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PROACTIVE INTERVENTIONS FOR COLLEGIATE SUCCESS: USING RESPONSE TO INTERVENTION WITH COLLEGE STUDENTS OF SCIENCE, TECHNOLOGY, ENGINEERING, MATHEMATICS, AND PSYCHOLOGY

Jenna Cook

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Jenna Cook

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Jenna Cook

Dr. Clare Waterman Irwin

ABSTRACT

PROACTIVE INTERVENTIONS FOR COLLEGIATE SUCCESS:

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College student attrition can cause a multitude of issues for students and universities. When a student leaves a program, the student may have to take additional credits and thus spend more on tuition, and the program may lose funding due to reduced enrollment. At a small private university in New Jersey, science, technology, engineering, mathematics and psychology (STEM) students were more likely than non-STEM students to change degree programs and be deemed at risk of failing. The purpose of this study was to determine whether a targeted response to intervention program that used academic coaching positively affected retention and persistence of STEM student. To fulfill these purposes, the Proactive Alerts for Student Success (PASS) Program, a response to intervention (RTI) model that uses academic coaching rather than remediation, was investigated in connection with successful completion of STEM classes, semester-to-semester retention of STEM students, and student desire to continue in STEM. It was found that students with lower GPAs were more likely to have taken a remedial course, and that those who engaged in the program by attending at least three of the seven bi-weekly meetings were more likely to be retained and have a stronger desire to stay in STEM than those who did not engage.

DEDICATION

For Glenny and Duckie. For little Penny, who wasn't sure who she would be.

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CHAPTER 1: BACKGROUND

Historically, to be literate meant to be able to read and write; however, more recently the International Literacy Association (n.d.) has defined literacy as "the ability to identify, understand, interpret, create, compute, and communicate using visual, audible, and digital materials across disciplines and in any context" (p. 1). Literacy has changed from reading, writing, and mathematics to having a base level of knowledge of a topic. This definition has challenged the education system to examine their literacy practices, infuse their curricula with the new definition of literacy, and create practices equitable for all communities. Colleges and universities have had to modify their own curriculums to ensure that they are providing equitable education to students of all backgrounds, but despite significant advances in the literacy field, researchers have not focused on post elementary students. In this study, the researcher examined a proactive response to intervention (RTI) for over 500 science, technology, engineering, mathematics, nursing, and psychology students at a small private university in New Jersey. The aim of the intervention was to aid STEM science, technology, engineering, math, psychology, and nursing, students by working with their present academic skills and refining them for future success to decrease attrition and increase confidence. The researcher examined the relationship between academic coaching, attrition, and motivation.

Middle and high school teachers have continued to debate the relative merits of teaching content versus teaching techniques to understand content (Gillis et al., 2017). Teaching of skills falls under disciplinary literacy, an approach to teaching literacy that focuses on the different requirements for comprehension across content areas. This is imperative for collegiate work, as students are expected to have foundational knowledge

before entering their courses, and because each area has unique attributes that contribute to comprehension, teachers in different areas must provide different strategies (Gillis et al., 2017).

Overall, comprehension techniques tend to be universal, but over the last two decades, disciplinary literacy practices have received more focus. Science texts, at all levels, are expository, and their authors aim to inform readers about past studies and facts. Without intervention, students who struggle with texts like these in middle and high school do not develop the necessary disciplinary literacy skills to pass their STEM classes in college. A reasonable conclusion is that students have not been retaining base-level knowledge of disciplines such as science or history grounded in informational texts, which challenges even the most advanced readers because of linguistic aspects such as technicality, abstraction, information density, and authoritativeness (Gillis et al., 2017).

Nearly half of STEM students who enter college either switch majors or do not obtain a degree, which leads to a smaller and less diverse applicant pool for STEM professions (e.g., medicine, research, and academia; Lisberg & Woods, 2018). The reasons for this vary, but academic factors such as exposure and preparedness can contribute to the derailment of STEM majors, with broad implications for the nation (Guenther et al., 2019). In 2012, the President's Council of Advisors on Science and Technology emphasized that colleges should graduate more STEM majors to maintain the role of the United States as a significant global contributor to scientific research (Guenther et al., 2019).

With diversity and inclusion at the heart of their institutional mission, the leaders of The University (located in Jersey City, New Jersey), looked to enhance their STEM

programming, which consisted of biology, biochemistry, biotechnology, chemistry, computer science, mathematics, physics, and psychology. Although 32% of the institution's students were enrolled in STEM majors, only 27% of those 32% received degrees (Hamilton et al., 2015, p. 5). The 6-year graduation rate for STEM majors was 37%, 13% lower than for non-STEM majors. To remedy this issue, the leaders of The University applied for and received a $3,900,000 SURGE Grant, with the primary purpose of serving low-income Hispanic students; however, the features of the grant served all active STEM students. At The University, a low-income student is a student eligible for a Pell Grant; such a student has a maximum expected family contribution of $5,711 per year.

The findings of an internal study conducted at The University indicated that STEM students were twice as likely as non-STEM students to change to a non-STEM major (SURGE, 2015, p. 5); the grant led to the creation of the STEM Engagement Center, a hub specifically for STEM students, to provide tutoring for all STEM classes, academic advice, registration, career coaching, and internship placement. In addition to these services, the STEM Engagement Center had three academic loaner programs—for textbooks, calculators, and laptops—targeted toward low-income students. The primary goals of the center were to ensure the retention of STEM students from semester to semester and ease the financial burdens of students so they could focus on academics.

Although the STEM Engagement Center provides academic and financial help, the expectation remained that students entered college with the literacy skills to support higher-level processing and access to a multitude of skills needed to succeed in their classes; however, some students enter college with insufficient learning or preparation

(Barnes, 2010). Students who have under-learned have completed the necessary requirements for passing through different grade levels but have not mastered the material; these students require more than just remediation because remedial classes are refresher courses on skills that students have already learned (Fusaro, 2007).

Statement of the Problem

A significant number of STEM students at The University have been entering college unprepared for college-level STEM classes, resulting in STEM students making up a large percentage of the at-risk student population. Public education systems unequipped to handle the demands of traditionally underserved students, such as first-generation students and non-White students, have led to large numbers of STEM students entering college having under-learned (Santiago, 2006). Scaffolded systems of learning that provide students with college and career readiness skills, such as Common Core State Standards, are built for kindergarten through 12th grade and rely on the retention of skills to mark imperative milestones of student achievement. These standards also prepare students for college entrance exams, such as the SAT and ACT. ACT (2018) stated that 76% of students tested wanted a postsecondary degree, but only 66% enrolled in college; this dramatic difference could be due to a variety of issues—academic level, financial matters, or lack of interest—but the statistics provided suggest that students attending high-performing schools were more likely to attend college than those who were underserved (ACT, 2018). This also translated to dollars earned in students' eventual careers. Black and Hispanic students earned less than their White counterparts (De Los Santos & De Los Santos, 2003). Barnes (2010) examined ACT statistics from 2005 and found the same problem evident in the 2018 statistics: Students were entering

postsecondary institutions underprepared because they did not know how to engage in self-regulated learning. Although faculty and staff members at The University worked diligently to help students needing remediation, the problem of students passing classes for which they were unprepared remained and indicated the need for a proactive intervention system to increase the chances of students retaining information and working toward the successful completion of their classes.

Though College Board, who owns the ACT and SAT, may not seem like reliable sources for information on college readiness, these exams are required from several institutions as a performance metric. Houlgum et al. (2005) conducted a study at South Dakota University's College of Pharmacy and found connections between markers of academically at-risk students and undergraduate requirements such as ACT composite score and grades in core science courses; students should have mastered these aspects before entering postsecondary education. Houlgum et al. (2005) described a heavy reliance on the ACT score during the admissions process. This score proved mastery of basic English language, writing, mathematics, and science skills. High school students who struggle with reading face academic difficulty because critical reading is needed to learn content-based subjects and further knowledge (ACT, 2018).

Gee (2001) discussed the connection between early phonological awareness and reading ability and stated that students who follow the typical reading process can read better as they grow, which is imperative for self-efficacy and motivation in college. Every child who learns to read approaches the process differently because of their existing relationship with texts and language. These differences can be problematic for students who have under-learned and can follow them through college and beyond. With

this knowledge, it can then be assumed that a student who masters literacy is theoretically prepared for standardized tests such as the ACT and SAT and college courses without remediation. As previously mentioned, understanding science requires mastery of reading comprehension skills; although the individualized nature of the reading process makes reading daunting to learn and causes some children to struggle, STEM students without a grip on reading will continuously struggle.

These problems in turn cause STEM students to switch to non-STEM majors or drop out altogether (SURGE, 2015). Such students tend to struggle in college and may need remediation, which results in additional issues, such as delayed graduation and financial burdens. In areas such as Jersey City, New Jersey, where many people have been living below the state's median household income (SURGE, 2015), students can follow traditional trajectories through college, but only with the help of proactive support systems. The SURGE Grant highlighted that the The University had improved the 6-year graduation rate with its Hispanic students but was not competitive with other private institutions (SURGE, 2015). To help make the institution's STEM graduation rates competitive, the researcher built on the work of the SURGE Grant and employed an RTI model with STEM students.

Significance of the Study

The researcher addressed the gap in existing literature regarding collegiate academic RTI programs for STEM students, particularly STEM students most at risk of switching majors or dropping out of college. The existing literature on RTI at the high school level was also very limited. As a means of bridging the educational gap between low-income families and their wealthier counterparts, the federal government created the

grant program known as Title I to help students achieve grade-level standards, which aligns with some of the goals of RTI (U.S. Department of Education, n.d.). A school can receive Title I funding if 40% of its total student population consists of low-income students (determined by eligibility for free or reduced-price lunch) and non-White students; however, Title I funding is not enough to provide the support needed to prevent every student reaching their grade level. The lack of support may lead to students entering college having under-learned and being unprepared for the rigors of higher learning.

Danilova (2017) found that high school graduation rates for Hispanic and Black students were lower than the national average. This disparity was a primary reason for the creation of the Hispanic Association of Colleges and Universities (HACU) and identification of Hispanic-serving institutions. These statistics suggest that non-White students need more help—a perfect opportunity for colleges to provide support.

