

UNDERSTANDING PLACEMENT INTO PREPARATORY-LEVEL COURSES AND THE  
EFFECTS ON ACADEMIC SUCCESS

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## ABSTRACT

Placement into preparatory courses presents a significant challenge related to access and equity in higher education; it connects to conversations around college readiness, particularly in geographical areas that have been underserved, or which have larger minority populations and underprepared students. At the same time, the research points to relationships between enrollment in preparatory coursework in higher education and lower rates of retention and college persistence; students who take these courses are more likely to drop out from the institution. These courses often carry no academic or transferable credit to be applied towards a college degree, yet the student has still accrued the same amount of debt as any other student who has taken credit-bearing courses. Therefore, these issues peripherally relate to matters surrounding college affordability and student debt. As a secondary analysis of Mid-Atlantic University data, this project investigated how preparatory coursework impacts college persistence and retention. It used the existing literature on placement into preparatory courses and any relationship to retention, with a focus on any noted disparities or inequities by student characteristics. Specifically, this study explored whether taking preparatory courses impacts some student groups differently than others in relation to retention and persistence. The data set was analyzed using quantitative, statistical methods. Findings include that students who take preparatory courses are more likely to be from minority backgrounds, are first-generation, are from homes where English is not the native language spoken and are from lower socio-economic status. There are also differential outcomes amongst those who take preparatory courses dependent upon student characteristics. Finally, preparatory students' responses on a New Student Questionnaire trend towards lower levels of academic and social integration. The implications of the results were focused on offering practitioners a unique look at the student data about the impact of pre-college course placement, which can be used to better support students placed into preparatory courses to increase the retention rates and improve academic outcomes of this vulnerable population.

To Ari and Zane

“Education is for improving the lives of others and for leaving your community and world better than you found it.”

- Marian Wright Edelman

“Education is a continual process, it’s like a bicycle...If you don’t pedal, you don’t go forward.”

- George Weah

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## CHAPTER 1

### Introduction

Almost all institutions of higher education assess the readiness of their incoming students in English and math. This is typically done by administering some form of placement assessment, either using standardized tests such as Assessment and Learning in Knowledge Spaces (ALEKS) or through their own placement exams. This is based on the understanding that if a student is not adequately prepared for college rigor, whether due to the high school environment and academics or other factors, the student faces a challenge in adequately completing college-level work. When one or more of these assessments is not passed, the student is typically placed into courses during their first academic year that are intended to enhance their skills in the area or areas where they are deficient. Whether these preparatory courses are termed “remedial” or “developmental” (see the section below), their purpose is to bring the student’s skills up to a level where more advanced courses can be taken. Preparatory coursework is an issue related to access and equity in higher education because it connects to conversations around college readiness, particularly in underserved geographical areas with larger ratios of minority populations (Kurlaender & Howell, 2012; Marisotis & Phipps, 2000).

The issue of preparatory coursework is not trivial. The National Center for Education Statistics (NCES) shows that in the 2018-2019 academic year, 74.6% of public four-year institutions offer remedial services (2018). Around 40% of all students entering four-year colleges enroll in some form of remediation. The issue is even larger for students entering two-year colleges where approximately two-thirds of incoming students are required to take one or more preparatory courses (Chen, 2016). At both institution types, rates of placement into remediation are higher for certain populations of nontraditional or at-risk students, including older students, first generation students, and those in the lowest income groups. Placement into preparatory courses at four-year institutions is also more common among Blacks and Hispanics, students from low-income backgrounds, and first-generation students (Chen, 2016).

While the intent of preparatory coursework is positive, there are also notable downsides to being placed in one or more of these courses. First, in some cases, these courses do not produce academic or transferable credit that can be applied towards a college degree. In such cases, the student has still accrued the same amount of debt as any other student who has taken credit-bearing courses (Bettinger, Boatman & Long, 2013). Second, the mere fact of taking such a course carries with it a certain amount of stigma and negative connotation. It is not surprising, therefore, that there is an extensive body of research that indicates that students who take preparatory courses have lower rates of retention and college persistence (Roderick, Nagaoka & Coca, 2009; Sanabria, 2020; Shields & O'Dwyer, 2017). The fact that these students have lower rates of college completion is not in doubt. The reasons for this, however, are more controversial. There are many independent variables, both student and institutional, to consider in an analysis that contextualizes the impact of remediation. In addition, there is little research that disaggregates the student population that is required to take preparatory courses. Overall, it seems fair to say that the research on the effectiveness of and need for remediation is mixed. The core purpose of this dissertation was to contribute to this body of literature to extend and clarify some of the unresolved issues in this area.

The purpose of this study was to understand how preparatory courses impact college persistence and retention as well as other indicators of academic success. The focus was on identifying whether there are any disparities by student demographics and other external variables within the group of students who place into and take preparatory courses. After an analysis of student placement into preparatory courses, this study was designed to close some of the gaps in the extant body of literature by assessing whether or not there are any differential academic outcomes within the group of students who take these courses. The purpose was to better understand how institutions of higher education can improve academic success and better support these students.

### Statement of Problem

Remedial coursework and developmental education programs<sup>1</sup> are prevalent across college campuses, as is low rates of college completion, particularly among the students who place into these courses (Roderick, Nagaoka & Coca, 2009). However, the research points to relationships between enrollment in preparatory coursework and lower rates of retention and college persistence (Shields & O'Dwyer, 2017). Students who take developmental courses are more likely to drop out from the institution (Sanabria, 2020). These courses may not carry academic or transferable credit, yet still cost the student the same in tuition, which may disadvantage students who need remediation. Since the outcomes in the existing body of literature on the effectiveness are inconsistent, it is necessary to continue an exploration of the relationships between placement in remedial education and academic outcomes, to better understand how institutions of higher education can support these learners from admittance through graduation (Adelman, 2006). After analyzing whether the investigated institution follows placement trends from the literature into preparatory courses, the present research aimed to close the gaps by exploring and assessing the academic impact of taking these courses within various student groups and characteristics.

### The Current Study

The current research took the position that student mindset at the onset of their college career is linked to student engagement. To ground the research questions and analysis, this study used Tinto's theory which will be presented in Chapter 2. Tinto described how student engagement is correlated with student outcomes. However, to advance the theoretical framework and account for its shortcomings, the current research examined the relationships between

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<sup>1</sup> Across higher education, these programs have various naming conventions. They may be referred to as remedial education, developmental education, precollege-level courses, among others. This report will explain different interpretations of these programs based on the naming used at the institution; however, throughout this report, these will be referred to as preparatory courses.

cultural background and college academic achievement as a layer of understanding persistence overall. Variables for consideration in the analysis included student responses on a New Student Questionnaire<sup>2</sup> (NSQ) to questions about students' self-expectations for their upcoming university experience both in and out of the classroom. For groups of students who typically carry an increased likelihood to drop out, such as students placed into preparatory-level courses, this study ultimately offers insight into how student perceptions and interactions with preparatory courses may affect student academic success. Where differential academic outcomes do exist among students in preparatory courses, this study further allows stakeholders to develop a retention plan which considers the need to improve student experiences in those courses in order to remain engaged, to maintain a positive sense of belonging, and thus to increase students' commitment to stay in school.

#### Research Questions

This study addressed three specific research questions.

- 1) *Which students take preparatory-level courses at the investigated institution? Do those placement trends align with the existing literature on which students require remediation in higher education?*

Using student records, New Student Questionnaire (NSQ) data, as well as student high school academic history, high school GPA, SAT or ACT scores when available, student characteristics, among other variables, an analysis was conducted to identify any differences, if any, between students who take preparatory courses and those who do not have to take any preparatory courses. Additionally, the analysis looked for any differences between those who had to take math, those who had to take English, and those who had to take both preparatory level subject

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<sup>2</sup> The New Student Questionnaire (NSQ) is an entering student survey completed as a part of the placement battery that collects additional student background data as well as information on student perceptions and expectations of the undergraduate experience.

areas. Ultimately this research attempted to determine whether placement trends into preparatory courses at an urban, diverse institution align with placement trends in the literature.

2) *Is there a difference in academic success by student characteristics and other student variables amongst those who do take preparatory-level courses?*

For the purposes of this research, academic success was measured by retention, grade in the following college-level course in the subject-matter sequence, and persistence to graduation. Retention was analyzed in the two ways that are typically used in the literature: first-to-second semester retention (fall year one to spring year one) and first-to-second-year retention (fall year one to fall year two). GPA will focus exclusively on the grade earned in the student's second level course in the same subject matter in which the student took a preparatory-level course. For example, if a student took preparatory-level English, the analysis included the grade earned in ENG 0802, which is the college-level requisite English course at Mid-Atlantic University. If a student took a preparatory-level math course, the analysis included the grade earned in the sequential college-level math course, which is dependent upon choice of major (Appendix A). Persistence to graduation was analyzed using four-year and six-year graduation rates and controlled for student demographics and other student characteristics amongst those who do take preparatory courses.

3) *Are there any trends in student responses on the New Student Questionnaire regarding their academic and social expectations during their time enrolled at the institution, amongst students who take preparatory courses?*

The focus of this analysis is within the group of students placed into preparatory-level courses, to determine which items on the NSQ, if any, may help predict more positive academic outcomes amongst those who need remediation.

## Definitions

The following definitions will be used in this document:

Preparatory courses (also referred to as remediation, developmental, or precollege-level): courses that are offered by postsecondary institutions but that cover curricular content below the college level (Saxon & Boylon, 2001). These classes help students gain more knowledge and ability in key college-level skills which they lack (Kokemuller, 2019). At the university where the data for this dissertation were derived, these courses are typically numbered between 0700 and 0799 and are identified as Preparatory Courses in the University Bulletin.

College-level courses: a traditional college course which provides college-level knowledge and training that helps a student move toward a degree while also increasing technical and soft skills (Kokemuller, 2019).

Preparatory-level students (also referred to as developmental students, remedial students, or precollege-level students): Students who are required to take a preparatory course or courses based on their academic history, SAT or ACT scores, or a placement assessment upon entrance to higher education.

Non-preparatory-level student: Students who are not required to take any preparatory course or courses.

## CHAPTER 2

### REVIEW OF THE LITERATURE

#### History of Remediation in Higher Education

Preparatory education has been offered by universities and colleges throughout the history of higher education (Arendale, 2011). The purpose of these courses is to help students “meet the academic standards expected of admitted college students” (Arendale, 2011 p.5) and to close the gap of academic preparedness. In the mid-1600s to the mid-1940s, remediation mostly looked like tutoring for privileged white males attending college or preparing to attend college. By the mid-1940s, however, remedial courses became integrated within the institution as a part of the curriculum; this coincides with the expansion and integration of women and students of color attending college.

The nomenclature of these courses has evolved throughout the history of higher education and even still today can be referred to in a number of ways; remedial education programs today often may be called developmental education, but also may be referred to as tutoring, preparatory programming, precollege-level courses, basic skills education, or compensatory education. All of these names, however, suggest a “type of teaching which ‘rectifies some deficiency’ or ‘puts things right’” (Sampson, 1975, p.1). According to Ross (1970), remedial and developmental are often used interchangeably but do not carry the same connotation. Remedial education denotes the skills or content being taught -- in other words a student may be unable to demonstrate proficiency in particular skills. Developmental education connotes the type of instruction used to teach content or skills, adjusting to meet students’ individual needs. One phrasing emphasizes what the student cannot do, whereas the other emphasizes what the instructor can do to support the student.

Preparatory education programs in higher education are designed to “get underprepared students ready for college-level work” (Mangan, 2012, para. 1). Upon admittance to a college or university, students are typically required to take a placement assessment to determine their academic readiness. Based on those results, students may be required to take a sequence of

preparatory courses before they can sign up for credit-bearing or college-level courses. The design and course sequence of such preparatory programs varies from institution to institution, as do the assessments or policies used to determine placement.

Criticism of the efficacy of placement measures and the effectiveness of preparatory courses in preparing students for college-level work is common. Some stakeholders believe that placement should not be determined by a single test, since students may or may not understand its significance or take it seriously. Additionally, students needing remediation drop out at higher rates, are less likely to persist to graduation, and require more semesters to graduate than their peers (Chen, 2016). Much work has already been done to evaluate the efficacy of various placement measures (Merisotis & Phipps, 2000; Sanabria, 2020; Saxon, 2001); therefore, the current research is not intended to be an evaluation of this institution's placement methods or tools. Instead, the current research accepted that the placement measures used at the institution are effective and reliable, allowing the focus of the analysis to be directed at the outcomes of students placed into preparatory-level courses at the institution.

#### Theoretical Orientation

A widely used theoretical framework to help explain student persistence, retention, and graduation patterns is Tinto's Student Integration Model (1975). The Student Integration Model identifies and explains some of the variables that can help predict whether a student stays or drops out of college. The theory focuses on a student's characteristics in combination with their social and academic integration with the institution to interpret a student's drop-out decisions. Studies testing Tinto's Student Integration Model revealed that institutions which foster both academic and social engagement with their students can improve persistence and graduation rates (Kirby, 2021; Merriweather Hunn, 2008; Tierney & Sablan, 2014). While there have been many expansions of this work to include other student populations and other institution types besides traditional students at four-year institutions, this early theory created a framework for understanding the implications of student engagement and involvement with the institution they

attend. Tinto's Model can be applied broadly to understand student academic behaviors, patterns, and outcomes based on independent student variables, as well as consideration of student's perception of their academic pathway. The present study argues that student perception plays a significant role in academic outcomes. If a student has positive and reasonable perceptions and expectations of their courses and plans during matriculation at the onset, they may have a more positive experience in their courses including any needed remediation, resulting in more positive academic outcomes overall. They may also be more inclined to participate in more meaningful ways in the course, with their peers and their instructor, to create greater rates of academic success. While there is no research to directly test this assumption it is reasonable to argue that students taking preparatory courses will feel less engaged and less integrated into the college experience since these courses are, by definition, outside the regular curriculum.

A study by Sidelinger, Frisby, and Heisler (2016) explored Tinto's assertion that students' commitment level is correlated with student academic and social integration on campus. They looked at how social and academic integration influences out of class communications with the instructor and formal campus support seeking. They theorized that students who feel a sense of connection with their instructors may be more likely to seek out support services and resources available at the institution. They surveyed 193 undergraduate students of different ages in a variety of class types, in order to measure instructor rapport, student self-management and self-regulation, out-of-class communications, and support seeking of institutional resources. They found positive correlations between instructor rapport and seeking support services. Their study supports Tinto's interactionist theory that student commitment is correlated with academic and social integration, in this case linked with students' likelihood to take advantage of the services on campus which increase their likelihood to persist. This aligns with some assumptions for the present study, including that students' sentiment at the onset of their college education can help predict their academic success in their preparatory courses as well as coursework beyond.

