	-1.7	166	150	23.2%	1.3	153	172.6	21.4%	-1.5	164	174.3	23.0%	-0.8	171	142.1	23.9%	**2.4**	714	714	100.0%
		436	436	10.5%		872	872	21.0%		1003	1003	24.2%		1013	1013	24.4%		826	826	19.9%		4150	4150	100.0%

Notes: SR = Standardized Residual

Appendix I - Crosstabulation of Educational Stress Level by Application Utilization by First-Generation Student Status

Educational Stress	Application Utilization	CONT			FGEN			Total		
		#	%	SR	#	%	SR	#	%	SR
1, 2 or 3	Did Not Download	47	14.90%	-1.1	13	10.80%	-1.6	60	13.8%	-1.7
	Passive Use	118	18.50%	0.6	48	20.50%	1.4	166	19.0%	1.3
	Low Use	107	15.60%	-1.2	46	14.60%	-0.9	153	15.3%	-1.5
	Medium Use	107	16.00%	-0.9	57	16.60%	-0.1	164	16.2%	-0.8
	High Use	117	21.90%	**2.5**	54	18.60%	0.8	171	20.7%	**2.4**
	Total	496	17.40%		218	16.70%		714	17.2%	
4	Did Not Download	45	14.20%	-1	21	17.50%	1.2	66	15.1%	-0.2
	Passive Use	101	15.80%	-0.4	25	10.70%	-1.2	126	14.4%	-0.9
	Low Use	111	16.20%	-0.3	39	12.30%	-0.6	150	15.0%	-0.5
	Medium Use	126	18.80%	1.4	44	12.80%	-0.4	170	16.8%	1
	High Use	88	16.40%	-0.1	47	16.20%	1.2	135	16.3%	0.5
	Total	471	16.60%		176	13.50%		647	15.6%	
5	Did Not Download	64	20.30%	0.4	20	16.70%	-0.7	84	19.3%	0
	Passive Use	126	19.70%	0.3	41	17.50%	-0.6	167	19.2%	-0.1
	Low Use	131	19.10%	-0.1	62	19.60%	0.1	193	19.2%	0
	Medium Use	112	16.70%	-1.5	71	20.60%	0.5	183	18.1%	-0.9
	High Use	115	21.50%	1.2	59	20.30%	0.3	174	21.1%	1.2
	Total	548	19.30%		253	19.40%		801	19.3%	
6	Did Not Download	70	22.20%	0.6	25	20.80%	-0.1	95	21.8%	0.4
	Passive Use	124	19.40%	-0.7	43	18.40%	-1	167	19.2%	-1.1
	Low Use	134	19.50%	-0.7	80	25.30%	1.5	214	21.3%	0.3
	Medium Use	151	22.60%	1.1	82	23.80%	1	233	23.0%	1.5
	High Use	108	20.20%	-0.2	50	17.20%	-1.6	158	19.1%	-1.1
	Total	587	20.60%		280	21.50%		867	20.9%	
7	Did Not Download	40	12.70%	-0.6	16	13.30%	-0.5	56	12.8%	-0.8
	Passive Use	97	15.20%	0.9	39	16.70%	0.7	136	15.6%	1.1
	Low Use	100	14.60%	0.5	50	15.80%	0.4	150	15.0%	0.6
	Medium Use	98	14.60%	0.5	46	13.40%	-0.8	144	14.2%	0
	High Use	60	11.20%	-1.7	44	15.10%	0.1	104	12.6%	-1.2
	Total	395	13.90%		195	14.90%		590	14.2%	
8	Did Not Download	31	9.80%	1	13	10.80%	1.1	44	10.1%	1.5
	Passive Use	50	7.80%	-0.3	18	7.70%	-0.1	68	7.8%	-0.3
	Low Use	63	9.20%	0.9	25	7.90%	0	88	8.8%	0.8
	Medium Use	58	8.70%	0.5	28	8.10%	0.2	86	8.5%	0.5
	High Use	30	5.60%	-2.1	19	6.50%	-0.8	49	5.9%	-2.2

	Total	232	8.20%		103	7.90%		335	8.1%	
9	Did Not Download	19	6.00%	1.7	12	10.00%	1.7	31	7.1%	2.3
	Passive Use	22	3.40%	-0.8	20	8.50%	1.5	42	4.8%	0.1
	Low Use	41	6.00%	2.5	14	4.40%	-1.2	55	5.5%	1.1
	Medium Use	17	2.50%	-2	16	4.70%	-1.1	33	3.3%	-2.1
	High Use	17	3.20%	-1	18	6.20%	0	35	4.2%	-0.6
	Total	116	4.10%		80	6.10%		196	4.7%	
Total	Did Not Download	316	100.00%		120	100.00%		436	100.0%	
	Passive Use	638	100.00%		234	100.00%		872	100.0%	
	Low Use	687	100.00%		316	100.00%		1003	100.0%	
	Medium Use	669	100.00%		344	100.00%		1013	100.0%	
	High Use	535	100.00%		291	100.00%		826	100.0%	
	Total	2845	100.00%		1305	100.00%		4150	100.0%	

Notes: SR - Standardized Residual

Vita

Katherine Drumm is the Director of Strategic Initiatives for Student Success at Virginia Commonwealth University. In this role, she supports student success initiatives across campus through the training, development and implementation of a variety of student success technologies. Prior to this role, Katherine has served as the Director of Advising for the VCU School of Business and as a Department Administrator, Internship Coordinator and Registration Assistant for the Tisch School of the Arts, New York University. While working at NYU, she earned her Master of Arts in Student Personnel Administration in Higher Education from New York University's Steinhardt School of Education in 2010. She received her Bachelor of Arts in English Language and Literature from the University of Virginia in 1998.