Other researchers have examined the role of early intervention for STEM students (Gibson et al., 2020), but the interventions studied work to address the lack of exposure to STEM with students before they begin their first semester as first-time, full-time, first-year students (Cronholm, 1999); these researchers have therefore not provided insight into how to aid students who have already started college.

The students the researcher studied for this project had already started at the university. Studying an RTI framework at the university level filled a gap in the literature, and the findings should be particularly helpful for administrators of colleges and universities because postsecondary institutions cannot intervene before students enter college, after which many have thought it too late to act. This study shed light on an RTI

that can benefit both students who have under-learned and STEM students who are not struggling because it included students who represented a mixture of academic standings, which was appropriate because RTI models support students across a continuum of needs.

For this dissertation, the researcher addressed how mediated learning, specifically academic coaching, can increase STEM program retention rates. The researcher also addressed the issue of student attrition, a common issue at the collegiate level for all programs, which occurs when a student leaves the university (Shaw & Mattern, 2013).

Attrition can lead to the loss of time and funds but can also lead students to feel less confident in their academic abilities, and they may not complete a degree at all as a result (Shaw & Mattern, 2013). In addition to retaining students in STEM majors, the academic coaching studied aimed to reduce attrition from one semester to the next. Overall, the researcher investigated the possibility that institutions could increase retention and decrease program attrition while developing academic support services for modern students.

Purpose of the Study

The purpose of this study was to determine whether a targeted RTI program that used academic coaching positively affected retention and persistence of STEM student. To ensure all struggling students were captured, the coaching was offered to 632 STEM students enrolled at the university in the 2020–2021 academic year.

Research Questions

Three topics guided this research: remediation, retention, and persistence. Each topic has research questions that utilize percentages, as well as bivariate correlations to determine their answer.

Remediation

1. What percentage of Proactive Alerts for Student Success (PASS) Program participants had taken remedial composition, reading, or mathematics?
2. What is the correlation between participants' grade point average and the number of remedial courses taken?
3. What is the correlation between participants' grade point average and failing STEM courses?

Retention

4. What percentage of PASS Program participants were retained from Spring 2021 to Fall 2021?
5. What is the correlation between program satisfaction and retention?
6. What is the correlation between program attendance and retention?

Persistence

7. What role did the PASS Program have in the desire of its participants to remain in STEM?
8. What is the correlation between program satisfaction and attendance?

Hypothesis

The researcher evaluated two hypotheses based on the research questions:

1. The percentage of PASS Program participants who had taken remedial courses was higher than the percentage of those who had not.
2. Participants who have lower grade point averages will have taken more remedial courses.
3. Participants who have higher grade point averages will be less likely to have failed STEM courses.
4. Participants who engaged with PASS Program were retained from Spring 2021 to Fall 2021.
5. Participants who are more satisfied with their participation in the program are more likely to be retained than those who are not satisfied with the program,
6. Participants who attend their bi-weekly meetings are more likely to be retained than those who do not attend.
7. This is a qualitative question – answers will vary.
8. Students who are more satisfied with the program are more likely to attend.

Definition of Terms

This section defines terms as used throughout this dissertation.

Program Attrition

Program attrition occurs when students switch from a STEM major to a non-STEM major or leave the institution altogether.

Academically at Risk

An academically at-risk student is on track to fail a course.

Under-learned

A student who has under-learned has completed the necessary requirements to enter a postsecondary institution but lacks to exposure to best practices for college success.

College Ready

A college-ready student can enter a university without having to take any remedial classes before beginning their major coursework.

Hispanic-Serving Institution

A Hispanic-serving institution has a population of Hispanic students that equals 25% or more of the total student population.

Low-Income Student

At The University, a low-income student has an expected family contribution of $5,711 annually.

Expected Family Contribution

A student's expected family contribution is the sum of money the student's family is expected to contribute to the student's education after completion of the Free Application for Federal Student Aid.

Assumptions

The first assumption underlying the study was that the program was implemented faithfully. The second assumption was that COVID-19 would not disturb the implementation of the program, given that The University had shifted to virtual learning with in-person support services. Although the delivery of coursework differed from earlier years, students still received a minimum of 2 hours of lectures for all seminar

classes and had the option of taking in-person laboratory classes in disciplines that offered them.

Limitations

The participants in this study attended a private university. Private institutions typically cost more than their public counterparts because private schools rely heavily on tuition and private donations. The program studied needed approval from the institutional review board but did not need approval or supervision from the grant director for the related SURGE project.

A second limitation was that the budget provided for the program studied came from the SURGE Grant, meaning that the university was not covering the cost of tutoring or academic coaching. Researchers seeking to replicate the study may therefore experience budgetary restrictions not encountered in this study.

Summary

This dissertation used RTI as a means of providing individualized support for collegiate STEM students. The purposes of this study were to determine if the PASS Program could help students pass their STEM classes and be retained, as well as to determine if the PASS Program provided students with confidence to continue in STEM. With minimal literature on post-secondary RTI available, this study adds value to the RTI field and showcase its versatility.

CHAPTER 2: REVIEW OF THE LITERATURE

Introduction

The literature review is made up of four sections that discuss remediation versus RTI, underrepresented populations in STEM, the theoretical framework, and academic coaching. The review also examines existing RTI practices across all grades and student motivation and achievement.

Remediation Versus RTI

RTI is a multitiered system of academic support that provides research-based services to students who are struggling with their academics (Bouck & Cosby, 2017). RTI usually involves three levels, each more intense than the last (Hughes & Dexter, 2011; Scanlon, 2011). Use of RTI increased after implementation of the Individuals with Disabilities Education Act of 2004 to aid in identification of students with learning disabilities, but the approach has become widespread at the early childhood level (ages 3–5 years) for disability identification (Bruder, 2010).

RTI involves instructional modifications delivered to students in tiers that depend on the necessity of intervention. The goal of RTI is to correct learning differences as early as possible so that a student has a chance to follow a traditional learning trajectory without falling behind. The approach focuses on teaching a student at their present learning level rather than at their grade level; this can affect students with learning difficulties because their academic ability may not match their academic grade (Scanlon, 2011).

Before RTI, educators used the IQ-achievement discrepancy model to identify learning disabilities, but this model received criticism for being reactive rather than

proactive (Bouck & Cosby, 2017). Students had to show that they were doing poorly before they could receive any type of assistance, but even poor performance was not enough to obtain comprehensive support. Although many have praised RTI in comparison to the IQ-achievement discrepancy model, some have criticized RTI, particularly when used with preschool students. RTI gives a wide range of students the opportunity for intervention but has found the greatest application at the elementary level. This focus is logically necessary; however, there has been little investigation of RTI for secondary or adult students "because of the scheduling problems and compliance issues often encountered when working with adolescence," despite an increased need for remediation in college (Fuchs et al., 2010). Harkins (2016) defined RTI as a model used to provide students with tools and resources to successfully overcome academic and behavior challenges. The broad definition of this model allows for the creation of programs for all educational levels and student types, even for college students. There has been little evidence to show that RTI has been used for college students, even less for those in specialized majors like STEM. Because researchers have little research about the effectiveness of remedial STEM classes, administrators can create individualized interventions that can help students compete with their classmates. Crain (2001) stated that colleges should help students at all levels graduate and become productive members of society. Cappelli (2015) notes that the task of skill and knowledge building has shifted from the workplace to colleges, as employers now expect students to enter the workforce with a general understanding of how to do a particular job without having experience, and that those with a college education generally make more money than those without one. However, giving students the opportunities to build their resumes can be daunting,

because some students enter college without fully understanding the demands of postsecondary education, which can lead them to fail simply through inability to adapt (Harkins, 2016). RTI benefits college students as it works with students where they are and provides them with the opportunities to grow. An example of the versatility of RTI comes from Harkins (2016), where RTI, student learning, and student success in online education were examined and found that educators can adapt RTI to focus on the long-term success and completion of incoming online college students. Utilizing RTI provided researchers with a student success tool that is inclusive and equitable.

Remediation has a long history in collegiate institutions; its purpose is to provide academically underprepared students with the chance to attend college (Saw, 2019). When college administrators began implementing open admissions policies in the late 1970s to limit racial, gender, and socioeconomic biases in college enrollment, they found that some populations of students, specifically African American, Black, and Hispanic students, were unprepared for college-level work. For members of these populations, college had been unattainable, so policies such as open admissions provided them with new opportunities. Since 1980, college admission for these populations has dramatically increased, but their 4-year completions rates have remained low (Wang & Shulruf, 2013).

Dudley (1978) pointed out that concern regarding the preparedness of students from areas of low socioeconomic status has existed since the 1950s and has resulted in this group having fewer opportunities for postsecondary education. Experts have continued to struggle with the progress of non-White students in higher education (Santiago, 2006). To create equitable access, President John F. Kennedy introduced affirmative action to protect students from rejection based solely on their race or

ethnicity, socioeconomic status, or gender, but researchers have not studied the academic success of non-White students in direct connection with affirmative action (Wang & Shulruf, 2013). Despite a shift in college admissions, many colleges continued to predominantly serve the upper-middle class and upper class (Dudley, 1978). Even with admissions open to all, low-income students still found themselves struggling to compete with their wealthier counterparts, particularly academically (Dudley, 1978). Wang and Shulruf (2013) confirmed Dudley's findings after they examined open admissions policies and found that non-White students who met the minimum admissions requirements had a lower chance of retention than White students in the same situation, which led to problems for both students and universities.

Some authors have said that remediation is a means of ensuring retention, especially in the first year, but others have disagreed. Two decades after the open admissions push, Cronholm (1999) argued against the City University of New York's policies, stating that remediation did not fix the issue of a broken system for kindergarten through Grade 12 and that college should be reserved for those prepared for the academic rigor. Cronholm cited Baruch College's approach, which involved removal of remedial courses and intensification of summer programs; Cronholm did not mention that students who did not do well were not granted admission to the college. Less than a decade later, Ohio Governor Bob Taft pushed for the reform of high schools in the belief that high schools should better prepare students for college and students who are not college ready should attend community college (Associated Press, 2006).