### Criticisms of Tinto's Theory

There are two major criticisms of Tinto's theoretical argument that links student engagement with student retention. The first criticism is that the college environment described by Tinto and used to ground the theory is outdated. The focus of Tinto's work is on brick and mortar schools and classrooms and the college experience of the 20<sup>th</sup> century (Tierney & Sablan, 2014). However, largely lacking from the model is the impact of social media, technology, games, online learning, and other trends which are now prevalent, if not a requirement, in higher education during the second decade of the 21<sup>st</sup> century. These new forms of media afford evolving opportunities for students to engage in the campus community but are not accounted for in Tinto's prevailing theory of student retention.

The second major criticism of Tinto's model is that it fails to recognize cultural variables, particularly for minority students, that contribute towards understanding student attrition (Guiffrida, 2006; Merriweather Hun, 2008). Tinto's framework is positioned within a Western, Eurocentric conceptualization of integration in higher education, and ignores the need for minority college students to build and retain connections to their cultural heritage (Gonzalez, 2000). Therefore, widespread application of Tinto's model is disrupted by lacking a prioritization of the unique experiences of minority students and students of color. Instructional characteristics and practices matter as much as institutional characteristics and practices in developing a sense of belonging and creating relationships that increase students' likelihood to persist (Kirby & Thomas, 2021). Not all students' trajectories on campus are the same, especially when accounting for demographic variables, and so student demographics should play a key role in testing and applying Tinto's theory to a prediction model or to an institutional retention plan.

### Who Takes Preparatory Courses?

Around 40 percent of all students entering four-year colleges enroll in some form of preparatory coursework; that number rises to around 60 percent among students entering two-year colleges (Chen, 2016). At both institution types, rates of need for remediation are higher for

certain populations of nontraditional or at-risk students, including older students, Black and Hispanic students, first generation students, and those in the lowest income groups. (Chen, 2016).

A review of a nationally representative data set<sup>3</sup> finds that the need for remediation in mathematics was more common than the need for English (writing and reading) remediation, and that on average preparatory-level students at public 4-year institutions took two remedial courses (Chen, 2016). As far as academic preparation, the need for remediation is more concentrated among students with weak or limited academic preparation, measured by high school grade point average, highest math course taken in high school, and college admission test scores. Although differential placement is evidenced in the literature, it is clear that placement into preparatory courses involves both disadvantaged and advantaged populations. For example, among all students at 4-year institutions, about one third of students from high-income or college-educated families participated in remedial education (Chen, 2016). Therefore, there are students from all academic, socioeconomic, and racial backgrounds being placed into preparatory coursework.

Another lens through which to understand the impact of preparatory education relates to student perception of these courses. Byrd and MacDonald (2005) interviewed first-generation college students on their perspective of college readiness and remedial courses. Using an in-depth phenomenological interview methodology to understand the impact of student perspective on academic outcomes, they interviewed eight undergraduate participants from a small urban university, all juniors and seniors who had earned an associate's degree and were older than 25. Using transcription, coding, and triangulation of the data, the researchers arrived at ten emergent themes which were then grouped into three categories that the students emphasized as essential for college readiness: skills in time management, ability to apply and focus on a goal, and ability to advocate for oneself as a learner. The student participants referred to a number of variables, including nonacademic skills such as time management and study skills as well as academic

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<sup>3</sup> Beginning Postsecondary Students Longitudinal Study

skills, which they felt were critical to their success and ability to persist. This demonstrates that academic need for remediation based on a test score (or other placement measure(s)) alone is not the only measure to predict whether a student will successfully persist through a preparatory program to degree completion. Understanding how to develop these nonacademic skills and to prioritize student support services may have a great impact on reducing the likelihood of preparatory-level student drop out. Institutions may also use this information to create a prediction model by measuring these nonacademic skills upon admission along with academic skills, which then allows the institution to target at-risk students with interventions that ultimately will promote student academic success and improve retention. The study by Byrd and MacDonald could be expanded by broadening the participant population to other institutions and other student demographic groups, such as students who are not first-generation. Additionally, the results of their study could be further supported by incorporating quantitative data such as GPA and time to degree to see whether any correlations exist between what students express during the interview, how they perform academically, and how they engage on campus (for example, do they go to tutoring, use the library, or office hours).

#### Impact on Retention and Graduation

##### *Negative Effects of Preparatory Course Placement*

In fall 2020, the full-time student retention rate across 5021 postsecondary institutions was 75.7% (NCES, 2020). The literature shows that retention rate trends decline amongst students who take preparatory courses. In a study by Shields and O'Dwyer (2017), the researchers used three outcomes to compare college students who took preparatory courses to their peers who did not. They began with the accepted findings from previous research on preparatory education: that students who take preparatory courses graduate at lower rates than those who do not take preparatory courses, and that students at community colleges are more likely to need remediation than students at four-year institutions. The researchers of this study considered institutional characteristics and student demographics, and they drew upon a

conceptual framework that integrates the impact of student demographics, student context (full time/part time, academic and social integration, etc.) and the institutional context (public/private, two-year/four-year, demographic makeup, etc.). In this quantitative study, they used a national data set<sup>4</sup> to examine the impact of taking remediation on student degree attainment. In addition to transcript data, they included a sample of 3510 students who were interviewed three times over five years, beginning with their first year enrolled in either a two- or a four-year school. The findings of this research point to correlations between enrollment in preparatory coursework and lower rates of retention and college persistence.

One limitation of their study is that students who were included in the sample had a lower incidence of risk factors than in complete national data sets, such as being first generation, having a dependent child, and level of high school preparation. This issue limits the generalizability of the findings across all students at any college, whereas the current research attempted to mirror aspects of this study while ensuring the inclusion of a more accurate representation of at-risk students in the sample. Overall, however, the findings of the Shields and O'Dwyer study aligned with other analyses of college student placement: that two-year students were more than twice as likely to require one or more preparatory courses than students at four-year schools, and that students at two-year schools took more preparatory courses on average (in other words, more students enrolled at two-year institutions need preparatory courses than those at four-year institutions, and among students who needed any remediation, those at two-year institutions each needed more preparatory courses than those at four-year institutions).

The data revealed that among the four-year population, students requiring any preparatory courses were less likely to earn a degree than their four-year peers, and that the likelihood to earn a degree decreased as the number of preparatory courses taken increased, after controlling for the student and institutional contexts of the framework. However, there was no relationship found between enrollment in preparatory courses and remaining enrolled or

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<sup>4</sup> Beginning Postsecondary Students Longitudinal study, and Postsecondary Education Transcript Study.

attaining an associate's degree at a two-year institution; therefore, there is still a significant amount of work needed to better understand the four-year preparatory-level student population, since their enrollment in preparatory courses appears to be impacting their retention and graduation in more detrimental ways. The other missing piece is about the relationship between the need for remediation and persistence to degree completion, and which student and institutional characteristics encourage this persistence. Also, previous studies on need for remediation that identified a relationship between preparatory course enrollment and retention typically exclude students who had previously enrolled on a part time basis; however, the research by Shields and O'Dwyer included part-time students, and therefore there is a need for further research to investigate the relationship between credit load and enrollment in need for remediation.

Research by Sanabria, Penner, and Domina (2020) addressed the importance of understanding how the academic outcomes associated with need for remediation vary based on academic success of the preparatory coursework. Although the previous literature often indicates lower retention and graduation rates amongst students who take preparatory courses compared to those who do not, the above researchers took a closer look within the group of students who place into remediation, by comparing those in remediation courses who pass and complete the course to those in remediation courses who fail, assessing both short- and long-term effects. While overall, students who require remediation typically have lesser academic and workforce outcomes compared to their peers who did not require preparatory coursework, when the analysis investigates *only* students who needed remediation, and then compares students who pass versus fail their remedial coursework, the outcomes and impact of the remedial courses are much clearer. In the multivariate analysis using a national data set<sup>5</sup> and controlling for a wide array of student characteristics, the researchers attempted to understand the answers to the following questions: who takes preparatory coursework, and how do students who pass and fail

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<sup>5</sup> National Longitudinal Survey of Youth 1997: NLSY97 and the follow up NLSY Postsecondary Transcript Study 2011

their preparatory coursework differ in academic and long-term outcomes (such as wage outcomes) from their non-preparatory course-taking peers?

Along with the high rates of need for remediation established earlier amongst all college entrants, and even higher rates within certain groups of students, failing of preparatory coursework is widespread. Among all four-year college students in preparatory courses, only 59 percent complete all of them that they attempted, and among all two-year college students in preparatory courses, only 49 percent completed all the preparatory courses they attempted (Chen, 2016). At the four-year institutions, 15 percent of the preparatory course-takers did not complete or pass any of the preparatory courses they attempted.

In a 2006 study, Attewell, Lavin, Domina, and Levey expanded the research by seeking to answer a slightly different question: are students who take and successfully complete preparatory courses more likely to graduate than their peers who did not need to take any preparatory courses. This question isolates those students who demonstrate the ability to pass courses in college, and reflects the concept that preparatory courses have the potential to offer more than just the basic academic skills that may have been lacking on a standardized test, such as social development, acquaintance with the campus and services available, fostering a stronger sense of community and identity at college, as well as successful academic preparation for the upcoming demands of their academic coursework. To examine the effects of preparatory courses during college, these researchers used a national data set<sup>6</sup> which included students' academic skills prior to college, family background, and college courses taken. To understand the impact of the interaction of student characteristics on academic success, their analysis included a logistic regression used to develop propensity scores, from which they were also able to dispel many misperceptions around preparatory education. For example, one misperception about preparatory education is that many students who need remediation need to take many preparatory courses. Attewell et al. found that it really depends on institution type; while 44 percent of students at two-

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<sup>6</sup> National Educational Longitudinal Study (NELS:88)

year colleges take between one and three preparatory courses, only 14 percent enroll in more than three. At non-selective four-year schools, this is even more drastic, as only five percent take more than three preparatory courses. In their study, they analyzed socio-economic status and found that although it is true that a majority of students (52 percent) in the lowest income quartile needed some remediation, it was true, too, that 25 percent of those in the highest income quartile needed some remediation as well. Finally, they found that academic privilege during high school may not be as clearly linked to a likelihood of requiring remediation as has been concluded from much of the previous literature noted earlier. Students in NELS were given a baseline combined math and reading assessment prior to entering college, and the analysis showed that ten percent of those scoring in the highest quartile on the assessment also took some preparatory courses, and that 25 percent in the second quartile took some preparatory coursework. This piece of the study is particularly effective at norming the participant population since institutions across the nation use their own assessment measures and requirements to determine placement. The analytical model used in this study matched two-year college students and four-year college students in academic skills, race, and family background, only to reveal that two-year institutions are more likely to place a student in a preparatory course than a matched four-year student. This disproves the belief that the reason students in two-year schools are more likely to take preparatory coursework than their peers is due to weaker academic backgrounds.

The researchers of this study (Attewell, Lavin & Domina, 2006) also evaluated the effects of taking preparatory-level courses on five markers of student progress, including degree completion and time to degree. Without the propensity score, it is true that students who enroll in a preparatory course are more likely to earn only ten or fewer credits. However, with the logistic regression model, accounting for students' academic background and demographics, they actually find the opposite - that students with similar academic preparation and/or with similar backgrounds are less likely to only complete ten or fewer credits when they enroll in preparatory courses. With the controls in place, they found that students are no more likely to leave college for a year or more as a correlation with enrolling in remediation, and that there is no statistically

significant difference when controlling for students' backgrounds and academic histories on likelihood to graduate; in other words, when controlling for other student variables, students who take preparatory courses are no more or less likely to graduate than their peers who require no remediation. This study addresses a huge gap in the dialogue about remediation, by comparing students with similar characteristics, rather than just looking broadly at those who do and do not need remediation. An additional extension for future research can investigate whether first semester or first year academic success is a statistically significant variable in the indicators set forth here for student progress and success.

#### *Positive Effects of Preparatory Courses Placement*

Also of note is that some earlier studies on preparatory programs found that they had mostly positive effects on retention. Hoyt (1999) conducted a study at an urban community college to try to better understand the relationship between preparatory education and retention. He used logistic regression to understand which variables were related to attrition; however, some critical variables were omitted from the regression model such as race, and previous academic experience (highest level of math taken in high school, high school GPA, etc.). He found that high rates of need for remediation had a negative correlation with student retention, and that students who needed more remediation in their first semester had lower first semester GPAs. However, since he did not factor in other variables including student academic history, he was not able to mitigate for the differences within and between student groups. However, his model did find that the greatest indicator of persistence is tied to first-semester academic success. Students in the study with an A or B first semester GPA had higher retention rates than those with a C average, who were at a significantly higher risk of dropping out. If first semester GPA is significantly correlated with retention, then further investigation should be conducted into grading practices in preparatory-level education, as well as institutional differences in how preparatory course credits count towards degree completion and/or transfer rates.

## Conclusion

Previous research has shown that certain student characteristics can predict which students will require preparatory-level coursework, and that these courses are correlated with lower retention and graduation rates, as well as longer times to degree completion. Students enter higher education with varying levels of academic preparation and differences in expectations of their upcoming college experiences. Despite the widely available research on preparatory education, there are several significant gaps in the literature:

- The body of literature on remedial education is incomplete, and often demonstrates inconsistencies across studies, which means we still do not know what we need to know with certainty to make informed decisions about remedial education programming.
- Much of the literature focuses on two-year students, which makes sense since they are much more likely to need remediation; however, we cannot ignore how placement practices and preparatory programs impact retention at four-year schools.
- Also missing from the literature is a strong focus on how student variables of students who place into preparatory-level courses interact with measures of academic success. For example, we know that needing preparatory courses is negatively correlated with retention, but less certain is what happens when we control for variables such as student demographics, academic history, and environmental factors (how many hours they are employed while enrolled in classes, for example). Also less certain are analyses of the impact of placement into preparatory-level courses on student variables within the group of students who need remediation. In other words, much of the existing literature compares students who do place into preparatory level courses against those who do not. Instead, deeper analysis needs to be conducted to determine what variables correlate with academic success within the group of students who need the remediation.
- Also nearly entirely missing from the existing body of literature is investigation into how student expectations of their upcoming college experience and plans, specifically among this vulnerable population, impacts academic success. Questions to answer include

whether students' expectations of their upcoming college experience is correlated with successful completion of their courses, their overall grade point averages, and their first-to-second semester and first-to-second year retention.