In the United States, high school students take either the SAT or ACT as part of the college admission process. The organizations responsible for these tests gather

national information about the test takers and provide public access documents with results. According to ACT (2018), only 38% of the 1,900,000 students who took the ACT in 2018 met all the college/career readiness benchmarks in all four subjects of the examination. Another alarming statistic is that more than 75% underserved learners—those without access to a high-quality education—were deemed not college ready (ACT, 2018).

Though these statistics indicate lack of college preparation among high school students, these students have still been graduating high school and pushed to pursue either college or trade school. A 2014–2015 Hechinger Report showed that 46% of New Jersey college students needed to take a remedial course in their first year of school. Remedial classes are classes that must be taken before required classes. For example, to take Composition I, a student may have to take Fundamental Writing. Students must pass any necessary remedial classes before moving to their required classes, which costs students and taxpayers billions of dollars a year (Butrymowicz, 2017). In New Jersey, the average tuition cost was $16,402 per school year, over $2,000 above the national average (ACT, 2018). These additional remedial classes can lead students to take longer to graduate and lose motivation.

Spann (2000) argued that falling literacy development in secondary education has led community colleges to assume the role of remediating students before they attend 4-year universities. Although it is positive that community colleges have taken on this responsibility, the majority of students taking remedial courses have been underserved students or students who have under-learned (Attwell et al., 2006). Attwell et al. (2006) believed that policies such as remediation reduce students' chances of obtaining a

bachelor's degree because these policies create academic, financial, and personal obstacles for students. Intervening with academic support may help students overcome these obstacles and successfully complete their classes.

Underrepresented Populations in STEM

Scholars have debated U.S. educational differences based on student ethnicity for decades. Researchers have demonstrated substantial and detrimental gaps in the education provided to low-income Black and Hispanic students when compared to that offered to wealthier White students. The term "Hispanic-serving institution" appeared in the 1980s and refers to a school with in which 25% or more of the students are Hispanic (Santiago, 2006). In 2020, there were 523 Hispanic-serving institutions in the United States, an increase of 386 since the 1990s (HACU, n.d.-a). Growth of the Hispanic population in the United States has occurred simultaneous with a decrease in postsecondary academic achievement among Hispanic people (Santiago, 2006). The U.S. Census Bureau (2004) described a serious discrepancy between Hispanic people and non-Hispanic people with regard to the number of people earning degrees; the discrepancy was even more pronounced in STEM. Santiago (2006) reaffirmed this finding. Also, the schools' Hispanic students attended lacked the funding needed to support the needs of students (Santiago, 2006, p. 6); thus, it is important to identify and label schools that fit certain criteria so that educators within those schools can create programming to aid Hispanic students.

Those who founded HACU in 1986 intended the organization to help advocate for Hispanic students in higher education.The organization has worked with Hispanic-serving institutions and elementary and secondary schools under the Hispanic

Educational Resources and Empowerment Act of 2019 to ensure that Hispanic students across the nation have equitable educational opportunities and that students complete school at all levels (HACU, n.d.-b). According to HACU (n.d.-b), a significant number of Hispanic students have been graduating high school and enrolling in college, but fewer than 50% of enrolled students have earned bachelor's degrees.

In 2012, the President's Council of Advisors on Science and Technology emphasized that colleges should be graduating more STEM majors to maintain the position of the United States as a major global contributor to scientific research (Guenther et al., 2019). Nearly half of STEM students who enter college either switch majors or obtain no degree, which has led to smaller and less diverse pools of applicants for jobs (Lisberg & Woods, 2018). At The University, Hispanic students were less likely to complete their intended STEM degrees, and low-income students had the highest rate of changing majors (13%; SURGE, 2015, p. 5); this qualified the group to be considered at-risk. The specific definition of "at-risk student" varies among institutions, but in general an at-risk student is in danger of failing. Such students have a variety of socioeconomic statuses, but students with low socioeconomic status are more likely than other students to face academic challenges and be labeled at risk (Hernandez, 2011). The SURGE grant at The University noted that the STEM population as a whole was fragile and needed support. To remedy this issue, the STEM Engagement Center provides low-income Hispanic students with laptop loaners that they can keep while they are students and textbook loaners every semester they apply. After the initial group is served, all low-income students become eligible for loaners, and finally all STEM students become eligible. The center also provides tutoring, peer mentoring, advice, and registration for all

STEM students. This initiative is significant because The University is a Hispanic-serving institution and its leaders have been attempting to serve Hispanic students through tailored programming.

Nealy and Orgill (2019) studied 42 underrepresented minority (URM) students to discover how these students saw themselves in STEM. The authors surveyed the group to determine what traits students believed they naturally possessed. Nealy and Orgill determined a set group of traits and asked students to separate them into two categories: traits they possessed and traits they did not. The authors used identity theory to frame the importance of representation in STEM for URM students. Gee (2000) defined identity theory as a way to model identity as the composition of a particular type of person. Identity modeled this way can be cultural, familial, racial, social, or—in the case of Nealy and Orgill's study—academic and professional.

Nealy and Orgill (2019) set out to determine how a student's identity can affect their sense of belonging in STEM majors and career fields. Nealy and Orgill (2019) found that although URM students believed they possessed the natural science identity traits of curiosity, persistence, and desire for change, they did not believe they possessed the science identity traits needed to be a scientist: intelligence, motivation, or natural science identity. College administrators push for community and connectivity as a means of retaining students, but that is difficult to achieve if students do not feel that they are capable of attaining their goals. A student who feels that they are not alone feels more connected to their campus and add their school to their identity; however, a student who cannot see themselves as part of the community through their mentors and peers and cannot see that they are smart enough to be in their programs may not be motivated to

finish their degree. Some students' academic identity aligns with school standards. Such students may enter college having taken classes that give them an advantage over URM students by aiding them in the learning process through connection to school culture and understanding of the language of science. The students in Nealy and Orgill's study lacked a solid connection to traits believed to be natural or inherent, leaving them feeling as though they would not have a place in STEM after graduation; thus, retention rates fell.

Learning involves mental labor, and students who are not motivated to learn may experience difficulty progressing through necessary coursework (Marinak & Gambrell, 2013). Marinak and Gambrell (2013) explained that flexible literacy learning programs are important because teachers must meet each student at the student's level. Students may struggle to comprehend material that is too hard and may get frustrated as a result, lessening their motivation to learn.

Students who are motivated characteristically have better academic outcomes than those who show little to no motivation. The students in Nealy and Orgill's (2019) study are prime examples of how motivation can affect a student's personal vision. Intrinsic motivation, "performing a task because it is inherently interesting or enjoyable" (Guthrie et al., 2012, p. 55), plays a pivotal role in a student's academic performance. By taking charge of the learning process through intrinsic motivation, students can develop perceived self-efficacy. By feeling that they can complete tasks, students become more willing to learn newer, more complex information because they have a solid foundation in all academic disciplines; this foundation is necessary for perseverance through failure. Failure is most harmful when students lack a set understanding of independence. In Nealy and Orgill's (2019) study, URM students felt that they had the knowledge needed to be a

scientist but not the expertise (p. 261), meaning that they did not know how to apply the knowledge they possessed and that they may not have developed the self-efficacy needed to succeed in STEM. Students who try but fail may lose motivation if they feel that they are not grasping the material.

Academic Coaching

Capstick et al. (2019) conducted a five-semester-long study to determine the effectiveness of a consistent academic coaching intervention program with at-risk students. Capstick et al. (2019) defined academic coaching as a one-on-one intervention designed to work with academically at-risk students by focusing on their "strengths, goals, study skills, degree of engagement, academic planning, and overall college performance" (p. 220). These biweekly 45–60-min sessions focused on exploring students' strengths, all types of academic barriers faced by students, academic and career goal setting, and any issues that arose between meetings (Capstick et al., 2019). Consistency is key to building academic ownership and self-efficacy. Moreover, academic coaching acts as a liaison between students and other departments on campus, furthering a trusting and collaborative relationship.

Capstick et al. (2019) studied 1,434 full-time and part-time undergraduate students who possessed 1–59 credit hours and whose GPAs were below 2.0. They used archival data and new data to determine the effectiveness of a single semester intervention. The researchers found that students who actively participated in academic coaching had significant increases in GPA—0.52 for full-time students and 0.75 for part-time students, which were 0.48 and 0.47 higher than the increases experienced by

nonparticipants for full- and part-time students, respectively. Students who participated were also more likely to be retained than nonparticipants (Capstick et al., 2019).

Robinson and Gahagan (2010) reported similar results from their study at the University of South Carolina. In 2007–2008, 182 students at risk of losing their financial aid due to academic failure received academic coaching. Because of the intervention, 92% of the students who participated improved their GPA by the end of the academic year (Robinson & Gahagan, 2010).

The coaching strategies at the University of South Carolina were split into two categories: academic coaching and engagement coaching (Robinson & Gahagan, 2010). Academic coaching focused on working on academic goals for students on academic probation or at risk of academic suspension. Engagement coaching helped incoming first-year students transition from high school to college. This transition is an important time for college retention. Robinson and Gahagan (2010) told an anecdote about a first-year student who struggled with his academics and belonging because he had not had to put in much effort to succeed in high school. He had assumed that his social and academic behaviors would translate directly to college success. He was wrong and struggled. He began to succeed after meeting with a coach and creating an identity intrinsically tied to his academic and social success, much like those described by Nealy and Orgill (2019).

The keys to success in academic coaching are "self-assessment, reflection, and goal setting" (Robinson & Gahagan, 2010, p. 27). Letting students assess their current academic performance allows them to take ownership of their pitfalls and work with their coaches to both reflect on how those things cause bigger issues and develop goals for improvement. Echoing the definition of an academic coach set by Capstick et al.'s (2019)

, Robinson and Gahagan (2010) stated that an academic coach's job is to act as a vital source of assistance to a student because they are "committed to the student's success" (p. 27). To build off of this, the coaching sessions for the present study's RTI focused on academics, but students completed an engagement survey at the end of the semester to determine whether the program contributed to students' feelings toward STEM.

Kendricks et al. (2013) conducted another study of academic coaching at Central State University, a historically Black college/university, in 2009. The researchers found academic coaching and mentoring to be key to the success of their STEM engagement program. Students majoring in STEM with a GPA of 3.0 or above received invitations to participate in the Benjamin Banneker Scholars Program, which had the goal of increasing retention, graduation, and rankings of STEM students at Central State University. Participants received a stipend that covered their room and board, lived together, took a minimum of two classes together, attended monthly program meetings, and worked with faculty mentors (Kendricks et al., 2013). This design stemmed from the organizational socialization theory discussed by Van Maanen and Schein (1979), which models how a person's experiences in a role help shape them in the future; the purpose of this theory coincides with that of identity theory (Gee, 2000) used by Nealy and Orgill (2019). Both theories aim to explain how outside influences such as peer social interactions and previous academic encounters affect the performance and retention of students.

In the Benjamin Banneker Scholars Program, students took an active role in their learning to foster teamwork and science identity. Students also completed pre- and post-program surveys; these surveys showed that although the students enjoyed their time together, 90% of participants felt their mentors had made the greatest positive impact on

their academic careers. A key element of the faculty mentoring in the program was that faculty had experience both in STEM and working with traditionally underserved racial populations. This foundation of experience built on a unique element of historically Black colleges/universities, in that faculty were sensitive to the needs of students and worked with them without judgement. Kendricks et al. (2013) also discussed the role of interpersonal relationships in their study. The faculty advisors of the Benjamin Banneker Scholars Program felt a sense of parenthood over their students, providing them with both academic and emotional support.

Positive student–faculty relationships play a major role in student retention and graduation (Christie, 2013). Seymour and Hewitt (1997) (as cited in Christie, 2013) described STEM faculty of the 1990s as "chilly and unwelcoming" (p. 22), a description that has remained apt. Christie (2013) found that many STEM faculty felt that hard work was the key to improving graduation rates and that students who dropped out of their classes were underperforming and not meant to be in those classes, which agreed with Nealy and Orgill's (2019) findings regarding science identity. STEM faculty have demonstrated little understanding of the role their engagement with students plays in the overall retention and graduation of STEM students, particularly those from underrepresented populations. Christie found that many faculty felt that students would succeed or fail regardless of how they taught.

Lisberg and Woods (2018) found that members of underrepresented student populations were more likely to feel intimidated when working with predominantly White faculty, making best practices such as office hours and supplemental aid moot. Faculty and administrators in higher education must mirror the populations they serve

because students in such environments are more likely to feel welcomed and understood (Russell et al., 2018). Increasing representation of underrepresented populations in the workforce, and among faculty of institutions of higher education in particular, requires an increase of STEM graduate students drawn from these populations. In 2009, only 9% of members of underrepresented populations in the United States were STEM professionals, and only 10% of STEM doctoral graduates were from underrepresented communities (Russell et al., 2018). Reaching equity for underrepresented populations in STEM will take time, but academic coaching is one way to create connections and community among students while keeping academics at the forefront of their minds.

CHAPTER 3: METHODS

Present Study

This chapter is organized to discuss the following: research topics and questions, sample, setting, research design and procedures, data collection, instruments and data analysis, and ethical considerations. The study employed a sequential-explanatory research design that sought to expand the literature regarding collegiate RTI practices, specifically with STEM populations. The overall goal was to examine (a) the relationships among the use of RTI, successful completion of STEM classes, and the likelihood of retaining STEM students and (b) whether a correlation existed between being at risk and having taken remedial composition, reading, or mathematics classes. These examinations occurred via a mixed-methods study in which students took part in an RTI program and had their progress measured. Students also had the opportunity to express their experiences of education from elementary to secondary school and their aspirations for postsecondary school and beyond. The researcher expected high variability among the answers to the qualitative questions.

The purpose of this mix-methods study was to determine whether a targeted response to intervention program that used academic coaching positively affected retention and persistence of STEM student. This following research questions were the focus of the study:

Remediation

1. What percentage of Proactive Alerts for Student Success (PASS) Program participants had taken remedial composition, reading, or mathematics?

2. What is the correlation between participants' grade point average and the number of remedial courses taken?
3. What is the correlation between participants' grade point average and failing STEM courses?

Retention

4. What percentage of PASS Program participants were retained from Spring 2021 to Fall 2021?
5. What is the correlation between program satisfaction and retention?
6. What is the correlation between program attendance and retention?

Persistence

7. What role did the PASS Program have in the desire of its participants to remain in STEM?
8. What is the correlation between program satisfaction and attendance?

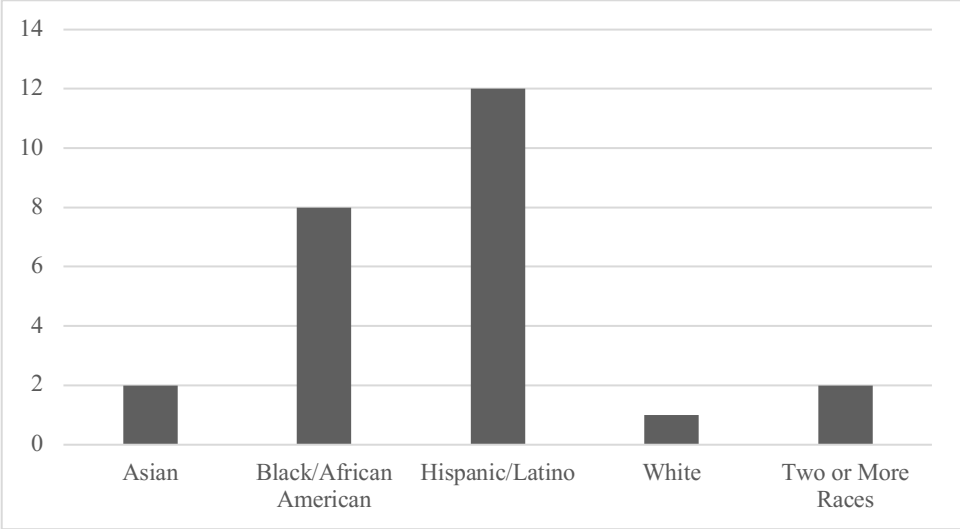
Sample

632 STEM students were invited to be part of the PASS Program at the beginning of the Spring 2021 semester; 25 students opted to take part. Eleven students (44%) were biology majors; two students were chemistry majors (8%); three students were computer science/cyber security majors (12%); one student was a mathematics major (4%); six students were psychology majors; two students were nursing majors (8%). Seven students (28%) were Pell-Eligible, meaning that they were considered low-income. Eleven students (44%) were not affiliated with any kind of special population. At The University, special population programs are the Equal Opportunity Fund Program, the TRiO Student Success Program, and Athletics. These programs provide students with

their own forms of academic support services that are included but not limited to academic advising, registration, tutoring, and financial support. Figure 1 is a breakdown of the racial and ethnic make-up of the students who participated in the PASS Program, an appointment summary was filled out and attendance was marked.

Figure 1

Racial/Ethnic Identities of Participants



Setting

The institution studied, The University, had obtained a SURGE Grant aimed at addressing the high volume of low-income students entering as STEM majors but switching out of STEM or not completing their degrees. The university was a Hispanic-serving institution: Of the 3,233 undergraduate students, 48% were Hispanic, 28.8% were Caucasian, 20% were Black, 9% were Asian, and 0.2% were American Indian/Alaskan. The institution was located in Jersey City, New Jersey, a diverse city in which STEM professionals were in high demand (Business Journals, 2011).

At The University, each student took a placement test in addition to their standardized tests. This placement test determined whether the student needed remedial

mathematics or writing. For non-STEM majors without a heavily mathematical curriculum, remedial mathematics classes may have few repercussions for overall degree progress. The university required all students, STEM and non-STEM, to take six or eight credits of mathematics. For STEM majors, these six credits could overlap with required mathematics classes; however, remedial mathematics courses could dramatically alter degree progress and put students behind by at least two semesters. Table 1 indicates how a student's class trajectory depended on their placement test score.

Table 1

Mathematics Classes Based on Placement Test Score

Condition	Placement
25 ≤ score	MA-123, MA-132/133, MA-143
17 ≤ score ≤ 24	MA-105/106 or MA-101
21 ≤ score ≤ 24 [a]	MA-212/222 or MA-218/212
Score ≤ 16	MA-100 (calculus track) MA-102/103 (non-calculus track)

Note. Data provided by the director of advisement and registration for The University.

a Alternate placement.

Students who entered with advanced placement credits or scored 25 or higher on the placement test were deemed ready for college and could choose the mathematics classes required by their majors. Table 2 gives the detailed math class requirements for different majors. Although in some cases the remediation of STEM students at The University had been successful, a need remained to help students with fundamental skills so that they could pass into the classes necessary for their majors.

Table 2

Base Mathematics Requirements by Major

Class code	Name
	Biology
MA-132	Statistics for Life Sciences
MA-133	Calculus for Life Sciences
	Biochemistry and chemistry
MA-143	Differential Calculus
MA-144	Integral Calculus
MA-273	Multivariable Calculus I
	Biotechnology
MA-143	Differential Calculus
MA-144	Integral Calculus
	Computer science
MA-123	Elementary Calculus II
MA-123	Elementary Calculus II
MA-212	Elementary Statistics
MA-216	Computer Mathematics
MA-218	Quantitative Methods for Business
	Mathematics
MA-143	Differential Calculus
MA-144	Integral Calculus
	Physics
PC-300/MA-382/MA-385	Math Methods/Math Modeling/Topics in Applied Math
MA-143	Differential Calculus
MA-144	Integral Calculus
MA-273	Multivariable Calculus I
MA-274	Multivariable Calculus II
	Psychology
PS-200	Statistics and Research Methods
PS-210	Advanced Statistics and Research Methods

Note. Data obtained from The University (2020).