## CHAPTER 3

### METHODOLOGY

This study explored which students at Mid-Atlantic University take preparatory-level courses, and whether those placement trends align with the existing literature on placement into remedial programs in higher education. This analysis used various student characteristics to determine whether any demographic differences exist in placement compared to the overall student population. It then measured academic success of the students who placed into preparatory-level courses. Academic success was measured using completion statistics of the preparatory courses, grade in the sequential college-level course after taking a preparatory-level course in the subject matter, retention, and graduation status. The final part of the study investigated whether there are any trends in responses on the New Student Questionnaire (NSQ) regarding their academic and social expectations during their time enrolled at the institution amongst students who take preparatory courses, and whether there are differences compared to non-preparatory-level students. The overall goal of the analyses was to determine whether it is possible to predict whether some students are better served than others by the preparatory-level courses.

#### Study Setting

Mid-Atlantic University is a large, urban public institution in the Northeastern United States. The university, located in one of the largest cities in the United States, commits to the diversity of its learners and scholars in its mission statement:

*“Mid-Atlantic University educates a vibrant student body and creates new knowledge through innovative teaching, research and other creative endeavors. Our urban setting provides transformative opportunities for engaged scholarship, experiential learning, and discovery of self, others and the world. We open our doors to a diverse community of learners and scholars who strive to make the possible real.”*

This institution was selected due to its prioritization of student access and equity. Helping students achieve and earn valuable degrees is part of the institution’s history and mission and is something this particular institution is trying to do well.

In 2015, Mid-Atlantic University created an opportunity for students to apply to the university without requiring SAT or ACT scores for admission. The institution allowed applicants to replace these standardized tests with essays intended to measure to student's motivation to succeed in college. Being a test-optional institution can better support the holistic evaluation of admission applications. However, students have the option to still submit their SAT or ACT scores, whether or not they apply as test-optional. Additional admissions criteria include a self-reported high school transcript along with the Common Application.

#### Understanding Placement at Mid-Atlantic University

Incoming students to Mid-Atlantic University receive a placement for English, math, and foreign languages in one of the following ways. Some incoming students will be automatically placed into math and English courses using their student data, including but not limited to: high school grade point average, SAT, ACT, or AP scores if available. Others need to take the placement assessments. Assessments are taken after students have been admitted to the University and have paid the tuition deposit. Students who receive more than one course placement, for example an automatic placement and an assessment, may take the highest course into which they place.

Some students at Mid-Atlantic University are admitted under the institution's Test Optional program. The test-optional application path is a holistic approach to admission to provide more opportunities for students to access college. This allows students to be admitted to the University without submitting standardized test scores such as the SAT or ACT, but if a student does not submit these scores, then they may be required to take a placement assessment if the institution does not have enough information to automatically place a student. Students who are admitted under the Test Optional program and who have submitted SAT or ACT scores are automatically placed and have the option to take a placement assessment. Additionally, students in the STEM or STEM-related majors may be required to take placement assessments. A list of the STEM majors is contained in Appendix A.

Based on these policies which serve to evaluate different levels of academic preparation, students are placed into appropriate math and English courses. For English, students may place into either ENG 0701/ENG 0711, or ENG 0802/ENG 0812. Math placement varies depending on the student's choice of major at the point of admission. See Table 3.1 and Table 3.2.

**Table 3.1***Math Course Options*

Course Name	Description
Pre-College Math Course	Developmental math course; Part of the math course sequence
College Algebra	Part of the math course sequence
Pre-Calculus	Part of the math course sequence
Calculus	Part of the math course sequence
General Education- Quantitative Literacy	General education course
Statistics Levels 1 and 2	Primarily taken by students in the business school

*Note.* Pre-College Math Course, College Algebra, Pre-Calculus, and Calculus are a part of the math course sequence.

**Table 3.2***Math Auto-placement Chart*

Math SAT & ACT Scores			
	SAT Scores	ACT Scores	Course Placement
Highest SAT Math/ACT Math score is less than or equal to	490	17	Pre-College Math Course
Highest SAT Math/ACT Math score is between	500 and 550	18 and 22	A Math Assessment is required.
Highest SAT Math/ACT Math score is equal to or greater than	560	23	General Education – Quantitative Literacy, Statistics Level 1
Highest SAT Math/ACT Math score is equal to or greater than	650	28	Statistics Level 2
Highest SAT Math/ACT Math score is equal to or greater than	700	31	Calculus

*Note.* Students with a SAT/ACT score between 500 and 550/18 and 22 are required to take a math placement.

At Mid-Atlantic University, courses follow a four-digit numbering convention, ranging from 0700 through 9999. Courses numbered 0700 through 0799 are reserved for preparatory courses, specifically undergraduate, first-year math and English courses. Courses numbered 0800 through 0899 (or 0900 through 0999 for Honors students) are reserved for undergraduate General Education course requirements. A unique element to the University's preparatory courses is that the credits count towards degree credits and grade point average and may take the place of electives in programs that have room for elective credit. At many other institutions, such preparatory courses do not count as college credit, and are not transferable. In addition, in many cases these courses do not count towards graduation credit requirements. Prior research has found that nearly 30 percent of all students attending a four-year institution are required to take noncredit remedial courses to develop basic skills in math and reading (Carey, 2010). This demonstrates one way that Mid-Atlantic is trying to support all of its learners and not disadvantage students with any academic deficiencies even further.

### Study Population

The current study used data from the incoming cohorts of students from the fall 2015 semester through the fall 2018 semesters. These cohorts were selected so that at minimum, analysis of four-year graduation rates could be conducted. Participants in the current study included all undergraduate enrollees from 2015 through 2018, consisting of 20,084 total participants. Due to the differences in preparatory-level course requirements across institutions and institution types, transfer students were not included in the analysis. Since spring admission cohorts are much smaller than fall admission cohorts and are made up of a significantly larger proportion of international students, spring admission cohorts were not included in the analysis. Therefore, this study focused on traditional first-time, first-year students in the above admission cohorts. Descriptive data on the students are presented in Chapter 4.

Data for this study were provided by the Office of Institutional Research and Assessment at the university studied. The dataset included student demographic data for each entering student in each of the four cohorts, along with student academic history data, and responses on the New Student Questionnaire (NSQ).

The NSQ (Appendix B) is a survey that is administered to all entering freshman and transfer students as part of the new student registration and orientation process. All entering students must complete the NSQ. The participating institution uses the NSQ to monitor trends in student characteristics, attitudes, intentions, and aspirations. Data from the NSQ may also be used to improve retention, academic programming, and campus climate. The NSQ includes 82-83 questions about student academic, financial, and demographic background. The survey also asks students about the importance of various academic and social areas and about their agreement or likelihood to engage in each survey item. Items on the NSQ relevant to the current study include where the student plans to reside during their first year at the institution and how many hours the student plans to work for money per week during the school year. Additionally, items related to what the student plans to do while they are at the institution were also used in the analysis, such as whether they plan to change their major field of study, whether they plan to join a social organization or club, and whether they plan to get tutoring help in specific courses. Between fall 2015 and fall 2018, there are three iterations of the NSQ with minor differences in each. For the purpose of the study, items have been aligned across the three versions of the NSQ for analysis.

### Research Model

The research and analyses focused on student academic success measured by preparatory-level course completion, sequential college-level course grade, retention, and graduation rates. The research was divided into three main areas: placement into preparatory-level math and English courses, the differences in academic success by demographics or other

student characteristics amongst the students who take preparatory-level courses, and whether there are any trends in responses to certain items on the NSQ regarding their academic and social expectations during their time enrolled at the institution amongst the students who take preparatory-level courses. For the latter two research questions, analyses were conducted to compare preparatory-level students to non-preparatory students to determine whether any additional differences exist between the two groups.

### Variables

The study's dependent variables were retention, grade and completion status of any precollege-level courses taken, grade in the sequential college-level course after taking a preparatory-level course in the same subject, and graduation rates. Retention was measured with first-to-second semester retention (fall year one to spring year one) and first-to-second-year retention (fall year one to fall year two).

Four- and six-year graduation rates include all students who completed their bachelor's degree in four or six years or less, correspondingly. Six-year graduation rates are unavailable for the fall 2017 and fall 2018 cohorts in the analysis. Students who graduate by the end of the summer semester are counted as graduating in that academic year and added to the number of spring graduates when calculating graduation rates.

The study's independent variables included a suite of student characteristics, demographics, and response data on the NSQ. Specifically, this includes: race, gender, first generation status, English as a second language status, socio-economic status, academic major, Test Optional program status, high school GPA, and SAT or ACT scores when available. From the NSQ, the analyses used items related to student agreement or likelihood to engage in certain academic and social areas while enrolled at the institution, such as how many hours the student

plans to work for money per week, how many hours the student plans to study per week, and how likely the student is to join a social organization or club.

There is an issue that occurred in analyzing the data that was not anticipated and that needs to be presented as it has a possible effect on the results. The data set that was obtained from the Office of Institutional Research contained a variable for each student that indicated which math and English course the screening process indicated that the student needed to take. As mentioned above, for both math and English the preparatory course has a section number of either 701 or 711. It was originally assumed that this variable would be used to define the students in the group required to take preparatory courses. However, when the actual course enrollments were investigated the number of students in these courses did not correspond to the number designated by the screening process. In addition, it was discovered that students do not always take the preparatory course in their first semester (fall of the year of their admission cohort) but rather wait and take the course either the following spring or, in some cases, several semesters after their initial semester. The assumption made about preparatory courses is that they are necessary to “prepare” students for higher level math or English courses and, as such, should be taken at the beginning of their academic careers. Given these considerations, it was decided to define students in the preparatory group as any student who took math 701/702 or English 701/711 in the fall of their first year. Students who took either of these courses in later semesters are not included in the preparatory group.

## CHAPTER 4

### RESULTS

#### Introduction

Chapter 4 will be presented in two sections. Section I will present descriptive data on the sample used for the analyses. Section II will present the results for each of the three research questions. A summary of the results will be presented in Chapter 5. Before any of the results are presented, several issues need to be discussed as a context for the data analysis.

The first and most critical issue concerns the definition of which students are included in the group that takes preparatory math or English. As described in Chapter 3, this group consists of students who took math 701/702 or English 701/711 in the fall of their first year<sup>7</sup>.

The next issue concerns the sample size used for the analyses. The data set contains all students admitted to the institution who enrolled in their first semester across a four-year span (fall 2015 through fall 2018). This resulted in a sample of more than 20,000 students. While this sample provides an excellent longitudinal view of the effect of taking preparatory courses, a sample size this large has enormous power. While this is beneficial from several perspectives it also means that almost any inferential analysis that is conducted will produce statistically significant results. Consequently, all analyses that will be reported will include the appropriate effect size metric. Since a large number of analyses were conducted on the data, emphasis will be placed on those where the effect size is considered at least medium (Cohen, 1968).

A third issue involves the large number of analyses that were conducted. As described in Chapter 3, the data set involves students who were required to take preparatory courses in both math and English. As originally conceived, all of the analyses involved three series: students who took preparatory math; students who took preparatory English; and students who took both math and English. All of these analyses will be included in the dissertation. However, the number of

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<sup>7</sup> Additional analyses were conducted to include students who took either of these courses in the spring of their first year at Mid-Atlantic University. There were no distinct differences in the results.

analyses required to completely answer the research questions was very large. It became evident that the essential pattern of the results for math, English, and both together, with a few exceptions, was the same. Therefore, to keep Chapter 4 at a reasonable length, the major emphasis will be on the third set of analyses where the sample is divided into three groups: students who did not take any preparatory course; students who took either math or English; and students who took both. The separate analyses for math and English is presented in Appendix C.

A final issue involves the way the analyses were approached. Since the study is exploratory, a decision was made to focus on univariate analyses where individual variables are investigated singly. As mentioned above, this has the effect of producing a large number of statistical tests, but it was felt that this approach was more appropriate for this research. Some multivariate analyses will be presented where this seemed appropriate.

Analyses will be presented throughout this section in response to each research question. A summary of the analyses for each research question as well as an overall summary of findings on the research topic will be presented in Chapter 5.

### Sample Description

The data analyzed for the current study included demographic and academic information, as well as other responses collected on the New Student Questionnaire as part of the admission process. Table 4.1 includes the number of students in each of the admission cohorts used for the research.

**Table 4.1**

*Admission Cohort Sample Sizes*

	Sample Size
Fall 2015	4,851
Fall 2016	5122
Fall 2017	5113
Fall 2018	4,998
Total	20,084

As mentioned in Chapter 3 and indicated in Table 4.1, only the data for fall admission cohorts were used. This decision was made because certain variables (for example, four-year and six-year graduation) are appropriate only for students who are in the fall admission cohorts since most programs are based on a four-year matrix starting with the first fall semester. The numbers in each cohort by gender and race are presented in Table 4.2 and 4.3.

**Table 4.2**

*Gender Distribution by Admission Cohort*

	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Total
Female	2,661	2,833	2,858	2,894	11,246
Male	2,190	2,289	2,255	2,101	8,835

**Table 4.3**

*Race Distribution by Admission Cohort*

	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Total
African American	604	526	609	597	2,336
American Indian	6	6	8	1	21
Asian	565	627	670	629	2,491
Hispanic	332	295	384	440	1,450
International	265	309	208	177	959
Multiple	167	155	195	205	722
Pacific Islander	3	6	2	4	15
Unknown	188	101	67	59	415
White	2,721	3,097	2,970	2,886	11,674

As shown in Tables 4.2 and 4.3, Mid-Atlantic University has a somewhat higher percentage of females than males. The percentage of the students who are white is approximately 58%.

Table 4.4 presents the number of students in each cohort who enrolled in a math or an English preparatory course in the fall of their first year. In this table math 701 and 702 are

combined, as are English 701 and 711. Table 4.5 presents the number of students who had to take none, one or two preparatory courses.

**Table 4.4**

*Number of Students in Each Cohort Taking a Preparatory Math or English Course*

	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Total
Math	451	539	594	668	2,252
English	950	828	716	649	3,143

**Table 4.5**

*Number of Students each Semester Taking None, One or Two Preparatory Courses*

	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Total
None	3,640	4,058	4,086	3,953	15,737
One	1,044	909	896	911	3,760
Two	167	155	131	134	587

As shown in Tables 4.4 and 4.5, more students took preparatory English courses than math courses. Overall, 21.6% of incoming students must take at least one preparatory course.

#### Analyses Relevant to the Three Research Questions

##### *Research Question #1: Which students take preparatory courses?*

The first research question was designed to understand placement trends at Mid-Atlantic University using the variables described below. The aim was to identify any differences between students who take preparatory courses and those who do not. These analyses also help determine whether placement trends into preparatory courses at a large, urban, diverse institution align with placement trends in the literature.

To answer Research Question # 1, a wide variety of variables were analyzed. These included demographic variables, background academic variables, and variables derived from the New Student Questionnaire. To simplify the presentation of the results, the tables analyzing

nominal variables will contain only percentages. For all the analyses using chi square, the effect size metric reported is Cramer's V. Cramer's V can be interpreted using these benchmarks.