Research Design and Procedures—Sequential Explanatory Design

PASS Program

The PASS Program built on existing work funded by the SURGE Grant with the aim of supporting and retaining STEM students. All STEM students were eligible to receive these services, but students had to opt into the program. The PASS Program allowed students to schedule biweekly 30–45-min meetings with the director of the STEM Engagement Center for academic check-ins that concentrated on identifying academic and personal barriers and creating success plans to overcome these barriers. Students who enrolled in the program could set weekly tutoring appointments before the tutoring schedule was available to the general student population, could schedule their advisement appointments before their peers, and could attend weekly office hours without making an appointment. Additionally, the PASS Program had an alert system implemented via EAB Navigate, the case management platform in use, an all-inclusive system that tracks all demographic data of undergraduate students at The University. Navigate was connected to Colleague, a customer relationship management system that tracked demographic data, account holds, grades, course evaluations, and other information. Table 3 summarizes the types of data collected.

Table 3

Data Collected

Category	Type	Collection location
Academic coaching attendance	Secondary	Navigate
Peer/faculty tutoring attendance	Secondary	Navigate
Remedial classes	Primary	Qualitative survey
Registered for fall 2021	Primary	Qualitative survey
Motivation to continue as a STEM student	Primary	Qualitative survey

Note. STEM = science, technology, engineering, and mathematics.

Each student who participated in the PASS program developed personal goals for the semester based on their GPA and the qualitative interview. Every student had to attend a minimum of one peer tutoring session per week, which was tracked through Navigate along with client progress reports filed by peer tutors. Client reports described whether students were prepared for their sessions, students' engagement during their sessions, and the material covered during sessions.

Two weeks before the end of the semester, students took a survey that asked about their experiences in the RTI program, whether they met their goals, and whether the academic support program altered their desire to stay in STEM.

In the past, The University used Retention Alert, which faculty or staff members could use to submit alerts (listed in Table 4) at any time if they were concerned about a student. Alerts fell into the categories of academic, academic discipline, disability services, financial, health and wellness, and personal. A faculty or staff member submitted an alert with a comment, which opened a case for a student. The system then assigned this case to the student's designated staff members for rectification. Although

this system was useful, students could fall through the cracks if they did not identify that they were struggling or if their professors or other staff members failed to notice an issue.

Because the PASS Program involved proactively working with students who may be at risk of failing a course, it combined faculty-led alerts with administrative checkpoints. Three times a semester, faculty received notifications from Navigate asking them to fill out progress reports for all of their students. Each report asked faculty to state whether students were at risk of failing, why, and whether they could recover (Table 4) and also provided an open comment box.

The progress report system was a joint effort with the associate vice president of academic administration, but the PASS Program worked specifically with STEM students. The director of the STEM Engagement Center and director of academic support programs fielded the reports.

Table 4

Pass Program Organization and Progress Report Questions

Question	Options
Alerts sent	Week 4 Week 8 Week 11
Alert reasons	Not attending class Not handing in assignments Not participating in class Low grades on assignments Not grasping the material Student expressed personal issues
Current grade	Pass Failing, can recover Failing, unlikely to recover
Follow-up steps	Academic coaching session with STEM director Tutoring session at the STEM Engagement Center Career coach session with the STEM career coach Student should withdraw/drop course

Note. STEM = science, technology, engineering, and mathematics.

Data Collection

Before any data collection was conducted, this dissertation study was submitted to the Institution Review Board at The University for approval. Approval was then sought from Saint John's University (Appendix A). The study officially began on January 27, 2021. An initial email was sent to all the STEM students enrolled at The University. Those who opted-into the program were asked to fill out an intake survey through Google Forms (Appendix C) that detailed necessary information for this study, which will be explicated in a later section. All students were asked to take part in an intake meeting via Zoom, bi-weekly meetings, also via Zoom, and at the end of the semester were asked to fill out a closing survey through Google Forms (Appendix D). During the intake meeting,

the researcher read through the implied consent form (Appendix E) with each student and answered any questions that may have been asked. The form was signed via the student's ID number on Google Forms, as The University student-facing services were predominantly remote. All appointments were made and tracked through the student success platform EAB Navigate. To further the data collection in terms of registration, an analysis was conducted to determine if there is a correlation between program satisfaction and retention. A second analysis was done to determine if there is a correlation between program attendance and retention.

Instruments and Data Analysis

Secondary data were collected through Navigate and used to determine whether STEM students had taken remedial courses, their grades at the end of the semester, whether they attended their academic coaching appointments, whether they attended tutoring, and demographic data including race and ethnicity, socioeconomic status (as measured by expected family contribution), and disability status.

Averages were used to analyze all quantitative questions. Students who chose to not take part in the PASS Program formed the control group and were compared to students who opted in. Subsets of data were compared through bivariate correlational analyses in SPSS.

Ethical Considerations

Every effort was made to keep any information collected about the students confidential. Student participation in this research was entirely voluntary, and participants could withdraw at any point without penalty. Data was kept in the researcher's The University Google drive, which is password protected and cannot be accessed unless the

password is known. After the data were collected, they were aggregated, and identifiable markers were removed. All the quantitative data that was collected in this study was accessed through EAB Navigate or Colleague, two systems that have interfaces specific to The University, and cannot be accessed without administrator credentials. The researcher was the only person with access to the study data. Students were notified that even if their name was not used in publication, the researcher would still be able to connect them to the information gathered about them in this research.

Summary

The leaders of The University have strived to retain STEM students. For this study, data were collected on student academic performance, remediation, and how intervention is associated with student desire to remain in STEM. Initial quantitative data—the student participation survey and remedial class participation—were collected at the end of the semester. Qualitative data were collected via open-ended questions in the end-of-semester survey. The study lasted 13 weeks. At the end of the study, the data were integrated and analyzed to determine whether the intervention with STEM students at risk of failing helped students complete their classes and want to continue in STEM. Research questions one and four were gathered through percentages, while research questions two, three, five, six, and eight were evaluated through bivariate correlational statistics. The variables in question two were GPA and remedial courses. The variables for question three were grade point average and failing STEM courses. The variables for question five were satisfaction and retention. For question six, the variables were program attendance and retention. For question eight, the variables were program satisfaction and attendance. Research question seven was a qualitative question in which data was provided by the

participants. The researcher also determined whether there was a correlation between being deemed at risk of failing in STEM and having taken remedial composition, reading, or mathematics.

CHAPTER 4: RESULTS

This chapter shows the results of each research question. As previously noted, the research topics are remedial/foundational courses, retention, and persistence.

Research Topics

Remedial/Foundational Courses

This first section addresses the percentage of PASS Program participants who had taken remedial composition, reading, or mathematics. As mentioned in Chapter 2, remedial/foundational courses can hold a student back from graduating in a four-year timeframe. For STEM majors, who must take anywhere between 39–59 credits for their concentration, it is imperative that students are on track to graduate as early as their first semester in college. Table 5 shows the breakdown of participants who had taken remedial/foundational courses:

Table 5

Remedial/Foundational Courses

Course	Number of Students (n = 25)	Percentage
CM-100EA English Fundamentals	6	25%
MA-100 Fundamentals of College Algebra	6	25%
MA-101 Precalculus	9	36%

Twenty-one (86%) of the 25 students who enrolled in the PASS Program had taken a remedial/foundational course during their time as a student at The University.

Correlation Between GPA and Repeating Remedial Courses

During the intake survey, 20% of participants stated that they had to retake at least one of the foundational courses in which they had been placed; 4% noted that they

had to retake anywhere between two and four courses. To draw out the implications of this data, a correlation analysis was conducted using SPSS 26.0. This aimed to determine if there is a significant correlation between participants' GPA and whether they retook a foundation remedial/foundation course before or during their participation in the program. At The University, a student can replace a failing grade by retaking the course. For example, if the student fails General Biology in Spring 2019 but retakes the course in Fall 2019 and receives a C, the C will replace the F in the overall GPA. The analysis found that the correlation between a student's GPA and the likelihood that they had retaken a remedial course was -.427 with $p < .05$. As GPA decreased, the likelihood of having to retake a remedial course increased.

Correlation Between GPA and Failing STEM Courses

In addition to being asked if they had to retake remedial courses, participants were asked if they had failed any STEM courses before enrolling in the PASS Program. As noted in Chapter 3, STEM students must stay on track due to the demands of the STEM degree requirements. If students fall behind, they may risk prolonging their academic career. The data show a significant ($p < .01$) The correlation between a student's GPA and having failed a STEM course was -.558 with $p < .01$. As GPA decreased, the likelihood of having failed a STEM course increased. It must be noted that if a student did not repeat the course and receive a passing grade, the failing grade is not counted in the GPA.

Retention

Retention data were collected using the final closing survey, which was administered to participants two weeks before final examinations. Table 6 shows the breakdown of responses from students.

Table 6

Retention from Spring 2021 to Fall 2021

Registered	Number of Students	Percentage
Yes	16	64%
No	2	8%
No Answer	7	28%

It should be noted that seven students did not complete the outtake survey. Sixty-four percent (64%) of the students enrolled in the program were retained by The University from Spring 2021 to Fall 2021.

Correlation Between Program Satisfaction, Attendance, and Retention

Given that data that the participants did not give could not be used, the seven participants in the study who did not participate in the closing survey were marked as having a satisfaction level of 1 and were noted as having not registered for courses for Fall 2021. The data show that the correlation between program satisfaction and retention is .805 with $p < .01$. Participants who rated the program with a higher satisfaction were more likely to be registered for the Fall semester. Similarly, students with higher attendance rates were more likely to be registered for Fall 2021.

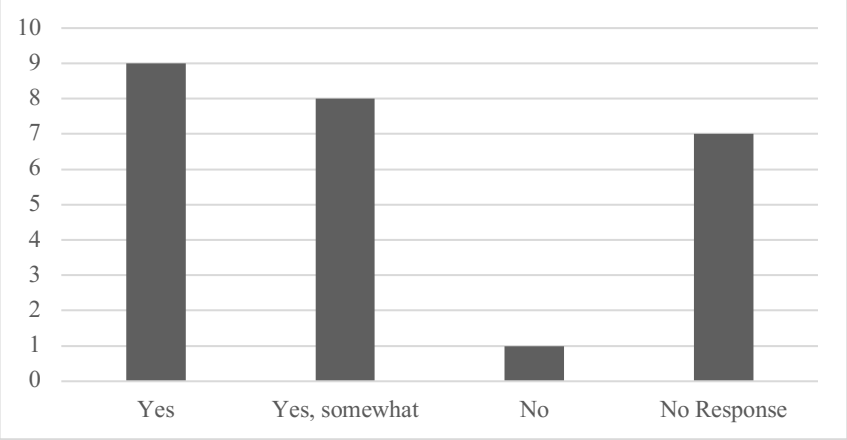
Persistence in STEM

This third section focuses on the role the PASS Program played in relation to a student wanting to remain in STEM. This role was examined via two quantitative questions and one qualitative question in the closing survey.

The first quantitative question asked students to discuss if the program contributed to their final grades for the semester by selecting yes, no, or yes, somewhat. Of the 18 participants who returned the closing survey, 9 (50%) felt that the PASS Program contributed toward their overall semester success, while 8 (44%) of the 18 felt that, while the PASS Program contributed toward their semester success, it was not the only factor (Figure 2).

Figure 2

The PASS Program's Overall Contribution to Semester Success



The second quantitative question asked students if they were going to change their major from a STEM discipline to a non-STEM discipline. The majority of participants (94.4%) specified that they were not planning to change their major. Only one participant stated that they were considering changing their major, but still wanted to remain in the STEM field. The qualitative question gave students a platform to share their feelings on how the program had impacted on their desire to stay in STEM.

Table 7 outlines the responses. Out of the 18 responses received, 13 participants left comments on their experience with the program. All 13 participants felt that they had benefitted from the program. Participants 4 and 6 recognized the potential of the program for benefitting other students who choose to take part in the future. Participants 8 and 17 revealed that the program had helped them with personal issues that were impeding their academic success. Participants 9 and 16 noted that the PASS Program had given them opportunities to talk with an administrator, which they found to be beneficial, especially during the COVID-19 pandemic.

Table 7

The Impact of the PASS Program

Participant	Response
Participant 2	It help*[ed]* me a lot this semester.
Participant 3	If my grades are low *[it]* is because of the lack of motivation of the class and difficult for me to participate that much. But the program has helped me a lot though.
Participant 4	This program will assist a lot of students now and in the future.
Participant 6	I think it was a great opportunity and I will gladly partake in *it [if]* it's being offered.
Participant 8	This program has helped me not only academically, but also with my very own personal struggles. I needed someone to push me to face my fears, and Jenna Cook did just that. I am so grateful for her and this program!
Participant 9	Having somebody to talk to during these unprecedented times about my academics was very rewarding.
Participant 10	It was a good program overall, really helped me stay on task.
Participant 12	Not much to say, but to say that this program helped me this semester.
Participant 13	The Pass Program was amazing, very appreciative to have been apart of the program.
Participant 15	This program helped motivate me throughout the semester.
Participant 16	This program enhanced my ability to communicate with my advisor and help with my overall progress for the semester.
Participant 17	This program has definitely helped me a lot. Before, I had a belief that no one was there to help me. This made me feel very unmotivated and I was already deciding on doing something else in my life. Once this program started, I stopped going to my therapy sessions and felt that someone was there to see me succeed.
Participant 18	I learned a lot of resources and helpful information.

Correlational Data for Program Satisfaction and Attendance

Correlational statistics were examined to explore the relationship between satisfaction rating and attendance. In the closing survey, students were asked to rate the program on a Likert scale of 1–5, with 1 being the most unsatisfactory and 5 being the

most satisfactory. The seven students in the study who did not participate in the closing survey were marked as having a satisfaction level of 1. The attendance numbers were taken from reports in EAB Navigate, The University's student success platform. T. The data show that the correlation between program satisfaction and attendance is .666 with $p < .01$. Students who rated the program with a higher satisfaction rating had attended more of their bi-weekly meetings. It also indicates that, as attendance declined, satisfaction declined.

Summary

The data collected present answers to all three research questions. Eighty-four percent (84%) of students enrolled in the PASS Program had taken a remedial/foundational course during their time as a student at The University. Correlational analyses found that, as a participant's GPA decreased, the likelihood of having to retake a remedial course increased. Sixty-four percent (64%) of participants enrolled in the program were retained from Spring 2021 to Fall 2021. Correlational analyses found a close relationship between attendance, satisfaction, and retention. Additional correlational analyses found that students who rated the program with a higher satisfaction were more likely to be registered for the Fall semester, and that participants with higher attendance rates were more likely to be registered for Fall 2021 courses. Fifty-two percent (52%) of participants felt that the program benefitted them and reinforced their desire to stay in the STEM field.

CHAPTER 5: DISCUSSION OF DATA AND FUTURE IMPLICATIONS

The goal of this final chapter is to highlight the most significant findings of this study, to discuss the potential implications of its results, and to make recommendations for future research within this area. It reflects on the purpose of this study which, in the context that STEM students at The University were more likely than non-STEM students to change degree programs and be deemed at risk of failure, aimed to determine whether a targeted intervention program driven by academic coaching had positively affected the retention and persistence of STEM students.

Remediation

The first set of findings relates to remediation. As noted in Chapter 2, remediation has a longstanding history in the American college system. Rising to this challenge, the University has credited foundational courses, meaning that students do not have to take courses without credit. However, the broader problem is that students are more likely to spend more time completing their degree program. While it is possible for a student to recover their GPA after having failed a course, especially since The University allows students to recompensate a course and have the grade replaced in their GPA, this adds time to a student's degree plan and can diminish motivation or resiliency. The results of the first research question, concerning the percentage of participants who took remedial/foundational courses, show that 84% of students in the PASS Program had taken at least one remedial course. While taking remedial/foundational courses does not necessarily mean that students will be unsuccessful in the STEM majors, it does require them to take extra courses to graduate. As highlighted in Chapter 4, STEM disciplines require between 39–59 credits, meaning that between 33% and 49% of the degree map is

made up of only STEM courses. This leaves very little room for failure, which can put additional pressure on students.

Moreover, by addressing the second and third research questions, which involved using bivariate correlational analyses, this research proved its hypothesis that participants with lower GPAs were more likely to have taken a remedial course and were also more likely to have failed a STEM course. Students who have taken foundational courses with lower GPAs have to face not only longer degree tracks, but also the inability to access certain services and privileges that have a GPA minimum. At The University, STEM students can take part in internships for college credit; however, many internships have a GPA minimum. For example, STEM students can apply for a Transformative Experience Internship, but they must have a minimum GPA of 2.5 and should be at least a junior (Transformative Experiences Program, n.d.). If a student's GPA is lower than this, they are ineligible to apply and lose out on a growth opportunity. Additionally, by having to take foundational courses and thus taking longer to graduate, students face delays in entering the workforce. This can increase student debt if a student is utilizing private or federal loans and can impede their opportunities to grow capital in 401ks and retirement funds and to own property. Graduates can be disadvantaged and may have to compete with others when they are in the workforce who may have graduated on time and with higher GPAs.

Retention

The second set of findings concerns retention. Retaining students is imperative for all higher education institutions as this affects a multitude of areas, for both the students and the universities. The PASS Program was designed as a proactive intervention

initiative, aiming to work with students before they started to struggle in the hope that they would be retained from Spring 2021 to Fall 2021. In line with the fourth research question, students were asked if they had registered for Fall 2021 in the exit survey and the responses suggest that 64% of students enrolled in the PASS Program were retained. A limitation on the data is that the students who did not respond to the exit survey were counted as non-registered even if they were registered during the bi-weekly meetings. The reasons for students not filling out the final survey are unknown, but may include time pressures and email fatigue.

The research also sought to determine the relationship between program satisfaction and retention and program attendance and retention, responding to research questions five and six. Correlational analyses revealed that students who were more satisfied with the program were more likely to register for the following semester and that students with higher attendance were more likely to be retained. A notable theme for the topic of retention was engagement. The greater a student's engagement with the program, the more likely they were to be retained.

While academic factors such as exposure and preparedness contribute to the derailment of STEM majors, external factors such as socioeconomic status, familial literacy levels, and work schedules also play a role in a student's performance and their ability to participate in extracurricular activities such as this study (Guenther et al., 2019). During the bi-weekly meetings, students reflected on the time pressures in their lives, especially since the onset of the COVID-19 pandemic. Students felt that the volume and intensity of work increased in comparison to previous semesters and felt that engaging in extracurricular activates was more difficult than when these activities were in-person.

The importance of understanding participants' lives in addition to their academic journeys is well-established in sociocultural theory; it is vital to explore the "historical, social, and cultural contexts of a child's experience to understand that person's intellectual or cognitive development truly" (Unrau & Alvermann, 2013, p. 67). Previous research on mentoring experiences has shown that academic coaching aids retention (Capstick et al., 2019) and the findings of the present study affirms this, as more than half of the students who participated in the program where retained from Spring 2021 to Fall 2021.

Persistence

The third set of findings addresses persistence. The qualitative survey responses demonstrate the positive impact of the program on the students, alluding to the seventh research question. The analysis in Chapter 4 identified a series of common themes about the effects of the program, highlighting its benefits for future students and its role in aiding personal issues and supporting connections on campus The University's mission statement emphasizes "cura personalis" [care for the whole person], which connects to Gee's (2011) assertion that people are products of their environments, one of the cornerstones of sociocultural theory. Empathy played a commanding role in the academic coaching model of the Pass Program, as the program director attempted to build a foundation of respect and trust with the students. Academic coaching offers educators an insight into students' lives and provides opportunities to aid them in removing barriers to their academic success. During the timeframe of this research, students were facing their third semester of remote learning due to the COVID-19 pandemic; all of their courses were delivered either synchronously or asynchronously via a mixture of Zoom, Google

Meet, Blackboard, and Google Classroom. During the bi-weekly meetings of the program, students shared that online learning was causing them stress and expressed a desire to return to the classroom to help them focus. Participant 9 suggested that it was comforting to have an administrator to speak with on a weekly basis, as the COVID-19 pandemic had removed in-person opportunities. Two of the participants noted that they were struggling with mental health and anxiety, which may not have been known if the students had not participated in their bi-weekly meetings.