Estimated values	Interpretation of association
0.00-0.10	Negligible
0.10-0.20	Weak
0.20-0.40	Moderate
0.40-0.60	Relatively Strong
0.60-0.80	Strong
0.80-1.00	Very Strong

### *Demographic Variables*

The data on gender and race are presented in Tables 4.6 and 4.7. To simplify the analysis for race, only the four major racial groups were included.

**Table 4.6**

#### *Percentage of Preparatory Courses by Gender*

	None	One	Two	Chi Square	Significance	Cramer's V
Male	77.0%	19.4%	3.2%	6.47	.039	.041
Female	77.6%	20.0%	2.9%			

**Table 4.7**

#### *Percentage of Preparatory Courses by Race*

	None	One	Two	Chi Square	Significance	Cramer's V
African American	64.9%	27.4%	7.7%	426.25	.000	.217
Asian	80.9%	16.7%	2.4%			
Hispanic	72.1%	23.0%	4.9%			
White	81.3%	16.4%	2.3%			

As shown above, more females take preparatory courses than males, although the effect is negligible. This is one case where there is a small difference between math and English: a

higher percentage of females had to take preparatory math while a higher percentage of males had to take preparatory English (see Appendix C). In terms of race, it is evident that both African American and Hispanic students take preparatory courses more often than whites or Asians. In this case the effect is moderate.

Data on English as a Second Language (ESL) status and whether the student is a first-generation student are presented below. ESL status is derived from the question on the New Student Questionnaire asking if English is the language spoken at home. First Generation is defined as a student where neither the mother nor the father attended college.

**Table 4.8**

*Percentage of Preparatory Courses by ESL Status*

	None	One	Two	Chi Square	Significance	Cramer's V
ESL	67.0%	28.7%	4.3%	179.51	.000	.094
Non-ESL	78.9%	18.10%	3.0%			

**Table 4.9**

*Percentage of Preparatory Courses by First Generation Status*

	None	One	Two	Chi Square	Significance	Cramer's V
First Gen	68.2%	26.1%	5.7%	202.55	.000	.229
Non-First Gen	79.1%	18.2%	2.7%			

The data show that students who self-identify as ESL take more preparatory courses although the effect is weak. The results for first generation show that students whose parents did not attend college take significantly more preparatory courses. In this case, the effect is moderate. It should be noted that the definition of first generation used in this research is not the same definition used by Mid-Atlantic University. Mid-Atlantic University defines first generation as a student where neither the mother nor the father obtained a bachelor's degree. There is considerable discussion in the literature about the definition of first generation (Toukoushin,

Stollen & Slaton, 2018). The definition used in this research is the one that is most often employed.

Data on the student's socio-economic status (SES) are presented in Table 4.10. SES is operationalized by combining a student's father's education, mother's education, and family income. These variables were factor analyzed with the resulting factor score converted to a T score (mean of 50 with a standard deviation of 10). In this case the data were analyzed by ANOVA with the effect size reported as partial eta squared. Partial eta squared can be interpreted using these benchmarks:

.01	Small
.06	Medium
.14	Large

**Table 4.10**

*Mean SES by Number of Preparatory Courses*

	Mean	F	Sig.	Partial Eta Squared
No Preparatory Courses	50.83			
One Preparatory Course	47.52	268.835	.000	.026
Two Preparatory Courses	44.94			

As shown in Table 4.10, students with lower SES are more likely to take at least one preparatory course. The effect, however, is small.

#### *Academic Preparation Variables*

Data on the students' high school GPA and SAT scores are presented in Table 4.11

**Table 4.11***Academic Preparation Variables by Number of Preparatory Courses*

	No Preparatory Courses	One Preparatory Course	Two Preparatory Courses	Sig.	Partial Eta Squared
HS GPA	3.59	3.47	3.35	.000	.028
SAT ENG	627.55	559.56	519.70	.000	.167
SAT MATH	617.57	562.59	508.93	.000	.106

As shown in Table 4.11 there are significant differences on all three variables with the differences in SAT scores being large. This difference is reflected in the students' response to the NSQ question: "In general, how well do you feel that your high school prepared you to do college work?" Responses to this question are contained in Table 4.12

**Table 4.12***Students' Perception of How Well their High School Prepared them for College Work*

	No Preparatory Courses	One Preparatory Course	Two Preparatory Courses	Chi Square	Sig.	Cramer's V
Very Well	27.2%	19.0%	16.1%			
Fairly Well	51.5%	51.9%	50.6%			
Uncertain	18.3%	23.6%	24.6%	272.441	.000	.18
Poorly	2.5%	4.5%	6.5%			
Very Poorly	.4%	1.0%	2.2%			

As shown in Table 4.12, students who take preparatory courses perceive that their high school did not prepare them for college to a greater extent than students who did not take preparatory courses.

*Research Question # 2: Is there a difference in academic success by student characteristics and other student variables amongst those who take preparatory-level courses?*

The second research question focuses on students who take preparatory courses. The aim of Research Question #2 is to understand whether taking preparatory-level courses may benefit some students more than others, measured by academic variables such as retention, grade in the following college-level course in the subject-matter sequence, and persistence to graduation. Even though it can be assumed that these students were entering Mid-Atlantic University with comparable academic skills since they placed into the same preparatory course on the onset, it was predicted that there would be differences in academic success by student characteristics within the group of students who placed into preparatory courses.

Although the focus of the analyses in this section of Chapter 4 is on those students who are required to take preparatory courses, to make this analysis more understandable, the analyses will also include data on students who were not required to take either preparatory math or English. To continue with the analysis presented above, the students who take preparatory courses were analyzed by comparing those who take one or two courses. The demographic variables analyzed were race, gender, ESL, First Generation, SES, Test Optional status, and academic major. Since the focus of this set of analyses is on students who take preparatory courses, the difference between those students who were required to take no preparatory courses versus those who did is not the major interest. It should be noted that in all of the analyses presented in this section of the chapter, there is always a significant difference between those who did not have to take preparatory courses and those who were required to take them. The analyses presented above demonstrate these differences. Since this is not the primary focus of these analyses, the specific statistics (i.e., F, significance level, and partial eta squared) will not be reported. In all of the analyses that are presented, a major focus is on the interaction since a significant interaction indicates that there are meaningful differences between the groups in the pattern of the data. In a few cases, data will be reported where the interaction is not significant since these results are relevant to other aspects of this research.

*First Year Fall to Spring and First Year to Second Year Retention*

As described in Chapter 3, retention is defined in two ways: fall to spring of the student's admission year, and first year to second year.

*Gender*

There were no differences in either form of retention related to a student's gender.

*Race*

There was not a significant effect for race on fall to spring retention. The data for first to second year retention are presented in Table 4.13.

**Table 4.13**

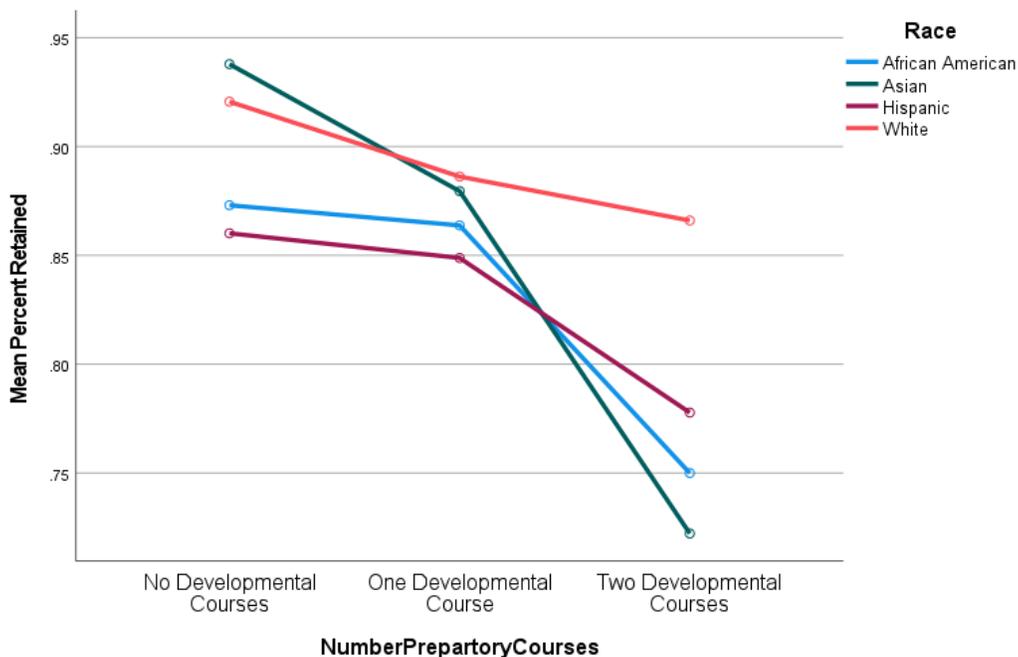
*Percent of Students Retained from the First to the Second Year by Race*

	No Developmental Courses	One Developmental Course	Two Developmental Courses
African American	87.30%	86.38%	75.00%
Asian	93.79%	87.95%	72.22%
Hispanic	86.02%	84.88%	77.78%
White	92.06%	88.62%	86.60%

The ANOVA conducted on the data in Table 4.13 produced a significant main effect for race ( $F = 29.294$ ,  $p = .001$ , partial eta squared  $d = .017$  and a significant interaction ( $F = 12.575$ ,  $p = .017$ , partial eta squared = .021). A plot of the interaction is presented in Figure 4.1.

**Figure 4.1**

*Percent Retained from First to Second Year by Race*



As shown in Figure 4.1, white students have the highest rate of first to second year retention and demonstrate only minimal differences across the three levels of preparatory courses. The ethnic group with the most pronounced difference are Asian students. As shown in Figure 4.1, taking one preparatory course decreases the rate of retention, but taking two has the largest impact for this group.

#### *English as a Second Language (ESL) Status*

There were no differences on either form of retention related to a student's ESL status.

#### *First Generation*

The data for first to second semester retention of first-generation students are presented in Table 4.14.

**Table 4.14***Percent of Students Retained from the Fall to Spring by First Generation*

	No Developmental Courses	One Developmental Course	Two Developmental Courses
First Generation	95.08%	92.96%	88.06%
Not First Generation	97.27%	95.62%	91.62%

The ANOVA produced a significant effect for First Generation ( $F = 16.696$ ,  $p = .000$ , partial eta squared = .001). In this case the interaction was not significant, but these data are presented to contrast with the next analysis. As shown in Table 4.14, first generation students have lower fall to spring retention in all three groups. The means for first to second year retention are presented in Table 4.15.

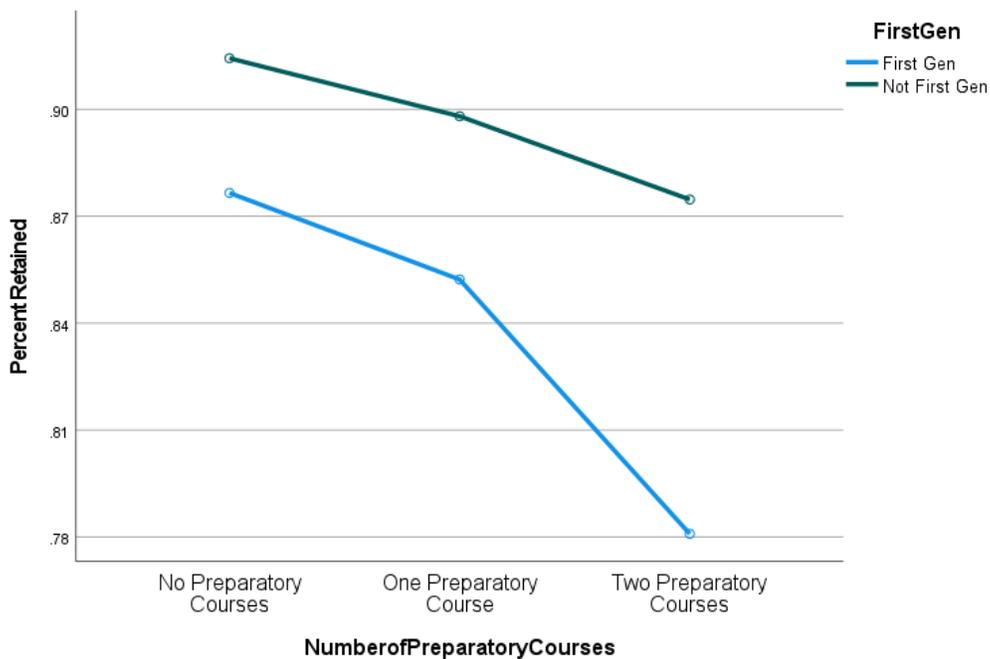
**Table 4.15***Percent of Students Retained from the First to Second Year by First Generation*

	No Developmental Courses	One Developmental Course	Two Developmental Courses
First Generation	87.66%	85.23%	78.09%
Not First Generation	91.43%	89.91%	87.47%

The ANOVA produced a significant main effect for first generation ( $F = 10.377$ ,  $p = .000$ , partial eta squared = .003) and a significant interaction ( $F = 3.277$ ,  $p = .038$ , partial eta squared = .001). A plot of the interaction is presented in Figure 4.2.

**Figure 4.2**

*Percent of Students Retained from the First to the Second Year by First Generation*



As shown in Figure 4.2, taking one preparatory course has only a marginal effect on non-first generation students, but a large effect for first generation students. Taking two preparatory courses increases this difference.