A bivariate correlational analysis, which was conducted to determine the association of program satisfaction and attendance and thus answer research question eight, showed that the participants who rated the program with a satisfaction score of at least 3 of 5 on a Likert Scale were more likely to attend their bi-weekly meetings. This program was entirely voluntary, and students could stop attending at any time, so their overall enjoyment of having bi-weekly meetings was a key factor in attendance. As students' needs are different, it is imperative for all those who work to aid students throughout their collegiate career to be flexible and support students to maximize satisfaction.

This study shows the importance of combining academic support and career counseling, as one of the main purposes of students attending college is to find employment in the field in which they are interested. Students need to be assured that there is a possibility of employment at the end of their academic career. The University chose to adopt academic coaching to target first-year STEM students in their transition from high school to college and then during their transition from introductory college work to the requirements of their major. Immediate academic coaching would involve

intervention with all first-year students as soon as they enter The University. This is a necessary change that would give students the opportunity to work directly with a staff member and create connections between students and administrators.

Limitations

This section outlines several limitations of this study. The first limitation relates to the COVID-19 pandemic. Virtual instruction, necessitated by social distancing restrictions, was a transition for all in-person college campuses, including The University. Students were required to spend hours on their computers and then volunteer to meet via Zoom for their courses. "Zoom fatigue," when a person experiences tiredness from participating in online meetings for more than two hours, was common among the participants. Additionally, some participants missed a bi-weekly session due to illness. As noted in the Methods chapter, students were not required to meet in-person at any time.

The second limitation is that the study relied on student participation and cooperation for data collection and, as a result, the final survey data may not fully reflect the reach of the program. Even after signing the Implied Consent Form or attending all of their meetings, some students did not respond to surveys or questions. As noted in Chapter 4, students who did not respond to the closing survey were marked as having a satisfaction level of 1 and as unregistered, even if the researcher registered the student during a bi-weekly meeting. As such, the sample group was relatively small in comparison with the full cohort of STEM students at The University; participants represented only 4% of students. Despite this, the data collected offered substantial findings and the program made an impact on the campus community.

Future Implications for RTI and Academic Coaching

There are other potential topics of study beyond the eight research questions addressed in this research. The first topic that could be investigated is a comparative study on the responsibilities of undergraduate students versus professors over the last ten years. A common comment from the participants in this study was that their professors did not understand their struggles from having to balance work, school, and homelife, and from mental health issues. A comparative study could open up a discourse on how to better prepare faculty for students in contemporary contexts, as well as how to better prepare students for the expectations of faculty. A second topic that could be explored is a comparison between retention rates of students who engage in academic coaching on a bi-weekly basis versus those who engage in coaching monthly. The student caseload of this study was manageable for bi-weekly meetings, but larger caseloads may result in less frequent meetings. As it is possible that this could have an adverse effect, it is vital to study the impact of frequency on retention rates.

In addition to opening these pathways for future research, this study has made immediate impacts. After formulating the findings of this research, the researcher spoke in a meeting with the Grant Director of the SURGE Grant, the Associate Vice President of Student Affairs, the Special Assistant to the President, and the Associate Dean of the Center for Academic Success and Engagement. The meeting focused on ways to enhance the existing retention initiatives for STEM students at The University for a new grant initiative. This research has paved a way for one immediate addition and one possible addition to The University . The second potential initiative would focus on students entering The University below grade level and transfer students. These students would be placed into a learning lab, where they could connect with a STEM faculty member. These

connections would allow students to receive support as they gain an introduction to college skills, envision themselves in the STEM field, and begin to prepare for difficult examinations like the MCAT and the GRE. Through one-to-one meetings with students during the academic coaching and advisement sessions, the researcher was able to determine the weakest points of the STEM support systems and create new programming that will enable students to thrive rather than simply pass.

APPENDIX A: IRB APPROVAL FROM THE UNIVERSITY

Saint Peter's UNIVERSITY

Institutional Review Board

To: Jenna Cook
From: Dr. Joshua Feinberg, chair
SPU Institutional Review Board

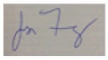
Date: December 21st, 2020

Letter of Support for research

Project Title: Proactive Interventions for Collegiate Success: Using Response to Intervention with College STEM Students

It is my understanding that Jenna Cook is looking for IRB approval for a project (listed above) she is completing as part of her graduate work at Saint John's University. She plans to collect data at Saint Peter's University using our STEM student population. I have reviewed her proposal and can endorse her project as consistent with the IRB guidelines at SPU. She will include in her proposal a letter giving her express permission to access the student sample and access the data as outlined in her proposal. Please do not hesitate to contact me with any questions or concerns.

Sincerely,



Joshua M. Feinberg, Ph.D.
Chair, Institutional Review Board
Saint Peter's University
Jfeinberg@saintpeters.edu

APPENDIX B: IRB APPROVAL FROM ST. JOHN'S UNIERSITY

Date: 4-18-2021

IRB #: IRB-FY2021-241
Title: PROACTIVE INTERVENTIONS FOR COLLEGIATE SUCCESS: USING RESPONSE TO INTERVENTION WITH COLLEGE STEM STUDENTS
Creation Date: 12-3-2020
End Date: 1-24-2022
Status: Approved
Principal Investigator: Jenna Cook
Review Board: St John's University Institutional Review Board
Sponsor:

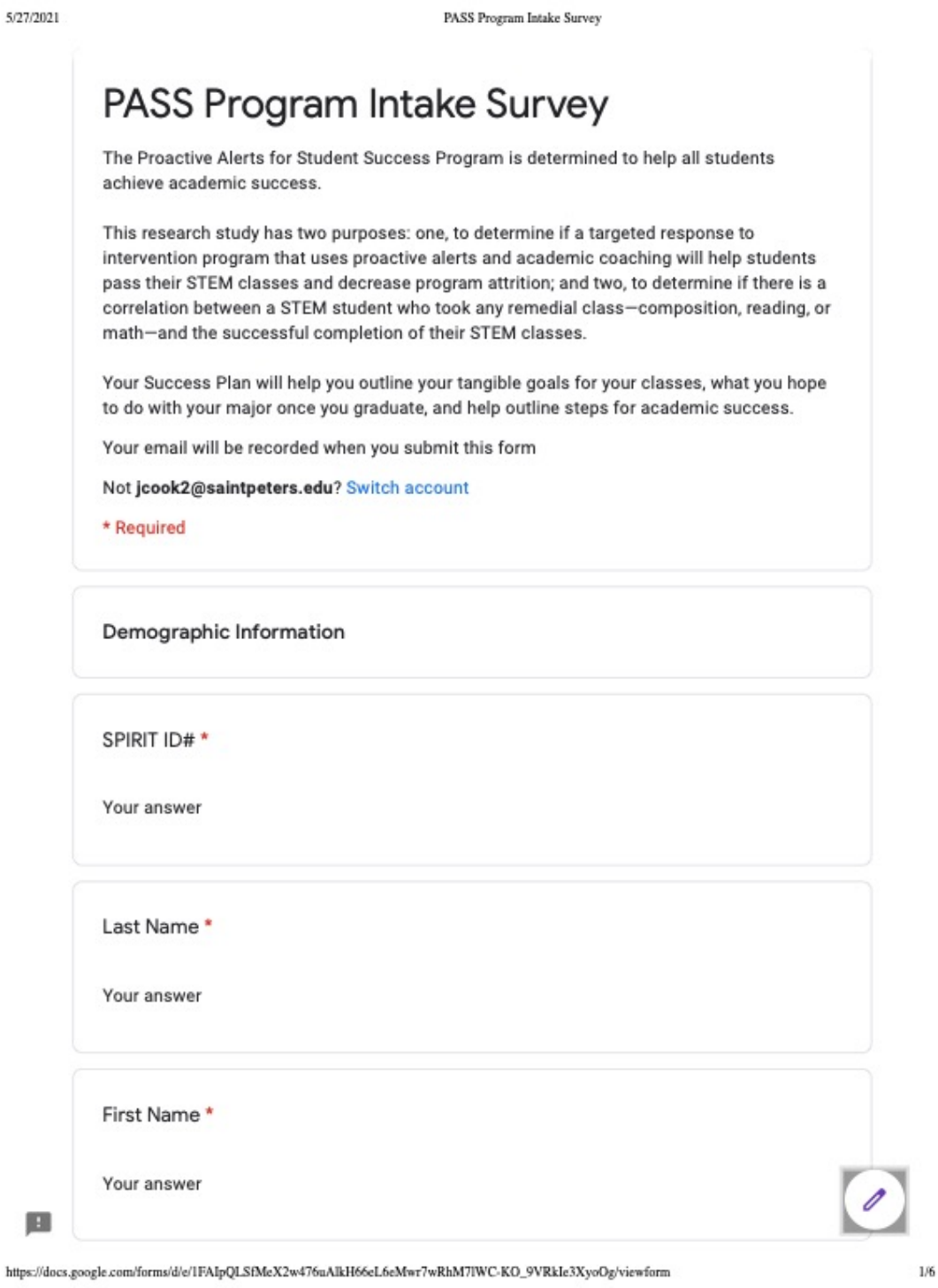
Study History

Submission Type	Review Type	Decision
Initial	Expedited	Approved

Key Study Contacts

Member Clare Irwin	Role Co-Principal Investigator	Contact irwinc@stjohns.edu
Member Jenna Cook	Role Principal Investigator	Contact jenna.szymanski18@stjohns.edu
Member Jenna Cook	Role Primary Contact	Contact jenna.szymanski18@stjohns.edu

APPENDIX C: PASS PROGRAM INTAKE SURVEY



5/27/2021 PASS Program Intake Survey

PASS Program Intake Survey

The Proactive Alerts for Student Success Program is determined to help all students achieve academic success.

This research study has two purposes: one, to determine if a targeted response to intervention program that uses proactive alerts and academic coaching will help students pass their STEM classes and decrease program attrition; and two, to determine if there is a correlation between a STEM student who took any remedial class—composition, reading, or math—and the successful completion of their STEM classes.

Your Success Plan will help you outline your tangible goals for your classes, what you hope to do with your major once you graduate, and help outline steps for academic success.