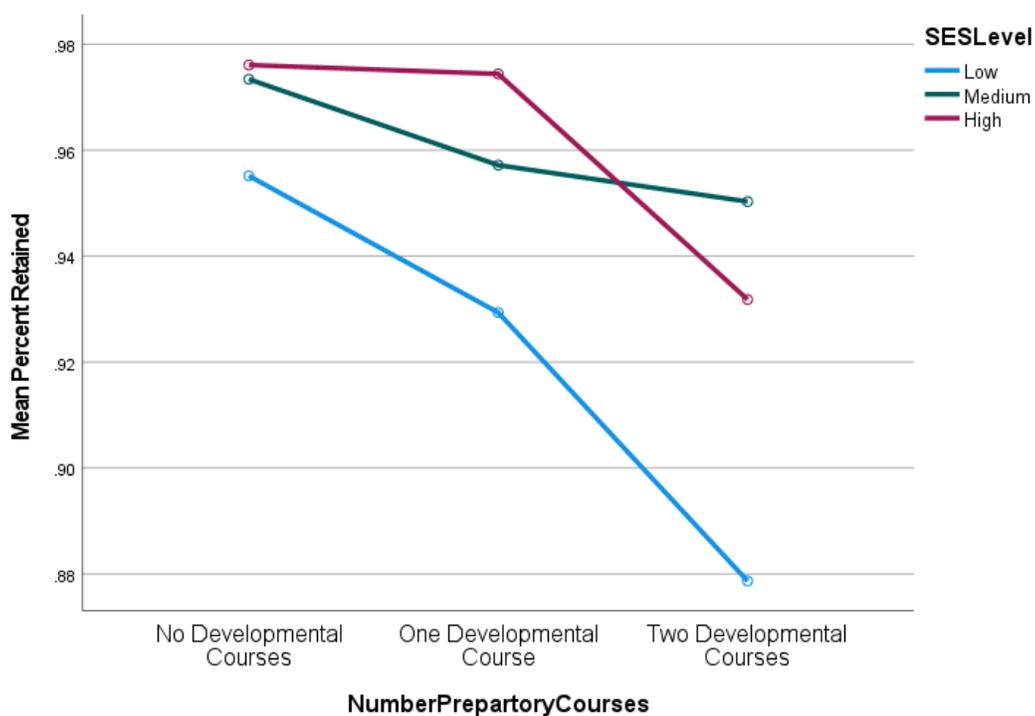
#### *Socioeconomic Status*

To maintain consistency with the previous analyses, socio-economic status (SES) was divided into high, medium, and low. The mean retention from fall to spring for these groups is presented in Table 4.16

**Table 4.16***Percent of Students Retained from Fall to Spring by SES Level*

	No Developmental Courses	One Developmental Course	Two Developmental Courses
High SES	97.61%	97.44%	93.18%
Medium SES	97.34%	95.72%	95.03%
Low SES	95.51%	92.94%	87.87%

There was a significant effect for SES ( $F = 22.481$ ,  $p = .001$ , partial eta squared = .002) and a significant interaction ( $F = 3.388$ ,  $p = .004$ , partial eta squared = .002). A plot of the interaction is presented in Figure 4.3.

**Figure 4.3***Mean Retention from Fall to Spring as a Function of SES*

As shown in Figure 4.3, taking one preparatory course has no effect on students with high SES, and only a minimum effect for students with medium SES. The effect is larger for

students with low levels of SES. The effect of taking two preparatory courses is even more pronounced. The analysis for first to second year retention was essentially the same.

### *Test Optional*

The mean retention from fall to spring for Test Optional students is presented in Table 4.17.

**Table 4.17**

*Percent of Students Retained from the Fall to Spring by Test Optional Status*

	No Developmental Courses	One Developmental Course	Two Developmental Courses
Temple Option	95.36%	94.57%	89.15%
Not Temple Option	97.18%	95.39%	93.36%

The ANOVA produced a significant main effect for Test Optional ( $F = 14.365$ ,  $p = .001$ , partial eta squared = .001). The interaction was not significant but, as above, these data are included to present a more complete description of the sample.

### *Academic Major*

The sample was divided into those programs that require College Algebra and those that don't. There were no significant effects.

### *Four-Year and Six-Year Graduation*

The percent of students in the three groups that graduated in four or six years are presented in Table 4.18. Only students who were retained throughout their entire time were included in this analysis.

**Table 4.18***Percent of Students Graduating in Four or Six Years by Number of Preparatory Courses*

	Percent Graduated in Four Years	Percent Graduated in Six Years
No Developmental Courses	92.53%	93.96%
One Developmental Course	87.77%	91.58%
Two Developmental Courses	76.32%	86.36%

The ANOVA's conducted on the data in Table 4.18 were significant at the .01 level with small effects sizes (Four-Year Graduation:  $F = 19.276$ ,  $p = .000$ , partial eta squared = .0215; Six Year Graduation:  $F = 7.79$ ,  $p = .000$ , partial eta squared = .004). Neither interaction was significant.

*Gender*

Females graduated more often in four years and six years than males, but the interaction was not significant.

*Race*

Table 4.19 provides data on four-year graduation rates by race.

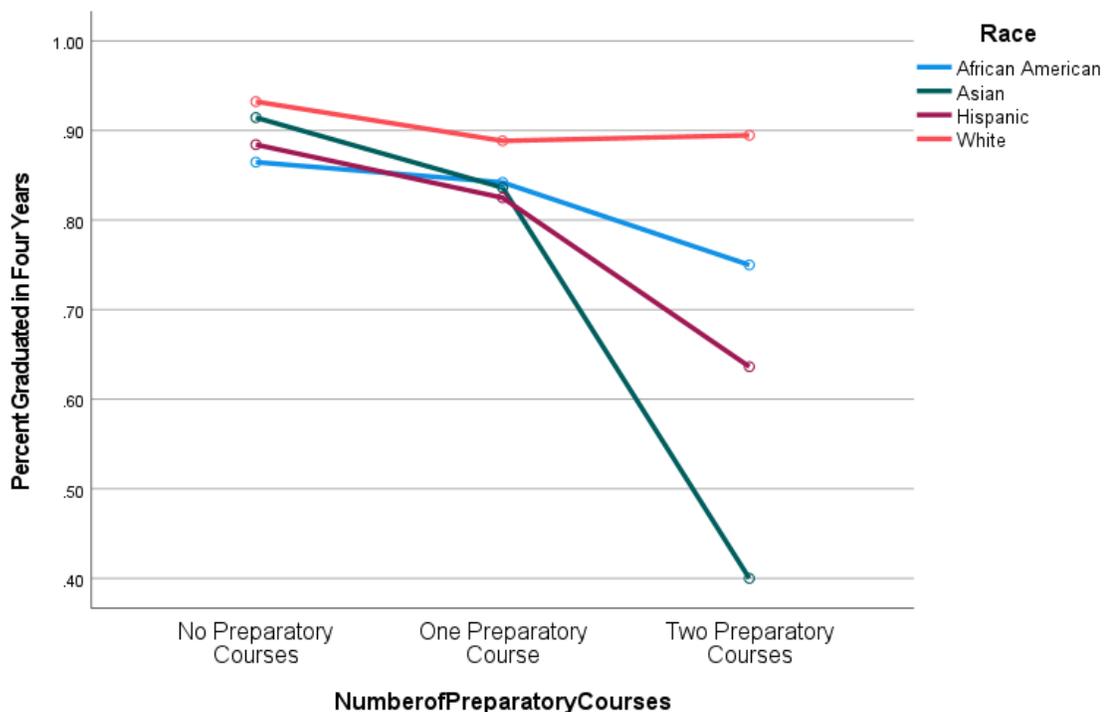
**Table 4.19***Percent of Students That Graduated in Four Years by Race*

	No Developmental Courses	One Developmental Course	Two Developmental Courses
African American	86.47%	84.21%	75.00%
Asian	91.45%	83.64%	40.00%
Hispanic	88.43%	82.50%	63.64%
White	93.23%	88.85%	89.47%

The ANOVA for these data produced a significant main effect for Race ( $F = 8.217$ ,  $p = .000$ , partial eta squared = .031) and a significant interaction ( $F = 3.488$ ,  $p = .003$ , partial eta squared = .021). A plot of the interaction is presented in Figure 4.4.

**Figure 4.4**

*Four-year Graduation Rate by Race*



As shown above, there is no effect of taking preparatory course on whites in terms of graduating in four years. The effect of taking two preparatory course is most notable for Asian students. The pattern for six-year graduation rate was identical.

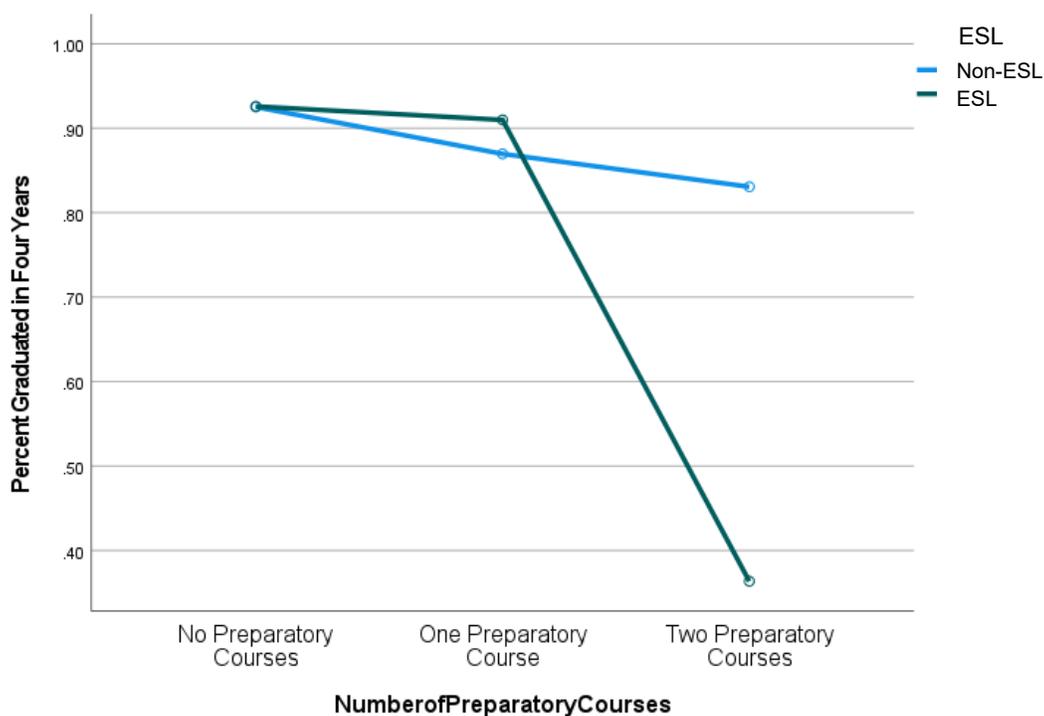
#### *English as a Second Language (ESL)*

The mean four-year graduation rates by ESL status are presented in Table 4.20.

**Table 4.20***Four-year Graduation Rate by ESL Status*

	No Developmental Courses	One Developmental Course	Two Developmental Courses
ESL	92.59%	90.99%	36.36%
Non-ESL	92.52%	86.97%	83.08

The effect of ESL Status was significant ( $F = 13.902$ ,  $p = .000$ , partial eta squared = .024) and a significant interaction ( $F = 3.16$ ,  $p = .031$ , partial eta squared = .007). A plot of the interaction is presented in Figure 4.5.

**Figure 4.5***Four-year Graduation Rate by ESL Status*

As shown in Figure 4.5, ESL status has no effect for those who take one preparatory course. The effect for those who take two, however, is pronounced. The same pattern was found for six-year graduation.

#### *First Generation*

There was a significant effect for first generation ( $F = 32.63$ ,  $p = .000$ , partial eta squared = .002) but the interaction was not significant. The same pattern was found for six-year graduation.

#### *Socioeconomic Status*

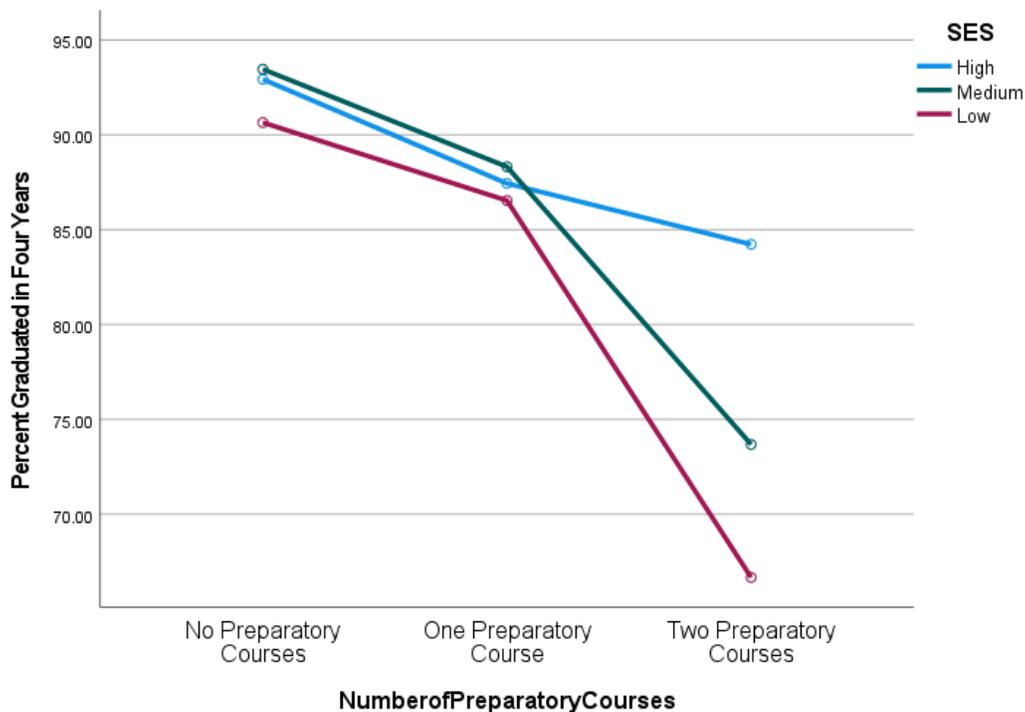
The means for four-year graduation by Socioeconomic Status (SES) level are presented in Table 4.21.

**Table 4.21**

#### *Four-year Graduation Rate by SES*

	No Developmental Courses	One Developmental Course	Two Developmental Courses
High SES	92.93%	87.41%	94.12%
Medium SES	93.46%	88.32%	73.68%
Low SES	90.65%	86.54%	66.67%

The effect of SES was significant ( $F = 17.45$ ,  $p = .000$ , partial eta squared = .019) as well as the interaction ( $F = 2.32$ ,  $p = .038$ , partial eta squared = .004). A graph of the interaction is presented in Figure 4.6.

**Figure 4.6***Four-year graduation by SES Level*

As shown in Figure 4.6, there is very little effect on four-year graduation for students who take one preparatory course. The effect is clear for those who take two courses.

#### *Test Optional*

Test Optional students graduated in four years at a significantly lower level than non-Test optional students. However, the interaction was not significant.

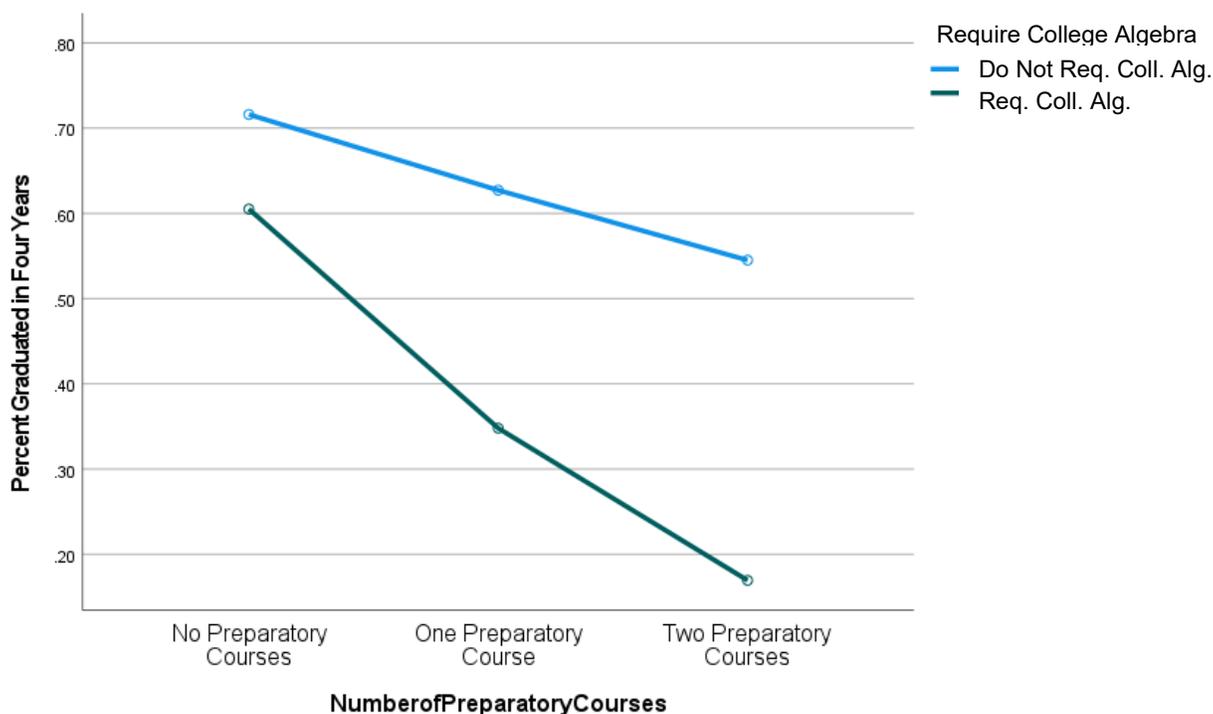
#### *Academic Major*

The four-year graduation rate of majors that require College Algebra and those that don't are presented in Table 4.22.

**Table 4.22***Four-year Graduation Rate by Program Requiring College Algebra*

	No Developmental Courses	One Developmental Course	Two Developmental Courses
Require College Algebra	60.52%	34.80%	16.95%
Do not Require College Algebra	71.61%	62.73%	54.52%

The ANOVA was significant with a medium effect size ( $F = 36.457$ ,  $p = .000$ , partial eta squared = .015); interaction ( $F = 31.45$ ,  $p = .000$ ., partial eta squared = .031). A graph of the interaction is presented in Figure 4.7.

**Figure 4.7***Four-year Graduation as a Function of Requiring College Algebra*

As shown above, students in programs requiring College Algebra graduate in four years at a much lower rate. It should be remembered in interpreting these results that many of these programs are in either the College of Science and Technology or the College of Engineering. Some of the programs within these colleges are designed so that graduation in four years is almost impossible if the student does not enter calculus-ready.

#### *Grades in Subsequent Math and English Courses*

The final variable that is being used to measure academic success is grades in the student's second level math and English course. To make this analysis possible the simplifying assumption was made to analyze the math and English grade that a student took in their second semester. As background information for this analysis, the grades that students obtained in the preparatory math or English course are presented in Tables 4.23 and 4.24.

**Table 4.23**

#### *Percent of Grades in Math 701/702*

Grade	% of Grades	% Above and Below C-
A	8.2%	
A-	6.1%	
B+	8.7%	
B	12.4%	72.7%
B-	9.3%	
C+	9.1%	
C	7.8%	
C-	11.1%	
D+	6.3%	
D	7.8%	
D-	1.3%	27.3%
F	9.6%	
W	2.2%	

**Table 4.24***Percent of Grades in English 701/711*

Grade	% of Grades	% Above and Below C-
A	11.9%	
A-	11.1%	
B+	19.6%	
B	22.3%	94.5%
B-	12.6%	
C+	7.2%	
C	5.4%	
C-	2.9%	
D+	.5%	
D	1.9%	
D-	.1%	5.9%
F	3.3%	
W	1.2%	

The grades in the math and English course taken after the preparatory course were analyzed. To keep this analysis brief, the most common second level course for students who took preparatory math or English was analyzed. The comparison group for those who did not take a preparatory course was the same course in the same semester. The only statistic computed was the percentage of each group that obtained a C- or above. These data for math and English are presented in Table 4.25.

**Table 4.25**

*Percentage of Each Group in the Second Level Math and English Course with a Grade of C- or Better*

	No Preparatory Course	One Preparatory Course	Two Preparatory Courses	Chi Square	p	Cramer's V
Math	78.8%	70.9%	47.4%	661.976	.000	.261
English	96.7%	89.6%	76.9%	334.198	.000	.186

As shown in Table 4.25, there is a significant difference between the groups. Students who take one and two preparatory courses are less likely to earn a C- or better in the subsequent math or English course. Consistent with previous results, the largest difference is for students who have taken both math and English preparatory courses.

#### *Binary Logistic Regressions*

As mentioned at the beginning of this chapter, the decision was made to focus on univariate analyses to answer the research questions. However, for the second research question, there were a wide array of results where each variable was considered by itself. As one way to summarize the results presented above, binary logistic regressions were run on the four dependent variables used to answer the second research question. The predictor variables were the ones that produced the largest effect sizes. Because these are not a major focus, only a brief summary of these analyses will be presented. Table 4.26 presents these results. The table lists the predictor variables in the order in which they entered the regression equation. If a variable was not significant, it is not included in the table.

**Table 4.26***Binary Logistic Regressions*

<i>Order of Predictor in Equation</i>	<i>Fall to Spring Retention</i>	<i>First to Second Year Retention</i>	<i>Four-Year Graduation</i>	<i>Six-Year Graduation</i>
1 <sup>st</sup>	SES	SES	HS GPA	HS GPA
2 <sup>nd</sup>	Race	Race	SES	SES
3 <sup>rd</sup>	SAT Math	HS GPA	Gender	Gender
4 <sup>th</sup>	ESL	SAT Math	Race	Race
5 <sup>th</sup>	HS GPA	Preparatory Courses	Preparatory Courses	Preparatory Courses
6 <sup>th</sup>		Gender	SAT Math	SAT Math
7 <sup>th</sup>		First Gen		First Gen
R2	.033	.122	.136	.063

As shown in Table 4.26, the primary predictors of these academic success variables are the ones typically cited in the literature, specifically High school GPA and SES. As also shown in the table, the requirement to take a preparatory course in either math or English does contribute to a lower level of academic success for three of the four variables used in this research.

*Research Question # 3: Is there a relationship between how students who place into preparatory-level courses respond to NSQ questions regarding their academic and social expectations during their time enrolled at the institution?*

The intent of the third research question was to determine whether any student self-reported academic or social expectations on the New Student Questionnaire (NSQ) differed among the students who took none, one or two preparatory courses. To answer the third research question, several of the questions from the NSQ were analyzed. The NSQ contains 82 or 83 questions (depending on the version) that ask in-coming freshman to self-report on several demographic variables as well as questions about why they came to Mid-Atlantic University and what they hope to do while they are at the University. A few of these questions were chosen for analysis that seemed most relevant to this research. These are presented below with a brief presentation on why the specific question from the NSQ was chosen.

### *Number of Courses Taken in High School*

Since the focus on this study is on students who must take preparatory math or English courses, it seemed interesting to see if these students differed in their high school preparation. The NSQ asks students how many years of various courses they had taken in high school. These data are presented in Table 4.27.

**Table 4.27**

#### *Percentage of Each Group Taking 4 Years of the Subject*

	No Preparatory Courses	One Preparatory Course	Two Preparatory Courses	Chi Square	p	Cramer's V
English	96.8%	94.6%	93.2%	41.01	.000	.085
Mathematics	90.3%	86.9%	83.7%	19.68	.012	.050
Foreign Language	31.6%	24.7%	20.0%	126.74	.000	.115
Natural Sciences	72.7%	69.6%	67.0%	43.67	.001	.067

As shown in Table 4.27 students who were required to take preparatory courses generally took fewer courses for all four years of high school in all subjects. This is most evident for foreign language.

### *Planned Residence*

It is well known that students who live on campus, especially for their freshman year, do somewhat better in college. Data on the planned residence of the students are presented in Table 4.28.

**Table 4.28***Percentage of Each Group by Planned Residence*

	No Preparatory Courses	One Preparatory Course	Two Preparatory Courses	Chi Square	p	Cramer's V
University Owned	81.5%	73.1%	66.2%	180.67	.000	.077
Parent's Home	11.6%	15.3%	21.7%			
Own Home	5.1%	8.4%	8.4%			
Other family members	.5%	1.1%	1.8%			
Other	1.2%	2.2%	2.0%			

As shown in Table 4.28, students who did not have to take any preparatory courses more typically planned to live in a university owned residence.

*Plan to Work*

The NSQ asks the students if they plan to work during their first year in school, and, if so, how many hours per week do they think they will be working. These data are presented in Table 4.29.

**Table 4.29***Percent of Each Group Planning to Work During Their First Year*

	No Preparatory Courses	One Preparatory Course	Two Preparatory Courses	Chi Square	p	Cramer's V
None	21.2%	20.3%	19.0%			
1 – 15 Hours	48.5%	44.2%	41.7%			
16 – 20 Hours	23.1%	25.2%	24.6%	80.65	.000	.052
21 – 25 Hours	5.3%	7.4%	9.4%			
More than 25 Hours	1.9%	3.0%	5.2%			

The data in Table 4.29 show an interesting pattern that nuances the issue of working while in school. As shown in the table, students who were not required to take any preparatory courses plan to work a small amount (1 – 15 hours) more than the other two groups. These students, however, do not plan to work more than 15 hours per week as compared to those who are required to take one or two preparatory courses.

#### *Analyses for the Motivational Questions*

The NSQ contains eight questions that ask the students to self-report on various aspects of their perceptions of themselves. These questions are often referred to as the motivational questions in the NSQ. Data on these questions are contained in Table 4.30. The questions are scored so that 1 = Definitely Agree and 5 = Definitely Disagree. As such, a lower mean indicates the student agrees with the statement.

**Table 4.30***Means for the Motivational Questions on the NSQ*

Question	No Preparatory Courses	One Preparatory Course	Two Preparatory Courses	Sig	Partial Eta Squared
Most of my teachers considered me one of the harder workers in their class	1.76	1.76	1.67	NS	-
I find it difficult to keep to a plan of action in my schoolwork	3.66	3.49	3.47	.001	.004
I enjoy studying and reading about things on which I am working	1.80	1.90	2.01	.001	.003
I know how to manage my time well	2.18	2.11	1.95	.017	.002
I am self-confident	1.82	1.73	1.65	.009	.003
My plans have frequently seemed so full of difficulties that I have had to give them up.	3.87	3.81	3.82	NS	-
I am organized and have good study habits.	2.21	2.19	2.08	NS	-
I prefer to be independent of others in deciding what I want to do.	1.88	1.89	1.86	NS	-

Although the effect sizes are very small, there are four questions where the students who did not have to take any preparatory courses differ from the other groups. On the positive side, they do not think they have difficulties keeping a plan of action, and they enjoy studying more. On the other hand, they feel they do not know how to manage their time as they would like, and they are less self-confident.

*Questions about what students plan to do while in college*

The NSQ contains a series of questions asking the students about what they think they will do while at Mid-Atlantic. The specific question is: "What is the chance that you will do the following while you are at the University?" with the options being Very Good Chance (1) to No Chance (4). As such, a lower mean indicates that the student perceives that there is a greater chance that the action will happen. The questions where there were significant differences are presented in Table 4.31.

**Table 4.31**

*Means for the Questions Relating to Plans While Attending College*

Question	No Preparatory Courses	One Preparatory Course	Two Preparatory Courses	Sig	Partial Eta Squared
Change your major field of study	2.73	2.43	2.03	.047	.002
Work full time while attending college	2.66	2.53	2.44	.001	.007
Join a social organization or club	1.31	1.43	1.55	.001	.012
Need more than 4 years to complete degree	2.97	2.76	2.63	.001	.008
Make close friends	1.11	1.16	1.45	.001	.005
Receive encouragement from family	1.20	1.36	1.69	.006	.003
Get tutoring	1.78	1.62	1.38	.001	.011
Transfer to another college before graduating	3.14	3.23	3.38	.001	.009
Study abroad/away	1.78	1.95	2.26	.001	.008

To summarize the above, compared to students who do not take preparatory courses, students who take two preparatory courses:

- are more likely to plan to change their major,

- are more likely to plan to work full time while attending college,
- are less likely to plan to join a social organization or club,
- think they will need more than four years to graduate,
- do not think they are likely to make close friends,
- do not think they will receive encouragement from their family,
- think they will need tutoring,
- do not think they are likely to transfer to another college, and
- are less likely to believe that they will study abroad.

As before, the effect sizes are small.

#### *Some Additional Analyses from the NSQ*

There are several questions on the NSQ that are somewhat peripheral to the major goals of this research. Since Chapter 4 already has many tables, results from the analysis of these additional questions are summarized below:

- (1) Students who had to take preparatory courses were more likely to say that Mid-Atlantic was their first choice.
- (2) Students who had to take preparatory courses indicated that their approximate high school average was lower than students who did not have to take one or two preparatory courses and that they graduated at a lower level in their high school class.
- (3) Students taking preparatory courses also expect to do somewhat worse in college.
- (4) Students who did not have to take any preparatory courses listed Mid-Atlantic's urban location as a major reason for choosing the institution.

On the other hand, these students indicated that Mid-Atlantic's reputation was not a reason for their choice.

## CHAPTER 5

### DISCUSSION

While around 40 percent of all students entering four-year colleges enroll in some form of remediation with the intent to bolster academic preparedness to college-level readiness, the data show that there are notable differences in rates of placement and in academic outcomes amongst the students in need of preparatory-level coursework (Chen, 2016; Roderick, Nagoaka & Coca, 2009; Sanabri, 2020; Shields & O'Dwyer, 2017). This discussion will assess the differential academic outcomes and student expectations within the group of students who take preparatory courses in their first semester, and then will explore how institutions of higher education can use these results to predict academic success and better support these students.

#### Summary of Findings

##### *Summary of Findings of Research Question #1*

Previous research by Chen (2016) found that around 40 percent of all students entering four-year colleges enroll in some form of preparatory coursework, and that the need for remediation is higher for certain populations of students. I hypothesized that the same would be true for the institution used in this research. Analyses of the present data found that at Mid-Atlantic University, males are slightly more likely to take preparatory English courses while females are more likely to take math preparatory courses. In terms of race African American students are more likely to take preparatory courses (35.1%), followed by Hispanic students (22.9%). Asian students (19.7%) and White students (18.7%) are least likely to need to take preparatory courses.