Your email will be recorded when you submit this form

Not **jcook2@saintpeters.edu**? Switch account

* Required

Demographic Information

SPIRIT ID# *

Your answer

Last Name *

Your answer

First Name *

Your answer

https://docs.google.com/forms/d/e/1FAIpQLSfMeX2w476uAlkH66eL6eMwr7wRhM7lWC-KO_9VRkIe3XyoOg/viewform 1/6

Major *

- [ ] Biology
- [ ] Biochemistry
- [ ] Biotechnology
- [ ] Chemistry
- [ ] Computer Science/Cyber Security
- [ ] Mathematics
- [ ] Physics
- [ ] Psychology
- [ ] Non-STEM

Campus Organization/FA-Choose all that apply *

- [ ] EOF
- [ ] TRiO
- [ ] Athlete
- [ ] ASP
- [ ] Pell-Eligible
- [ ] N/A

Racial or Ethnic Group *

- ○ White
- ○ Black/African American
- ○ Hispanic/Latino
- ○ Asian
- ○ American Indian/Alaskan Native
- ○ Native Hawaiian and other Pacific Islande
- ○ Two or More
- ○ Other:

Academic Information

GPA *

Your answer

Have you taken any of the following classes? *

- [ ] CM-100EA English Fundamentals
- [ ] CM-104 Introduction to Composition I
- [ ] MA-100 Fundamentals of College Algebra
- [ ] MA-101 Precalculus
- [ ] MA-102 Applied Mathematics for Liberal Arts
- [ ] MA-103 Probability and Statisitcs for Liberal Arts
- [ ] MA-105 Elementary Applied Mathematics
- [ ] MA-106 Introduction to Probability and Statistics
- [ ] No

Did you have to repeat any of these courses? If so, how many? *

- ○ No
- ○ Yes, one (1)
- ○ Yes, two (2) to (4)
- ○ Yes, five (5) or more

Have you failed a STEM class? If so, how many? *

- ○ No
- ○ Yes, I have failed ONE (1) class.
- ○ Yes, I have failed between TWO (2) and FOUR (4) classes.
- ○ Yes, I have failed more than FIVE (5) classes.

Choose the TOP 3 obstacles that you believe best describe what has impeded your academic success. If nothing, click the first option. *

- [ ] I'm doing well! Just want the extra support!
- [ ] I do not attend class.
- [ ] I do not pay attention in class.
- [ ] I do not turn in my assignments on time or at all.
- [ ] I have a difficult time understanding the texts.
- [ ] I had difficulty with the subject matter in one or more of my classes.
- [ ] I do not participate in class.
- [ ] I do not study enough, or I don't know know how to study.
- [ ] I missed an important assignment.
- [ ] I do not know what I want to do with my life after I graduate.
- [ ] I have difficulty managing my time.
- [ ] I have responsibilities at home that I cannot ignore.
- [ ] I want to do well but I am not motivated to do my work.
- [ ] I am having personal problems.
- [ ] I am having or have had health problems.
- [ ] I do not have transportation to get to school.
- [ ] I do not have internet or other technological tools needed for learning.
- [ ] I spend too much time on my phone, social media, or watching TV.
- [ ] I do not have organization skills.
- [ ] I procrastinate.
- [ ] I am having financial issues and am stressed about this.
- [ ] I am having a hard time balancing work and school
- [ ] Other:

PASS Program Success Plan Agreement

I understand that by filling out this Success Plan, I am agreeing to work with my Success Coach toward improving my academic performance. I will meet with my success coach bi-weekly 30-45 minutes as prescribed in my Success Plan.

Signature - ID#

Your answer

Submit

APPENDIX D: PASS PROGRAM CLOSING SURVEY

Pass Program Closing Survey

Thank you for participating in the PASS Program in the Spring 2021 semester. Please fill out this end-of-project survey.

* Required

Name *

Your answer

Overall, how satisfied are you with the PASS Program? *

	1	2	3	4	5	
Extremely Dissatisfied	○	○	○	○	○	Extremely Satisfied

Do you believe that the PASS Program positively contributed to your final grades this semester? *

- ○ Yes, the PASS Program helped me with my grades this semester.
- ○ Yes, but the PASS Program was only a small portion of my success.
- ○ No, the PASS Program did not contribute to my grades at all.

Are you registered for Fall 2021? *

- ○ Yes
- ○ No

Is there a non-academic issue (hold) on your account preventing you from registering? *

- Yes
- No

Will you be changing your major next semester? *

- Yes
- No
- Maybe

If so, will the major be a non-STEM major?

- Yes
- No

Please share any comments you may have about your participation in the program. *

Your answer

Submit

APPENDIX E: IMPLIED CONSENT FORM

Implied Consent Form - Dissertation Study

Thank you for choosing to take part in Proactive Interventions for Collegiate Success: Using Response to Intervention with College STEM Students. Please read the entire consent form before signing.

PROJECT TITLE: Proactive Interventions for Collegiate Success: Using Response to Intervention with College STEM Students
PRINCIPAL INVESTIGATOR: Jenna Cook - jenna.szymanski18@my.stjohns.edu, jcook2@saintpeters.edu
SJU MENTOR: Clare Irwin – irwinc@stjohns.edu
SPU SPONSOR: Nicole DeCapua Rinck, Ed.D. – ndecapuarinck@saintpeters.edu

* Required

INTRODUCTION

You are invited to consider participating in this research project. Please take as much time as you need to make your decision. Feel free to discuss your decision with whomever you wish, but remember that the decision to participate, or not to participate, is yours. If you decide to participate, please sign and date where indicated at the end of this form.

PURPOSE

This dissertation has two purposes: one, to determine if a targeted response to intervention program that uses proactive alerts and academic coaching will help students pass their STEM classes and decrease program attrition; and two, to determine if there is a correlation between a STEM student who took any remedial class—composition, reading, or math—and the retention of a STEM student.

Project Plan

You are being asked to take part in this research because you are a college STEM student. About 570 students are invited to participate in this research.

If you decide to participate in this research, you will do the following:
1. Fill out an initial academic coaching survey through google forms.
2. Have bi-weekly 15-30 minute Zoom meetings with the Director of the STEM Engagement Center addressing any issues that may have presented themselves that could deter your successful completion of your classes.
3. Will have priority access to book tutoring appointments and advising appointments.
4. At the end of the semester, you will fill out an anonymous survey asking about your desire to remain in STEM.

The research will be looking at your previous participation in foundational mathematics, composition, or reading classes; academic barriers that could potentially derail your degree progress; your previous participation in tutoring or academic coaching; and finally, your motivation to remain a STEM major.

The entire study will take 13 weeks, two weeks less than a full semester. Six bi-weekly check-in meetings and one advisement session are built into your participation in this program. Each session will last anywhere between 30-45 minutes. The amount of tutoring you receive is entirely up to you, and tutoring sessions are 60 minutes

Risks

It is possible, but unlikely, that this research could cause psychological stress if the student reflects on a troubling factor that could be hindering their academic success. In this case, they will be referred to the appropriate department for assistance.

The researcher will try to reduce this risk by working interdepartmentally to ensure the student has the services that they may need, i.e. counseling or financial aid.

BENEFITS

If you agree to take part in this research, there will be no direct benefit to you. However, information gathered in this research may provide insight as to how academic coaching can be used to promote the successful completion of STEM courses and the retention of STEM majors.

CONFIDENTIALITY

Every effort will be made to keep any information collected about you confidential. However, it is impossible to guarantee absolute confidentiality.In order to keep information about you safe, data will be

kept in the researchers Saint Peter's google drive, which is password protected and cannot be accessed unless the password is known. After the data has been collected, it will be aggregated, and identifiable markers will be removed. All of the quantitative data that will be collected in this study can be access through EAB Navigate or Colleague. Each system is password protected via the Saint Peter's Single Sign-On function.The researcher is the only person with access to the data. Identifiers will be removed and, in terms of quantitative data, only the successful completion, the participation of remedial courses, and your registration for Fall 2021 will be documented. Qualitative responses will be coded via MAXQDA. Please note that, even if your name is not used in publication, the researcher will still be able to connect you to the information gathered about you in this research.

YOUR RIGHTS AS A RESEARCH PARTICIPANT

Participation in this research is entirely voluntary. You can choose not to participate at all, or to withdraw at any point. If you decide not to participate, or to withdraw, there will be no penalty or loss of benefits to which you are otherwise entitled, or any effect on your relationship with the researcher, or any other negative consequences. Your participation or refusal to participate will have no effect on the grade you receive in any course or your standing at Saint Peter's University.

If you decide that you no longer want to take part in this research, you are encouraged to inform the researcher of your decision. The information already obtained through your participation will not be included in the data analysis and final report for this research.

QUESTIONS OR CONCERNS

If you have questions about this research project, you may contact Jenna Cook at 201-761-6337 or jcook2@saintpeters.edu. Please contact the IRB Office at Saint John's University at 718-990-1440 or irbstjohns@stjohns.edu. You can speak with Dr. Raymond DiGiuseppe, Ph.D., IRB Chair, Marie Nitopi, Ed.D., IRB Coordinator, or Jared E. Littman, M.P.A.

You may also contact Saint Peter's University IRB at 201 761-6300 or jfeinberg@saintpeters.edu if you have any questions about your rights as a research participant.

STATEMENT OF PERSON OBTAINING INFORMED CONSENT

I have fully explained this research to the participant. I have discussed the purpose and procedures, the possible risks and benefits, and that participation in this research is completely voluntary. I have invited the participant to ask questions and I have given complete answers to all of the participant's questions.

Please type in your name to confirm this statement. *

Your answer

STATEMENT OF CONSENT

I understand all of the information in this Consent Form. I have gotten complete answers for all of my questions. I freely and voluntarily agree to participate in this research project. I understand that I can withdraw at any time. My signature also indicates that I am 18 years of age or older and that I have

received a copy of this consent form.

Please type in your name to confirm this statement. *

Your answer

Submit

Never submit passwords through Google Forms.

This form was created inside of Saint Peter's University. Report Abuse

Google Forms

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Vita

Name	*Jenna Cook*
Baccalaureate Degree	*Bachelor of Arts*, *New Jersey City University, Jersey City*
	Major: English Literature
Date Graduated	*January, 2016*
Other Degrees and Certificates	*Master of Arts, Southern New Hampshire University, Manchester*
	Major: English and Creative Writing
Date Graduated	*November, 2017*