Consistent with previous research about students in remedial coursework, analyses were conducted on a number of other student characteristics to understand what types of students take preparatory courses. Chen (2016) found differences by student characteristics such as English as a Second Language (ESL) status, first-generation status, and socio-economic status. In the present data set spanning incoming freshman cohorts from fall 2015 through fall 2018, analyses

showed that students who self-identify as ESL, first generation, and low socioeconomic status take more preparatory courses than their peers.

The aim of Research Question #1 was to identify any differences between students who take preparatory courses and those who do not. Overall, the findings in the analyses presented largely align with the existing literature on placement into preparatory-level courses at four-year institutions.

#### *Summary of Findings of Research Question #2*

The aim of Research Question #2 was to identify whether there are any differences in academic success by student characteristics within the group of students who placed into preparatory courses. The results of the analyses for this research largely align with the existing literature.

##### *Retention:*

Roderick, Nagaoka and Coca (2009) found that students who take preparatory courses have lower rates of retention than their peers who do not take any preparatory courses. In the analyses conducted for the current study, generally there were fewer significant effects for first-to-second semester retention, but there were more significant effects for first-to-second year retention, particularly when taking one versus two preparatory courses. There was a significant effect for race on first-to-second year retention; among students in one or two preparatory courses in their first semester at Mid-Atlantic University, white students were the most likely to be retained from first-to-second year than other ethnic groups. Taking one preparatory course decreases the rate of first-to-second year retention for all ethnic groups but taking two preparatory courses more drastically decreases the rate of retention for Asian, Hispanic, and African American students than for white students. There is a significant effect on first-to-second year retention for first generation students; again, taking two versus one preparatory course more drastically reduces the rate of retention for first generation students. Among students with a low socio-economic status, taking one preparatory course has no significant effect on first-to-second

semester and first-to-second year retention, but taking two preparatory courses in the first semester has a large significant effect on retention.

*Graduation:*

Previous research has found that students who take developmental courses are more likely to drop out from the institution (Attewell et al., 2006; Sanabria et al., 2020; Shields & O'Dwyer, 2017). Many of the graduation rate analyses in the present research had similar findings as the analyses on retention, and they align with the conclusions in the body of literature on remediation course effects on graduation rates. In the current study, the patterns for four- and six-year graduation rates were nearly identical when the information was available. The present analyses found that there is a greater effect on graduation rates for groups of students when taking two preparatory courses versus one preparatory course. Graduation rates for white students are impacted less than other ethnic groups, especially Asian students, when they take two preparatory courses. There was a significant effect for graduation rates amongst ESL students, and students from medium and low socio-economic status, when taking two preparatory courses.

*Grade in Subsequent Math and English Courses:*

Hoyt (1999) studied the impact of remediation on retention, but one of his most significant findings in his sample was that the greatest indicator of persistence is tied to first-semester academic success. This emphasizes the need to understand academic performance in these courses to predict later academic outcomes. In the present data set, the analyses of grades earned in the subsequent math or English courses after taking a preparatory course found that for students who earned a C- or above in the preparatory course, there is a difference in likelihood of subsequent course completion between students who take preparatory courses and those who do not. Students who take two preparatory courses in the first semester are significantly less likely to successfully complete their second English courses (with a weak association) than their peers who took no preparatory courses, and they are even less likely to complete their second math course (with a moderate association).

### *Summary of Findings of Research Question #3*

As explained throughout Tinto's Student Integration Model, a student's social and academic integration with the institution can help interpret, and perhaps even predict, persistence and graduation (1975). Research testing Tinto's model has found that students who participate in meaningful ways with their peers and instructors on campus, both in and out of the classroom, are likely to feel more engaged resulting in more positive academic outcomes overall (Kirby, 2021; Merriweather Hunn, 2008; Tierney & Sablan, 2014). In the current study, the aim of Research Question #3 was to determine whether there are trends in responses to some of the student self-reported academic or social expectations on the New Student Questionnaire amongst the students who take preparatory courses. Using several relevant questions from the NSQ, the following results were established.

Within the data set used for the present research, analyses found that students who take two preparatory courses in the first semester are less likely to live on campus, a variable typically associated with greater academic success. They are also more likely to report planning to work more hours than their non-preparatory peers while enrolled in school, and they report feeling less self-confident and less like they know how to manage their time well. Overall, their plans for how they will spend their time while attending college, such as getting tutoring, working full time, making close friends, receiving encouragement from family, and joining a social organization or club, all trend towards associations with lower rates of academic success.

### *Overall Summary of Findings*

Overall, the results were largely aligned with predicted findings, and in many ways, the results in these analyses replicated what we already know from the existing body of literature about students who are required to take preparatory courses. The students who demonstrate a need for remediation based on placement practices are more likely to be African American or Hispanic, lower socioeconomic status, first generation, and to speak English as a second

language. As presumed, students who take preparatory courses are less likely to be retained from first-to-second year, and less likely to graduate in four or six years. They are also less likely than their peers who take no preparatory courses to respond to items on the NSQ that would indicate higher levels of engagement on campus.

However, there are a few results that were surprising. For one, it was predicted that there would be a difference between students who place into preparatory math versus preparatory English; however, the overall outcomes were not noticeably different between students in either subject matter. Instead, the differences are most significant when comparing students who are required to take none, one (either math or English) and two (both math and English) preparatory courses in their first semester at Mid-Atlantic University. Largely, students who take two preparatory courses in their first semester are among those least likely to remain enrolled from first to second year, least likely to graduate within four or six years, and least likely to successfully complete their subsequent math or English course with a grade of C- or better.

Although for all students, taking two preparatory courses decreases retention and graduation rates compared to taking none or one, another interesting result is that there is a disparate effect of taking two preparatory courses that appears to be dependent on race, first generation status, ESL status and SES. For example, as shown in Figures 4.1 and 4.4, taking two preparatory courses reduces rates of retention and graduation much more than taking one, but the difference between one and two preparatory courses is much greater for Asian, Hispanic, and African American students. Again, as shown in Figures 4.3 and 4.6, taking two preparatory courses reduces rates of retention and graduation for students from all socioeconomic backgrounds, but the effect is especially great for students with a low SES. The same pattern holds true for retention rates by first generation status (Figure 4.2) and graduation rates by ESL status (Figure 4.5).

All of the above conclusions highlight some inherent issues with placement into preparatory courses. As noted earlier, preparatory education programs and courses are designed to remediate based on academic need using established placement measures. The purpose is to

get underprepared students ready for college-level work and to bring them up to a comparable academic readiness as their peers who place into college-level courses from the onset. However, it is clear from these analyses that even after taking preparatory math and/or English courses, students who place into them and complete them do not have comparable rates of retention and graduation. This can possibly be explained by evaluating their responses on the New Student Questionnaire. Among their responses, upon admission, preparatory-level students are less likely to report planning to join a social club or organization or to think they will make close friends at college, and they are more likely to work full time, to plan to change their major, and to think they will need tutoring and more than four years to graduate. Research testing Tinto's theory has found that students who are more engaged and integrated with their academic and social lives while at college are more likely to succeed academically, and preparatory-level students in the present analyses demonstrate lower expectations for engagement and integration. These differences may explain some of the academic differences between preparatory and non-preparatory level students.

The purpose of preparatory courses is to smooth out the playing field in higher education and to increase access and equity, giving students from diverse backgrounds an entryway into college courses and to bring up their academic readiness to a level that matches their peers. Yet, the present research has demonstrated that preparatory-level students do not have comparable rates of academic success, even after taking these prerequisite courses. One perspective that may explain these persistent differences is the Cumulative advantage/Disadvantage Theory, or the Matthew Effect. According to Ferraro and George (2015):

The Matthew Effect refers to a pattern in which those who begin with advantage accumulate more advantage over time and those who begin with disadvantage become more disadvantaged over time. The result is ever-widening differences between the advantaged and disadvantaged. (p. 93)

As the data showed, students taking one and two preparatory courses during their first semester at Mid-Atlantic University are more often low income, ESL, first generation, or African American or Hispanic. They enter campus with the biggest deficit; they have lower levels of academic

preparation measured with SAT scores and lower levels of confidence that their academic history has prepared them well for college-level work. These are indeed the students who need the most support. But, like the Matthew effect demonstrates, those who begin with disadvantage become more disadvantaged over time. Those who most need the support are the ones who would get the least out of it.

### Limitations

Although the transcript data used for this study were institutionally generated, some data used in the analyses were students' self-reported responses to the New Student Questionnaire. As is the case for any self-reported data, there may be some reliability concerns. Examples of self-reported data used in this study include the participants' parental education level and family income. Responses to the sentiment items on the NSQ are also self-reported, such as plans to join a social club or organization and plans to work full time while attending school. Additionally, decisions were made in the handling of the data in this study. When measuring four-year graduation rates, spring admit cohorts were excluded since their demographics are different. Participants were only considered preparatory if they took the preparatory-level course in their first semester. Any students who took an initial preparatory course after their first semester of enrollment were not considered preparatory in the analyses. Moreover, the analyses of grade earned in the subsequent college-level math or English course were only tabulated when they took the subsequent course in the semester immediately following the preparatory course. These data decisions are unlikely to seriously threaten the validity or reliability of the study nor result in substantially different findings. Nonetheless, they need to be considered when interpreting the results.

There are a few primary limitations of the current study. First, there were different iterations of both the NSQ and the math placement test used among the cohorts included in the data set. The shift in the math placement can be seen in the increase in the number of students

who placed into preparatory math in Table 4.4. Items from the different versions of the NSQ were aligned for consistency but the wording of a few of questions changed across time.

Second, the data set did not include instructor information, such as which instructor each student took the course with, and trends over time that would measure any differences in student academic outcomes based on instructor. It is plausible that some instructors are teaching the preparatory English or math course in such a way that their students are more successful in subsequent semesters than students who take the course with another instructor. The current study did not account for any instructor effect.

Third, the present study is built around a presumption that the screening measures used at Mid-Atlantic University are effectively placing students into the appropriate level course. This analysis was not designed as an investigation into the efficacy of the current screening measures.

Fourth, there is a strong likelihood that the graduation rates of final cohorts included in the analyses were impacted by the COVID-19 pandemic. There is no data at this time to assess that impact.

Finally, since the data were generated from a single institution, the results lack external validity, and the generalizability to other institutions is limited.

#### Directions for Future Research

The present study used student and institutional data to study the effect of taking preparatory courses at a large public research university. It focused on academic outcomes of retention, graduation, and grade in subsequent subject-matter courses. Similar studies can be conducted at various institution types to explore the validity of the present findings, and to compare the similarities and differences of the effect of preparatory courses and programs. Additionally, research into possible institutional factors at Mid-Atlantic University and other institutions that would perpetuate any differential outcomes would be also beneficial.

As noted as a limitation, some of the variables in this quantitative study were self-reported on the New Student Questionnaire. A qualitative study that further explores students'

plans for integration, as well as their actual integration while at the university, would further explore any relationships between taking preparatory level courses and later academic outcomes. It would be interesting to follow students across their time at the institution and to monitor their engagement and integration on campus and their interactions with peers and faculty.

Future research on the topic may also look at instructors of the preparatory courses across time. The intent of such research would be to identify any instructor differences and instructor effect on the academic outcomes of their students. It is possible that some instructors of preparatory-level courses teach classes of students who end up with more positive academic outcomes, which may be the result of their teaching practices. Of interest may be the pedagogical strategies used, instructors' background, and course design to determine whether any instructors or sections are more successful than others as measured by retention, graduation, and grade in subsequent course amongst their students. The goal of this research would be to attempt to ascertain whether any instructor effect plays a role in student outcomes.

As noted earlier, students sometimes delay taking a preparatory course. Instead of taking it in their first semester enrolled at the institution, they may delay taking the course until their second semester or year, or even later. Further research could explore the impact of delaying taking preparatory courses on retention and graduation to help understand and predict these student patterns even better.

Expansion of the present study may also center around sense of belonging and motivation. To do so, a study could focus on specific student groups that have built-in social and academic supports, such as collegiate athletes, to see if any patterns change amongst those groups. Also, future qualitative research should investigate more closely the students who take preparatory courses yet still have high academic achievement and outcomes, as a way to understand what these students are doing differently, and what is working for them.

Finally, an additional direction for future research includes an investigation into the validity and reliability of placement practices. Since placement or screening measures vary from institution to institution, as well as across time at an individual institution, it is necessary to

understand that the placement practices used to determine whether students will be required to take preparatory-level courses are effective.

#### Recommendations to Improve Higher Education Practice

Based on the findings in this research, it is evident that taking one or two preparatory courses in the first semester does have a differential impact on academic outcomes. However, I believe that the institution is making two significant assumptions in its current practices:

- That the screening process used to place students into math and English courses is valid.
- That the preparatory courses' content and structure are doing what they are supposed to do – bringing the students' academic readiness up to the level of their peers.

If the above two assumptions were true, then students who are taking the preparatory courses at Mid-Atlantic University should be doing just as well as their peers who do not take any preparatory courses. However, this is not what the analyses found in this current study. Instead, the students who are required to take preparatory level courses are retained from first to second semester and first to second year at lower rates, are graduating in four or six years at significantly lower rates and are not performing as well in the courses that follow the remediation as their peers who did not take any preparatory courses.

For administrators, this means there is a lot of work to do and questions to be answered about the intent, content, and overall need for these preparatory courses. Administrators should continue to use the data on academic achievement amongst these students to determine whether there is enough evidence to continue requiring these preparatory courses, whether these courses help what appears to be some of the most vulnerable students from the start, and what improvements can be made to the courses themselves to enhance the student's experience and outcomes. Maybe in addition to academic content, these courses require opportunities for the students to integrate with the college campus. For example, while enrolled in a preparatory course, students may also be required to visit and engage with certain campus services and

amenities such as the library and tutoring, and even social aspects such as attending meetings for a club or organization.

Similarly, how students perceive the purpose of these courses will have an impact on their motivation to take the course seriously and gain the skills in which they were lacking. If students do not understand the intended purpose of preparatory courses and programs, or if they do not see an advantage to what they may perceive to be unnecessary or extra, then they may not be as motivated to gain from the course. Therefore, it is recommended that the institution considers its messaging to students regarding the purposes and intent of these preparatory course sequences.

Additionally, these outcomes have implications for administrators and academic departments to collaborate on ensuring that the placement assessments and the preparatory courses are collaboratively designed in such a way that the courses teach to students' evaluated areas of deficiency. For example, the ALEKS math placement test alerts students to their area of need. This information can be made more readily available so that the instructor can teach the specific content for which the test has shown the students need the extra support, to maximize the effectiveness of the course and improve student outcomes.

Finally, administrators may take a closer look at who is teaching these courses and how their students fare, to determine whether any changes to the assigned instructors might improve the overall academic performance for these students. Through careful consideration of the placement practices and the courses themselves, administrators may be able to reshape student outcomes.

### Conclusion

Retention and graduation are among the goals for enrollment in degree programs in higher education. Although not all students enter college or university with the same level of academic readiness, preparatory courses are designed to bring the students' skills and academic readiness up to a level where they will be just as successful in more advanced courses as their

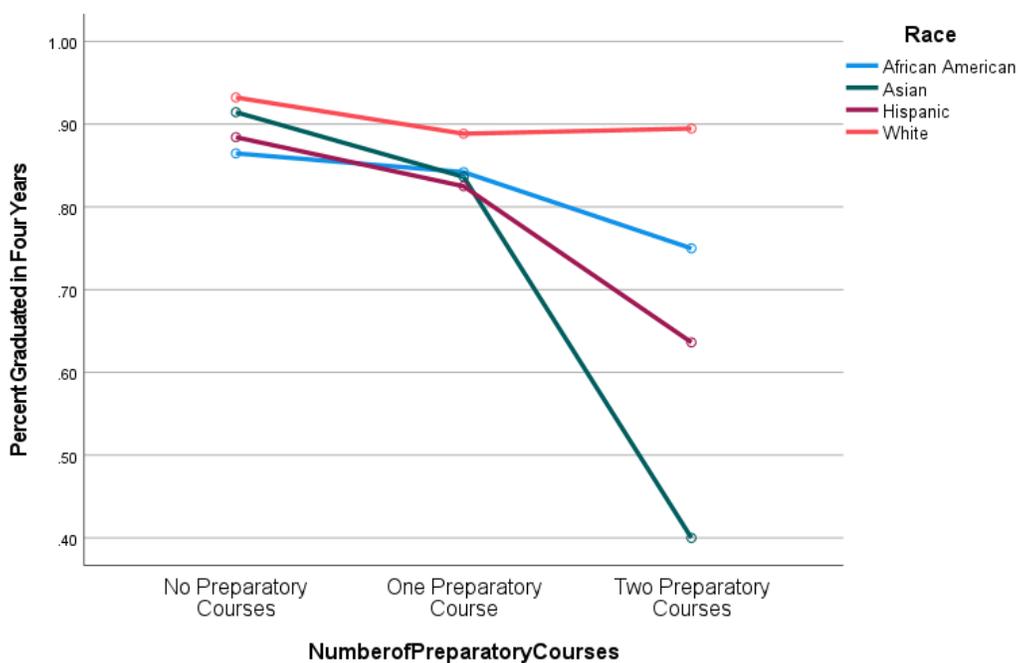
peers. Often called remedial courses, the purpose is to remediate any deficits or areas in need of improvement to support their later academic careers. As in much of the previous literature on the relationship between preparatory courses and overall academic success, data from the institution studied demonstrated a relationship between placement into preparatory courses and lower rates of retention, graduation, and successful performance in the college-level course that follows.

Tinto's Student Integration Model explains the impact of students' social and academic engagement on persistence and graduation rates. Through the lens of Tinto's model, it is important to take a close look at how well-integrated students who take preparatory courses are with the institution. The current study found that preparatory students' responses to questions about how they plan to spend their time while attending college, such as getting tutoring, where they will live, whether they will work full time, and whether they expect to make close friends, receive encouragement from family, or join a social organization or club, all trend towards associations with lower rates of engagement and integration, and thus with lower rates of academic success.

While there is no simple overall summary of the results, in many ways there is little in the data that is surprising. Essentially, a large majority of the data replicate data that have been known for many years. Specifically, students who are from minority backgrounds, who are first generation, who come from families where English is not the native language, and who are from lower socio-economic status are more likely to take preparatory courses. In theory, the reason these preparatory courses exist is to eliminate or at least reduce the gap that such students demonstrate in their math and English so that they are now prepared for higher level courses and are ready to complete their academic programs. The results demonstrate that this is only partially correct. In many ways, the results from this study seem to be consistent with the Matthew Effect. In many of the analyses, and most clearly in the data for the second research question, the results show that students who do not have to take preparatory courses have consistently better academic success. Those students who have to take preparatory courses, and especially those who have to take both math and English, start out with a lower level of academic success, and

that this gap increases. There are several examples of this in Chapter 4, but one of the results that show this clearly is presented below (Figure 4.4).

*Four-year Graduation Rate by Race*



As shown above, there is almost no difference in four-year graduation rates among the four racial groups for those who do not have to take any preparatory course. The effect of taking one and then two preparatory course is almost nonexistent for white students, but is extensive for Asian, Hispanic, and African American students.

Based on the results presented in Chapter 4 and the summary of findings in Chapter 5, it is evident that there are differences in which students more often are required to take preparatory courses, and that there are differential outcomes by student characteristics amongst those who take preparatory courses. Finally, there are trends towards lower levels of integration and engagement amongst preparatory students on the New Student Questionnaire at the onset of their enrollment at the institution, which may be contributing to their lower rates of academic success. These findings suggest that there is more work to do in the area of placement and

remediation to ensure more equitable opportunities for these students. These are data that all institutions already have but are not necessarily using in significant ways to make impactful decisions to best support their students. Now that these trends in academic outcomes amongst preparatory students have been identified, it is important to consider this information in meaningful ways, to reflect on it, to use it to make decisions and to improve the outcomes of students who need such supports the most.

## REFERENCES

- Adelman, C. (2006). The toolbox revisited: Paths to degree completion from high school through college. US Department of Education.
- Arendale, D. R. (2011). Then and now: The early years of developmental education. *Research and Teaching in Developmental Education*, 58-76.
- Attewell, P., Lavin, D., Domina, T., & Levey, T. (2006). New evidence on college remediation. *The Journal of Higher Education*, 77(5), 886-924.
- Bettinger, E. P., Boatman, A., & Long, B. T. (2013). Student supports: Developmental education and other academic programs. *The Future of Children*, 93-115.
- Byrd, K. L., & MacDonald, G. (2005). Defining college readiness from the inside out: First-generation college student perspectives. *Community college review*, 33(1), 22-37.
- Carey, K. (2010). Why we need a "Race to the Top" for higher education. *Chronical of Higher Education*, 56(26).
- Chen, X. (2016). Remedial course-taking at U.S. Public 2- and 4-Year Institutions: Scope, experiences, and outcomes (NCES 2016-405). U.S. Department of Education. Washington, DC: National Center for Education Statistics.
- Cohen, J. (1968). Multiple regression as a general data-analytic system. *Psychological Bulletin*, 70, 426-443.
- Davies, M. B., & Hughes, N. (2014). *Doing a successful research project: Using qualitative or quantitative methods*. Macmillan International Higher Education.
- George, L., & Ferraro, K. (Eds.). (2016). *Handbook of aging and the social sciences*. Elsevier.
- Gonzalez, K. P. (2002). Campus culture and the experiences of Chicano students in a predominantly White university. *Urban Education*, 37(2), 193-218.
- Guiffrida, D. A. (2006). Toward a cultural advancement of Tinto's theory. *Review of Higher Education*, 29(4), 451-472.
- Hoyt, J. E. (1999). Remedial education and student attrition. *Community college review*, 27(2), 51-72.

- Keith, T. Z. (2014). *Multiple regression and beyond: An introduction to multiple regression and structural equation modeling*. Routledge.
- Kirby, L. A., & Thomas, C. L. (2021). High-impact teaching practices foster a greater sense of belonging in the college classroom. *Journal of Further and Higher Education*, 1-14.
- Kokemuller, N. (2019, May 17). *The Difference Between Developmental Courses & College Courses*. The Classroom. <https://www.theclassroom.com/remedial-classes-psychological-effects-30679.html>
- Krouss, P., & Lesseig, K. (2020). Effects of a Flipped Classroom Model in an Introductory College Mathematics Course. *Primus: Problems, Resources & Issues in Mathematics Undergraduate Studies*, 30(5), 617–635.
- Kurlaender, M., & Howell, J. (2012). Collegiate remediation: A review of the causes and consequences. Literature Brief. New York, NY: College Board Advocacy and Policy Center.
- Mangan K. (2012). National groups call for big changes in remedial education. *Chronicle of Higher Education*.
- Merisotis, J., & Phipps, R. (2000). Remedial education in colleges and universities: What's really going on? *The Review of Higher Education*, 24(1), 67–85.
- Merriweather Hunn, L.R. (2008). Proof in the pudding: Does Guiffrida's cultural advancement of Tinto's theory apply to African American graduate students?. *Journal of Ethnographic & Qualitative Research*, 2(4).
- U.S. Department of Education, National Center for Education Statistics. (2020). *IPEDS: Integrated postsecondary education data system*. <https://nces.ed.gov/ipeds>
- Roderick, M., Nagaoka, J., & Coca, V. (2009). College readiness for all: The challenge for urban high schools. *The future of children*, 185-210.
- Ross, D. (1970). Remedial or Developmental? Confusion over Terms. *The Two-Year College Mathematics Journal*, 1(2), 27–31.
- Sampson, O.C. (1975). *Remedial Education* (1<sup>st</sup> ed.). Routledge.

- Sanabria, T., Penner, A., & Domina, T. (2020). Failing at Remediation? College Remedial Coursetaking, Failure and Long-Term Student Outcomes. *Research in Higher Education*, 61(4), 459–484.
- Saxon, D. P., & Boylan, H. R. (2001). The cost of remedial education in higher education. *Journal of Developmental Education*, 25(2), 2-9.
- Shields, K. A., & O'Dwyer, L. M. (2017). Remedial education and completing college: Exploring differences by credential and institutional level. *The Journal of Higher Education*, 88(1), 85-109.
- Sidelinger, R. J., Frisby, B. N., & Heisler, J. (2016). Students' out of the classroom communication with instructors and campus services: Exploring social integration and academic involvement. *Learning and Individual Differences*, 47, 167-171.
- Tierney, W. G., & Sablan, J. R. (2014). Completing College: Rethinking institutional action. *Journal of Higher Education*, 85(2), 280-282.
- Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of educational research*, 45(1), 89-125.
- Toutkoushian, R. K., Stollberg, R. A., & Slaton, K. A. (2018). Talking 'bout my generation: Defining "first-generation college students" in higher education research. *Teachers College Record*, 120(4), 1-38.
- Wine, J., Janson, N., & Wheelless, S. (2011). 2004/09 Beginning Postsecondary Students Longitudinal Study (BPS: 04/09). Full-Scale Methodology Report. NCES 2012-246. National Center for Education Statistics.

## APPENDIX A

## DEGREE PROGRAMS THAT REQUIRE ALEKS MATH PLACEMENT AND COLLEGE ALGEBRA

Actuarial Science, B.B.A.

Architecture, B.S.

Career and Technical Education, B.S.

Early Childhood Education, B.S.

Exercise and Sport Science, B.S.

Facilities Management, B.S.

Health Professions, B.S.

Historic Preservation, B.S.

Mathematical Economics, B.A.

Middle Grades Education, B.S.

Music Technology, B.S.

Neuroscience: Systems, Behavior & Plasticity, B.S.

Secondary Education/English Education, B.S.

Secondary Education/Mathematics Education, B.S.

Secondary Education/Social Studies Education, B.S.

Secondary Education/World Languages Education, B.S.

Special Education, B.S.

Statistical Science and Data Analytics, B.S.

All programs within the College of Science and Technology

All programs within the College of Engineering

All studies in University Studies

## APPENDIX B

## NEW STUDENT QUESTIONNAIRE (NSQ)

*Note.* “Mid-Atlantic University” was used to ensure the anonymity of the participating institution.

1. Is English your native language?
  - a. Yes
  - b. No
2. During the school year how many hours do you plan to work (for money) per week?
  - a. None
  - b. 1 to 15 hours
  - c. 16 to 20 hours
  - d. 21 to 25 hours
  - e. More than 25 hours
3. In what kind of residence will you be living during your first semester at Mid-Atlantic University?
  - a. University-owned housing (including residence halls)
  - b. Home of parents/relatives
  - c. Your own home or apartment
  - d. With other family members
  - e. Other
4. Are you are person who would identify are someone who was or currently is in the care of a public child welfare agency (e.g., foster care, kinship care, dependent or ward of the course, emancipated minor, unaccompanied youth, etc.) and/or someone who was or currently is homeless and/or transient (e.g., moving from one temporary housing arrangement provided by friends, family, or strangers to another, couch surfing, etc.)?
  - a. Yes, I identify as someone who was or currently is in the care of a public welfare agency
  - b. Yes, I identify as someone who was or currently is homeless and/or transient
  - c. Yes, I identify as someone who was or currently is in the care of a public welfare agency AND as someone who was or currently is homeless and/or transient.
  - d. No, I do not identify as someone who was or currently is either in the care of a public welfare agency, or homeless and/or transient.
  - e. I identify as someone who is at risk for becoming homeless and/or transient
  - f. Don't know
  - g. Prefer not to answer

h. Other

5. What is your U.S. Military status?

- a. No military service
- b. Active military service
- c. Veteran
- d. Reserves or ROTC
- e. Other

6. What is your best estimate of the total income of your PARENTAL FAMILY during the past year?

- a. Less than \$20,000
- b. \$20,000 to \$39,999
- c. \$40,000 to \$59,000
- d. \$60,000 to \$79,000
- e. \$80,000 to \$99,000
- f. \$100,000 to \$124,000
- g. \$125,000 to \$149,000
- h. \$150,000+

7. What is your best estimate of YOUR OWN total income during the past year?

- a. Less than \$2,000
- b. \$2,000 to \$3,999
- c. \$4,000 to \$5,999
- d. \$6,000 to \$7,999
- . \$8,000 or more

8. Did you file the FAFSA to be considered for financial aid at Mid-Atlantic University for the upcoming year?

- a. Yes, and I received a financial aid award
- b. Yes, but I did not receive a financial aid award
- c. Yes, but I have yet to hear about a financial aid award
- d. No, but I intend to apply
- e. No, I will not need financial aid to attend Mid-Atlantic University

9. How did the amount of financial aid you received from Mid-Atlantic University compare to other schools to which you were admitted?
- Higher than most
  - About the same
  - Lower than most
  - Applied for aid only at Mid-Atlantic University
  - Did not apply for financial aid
10. Do you have any concern about your ability to finance your college education?
- None (I am confident that I will have sufficient funds)
  - Some concern (but I will probably have enough funds)
  - Major concern (not sure I will have enough funds to complete college)
11. What was your rating of Mid-Atlantic University at the time you applied for admission?
- Mid-Atlantic University was my first choice
  - Mid-Atlantic University was my second choice
  - Mid-Atlantic University was my third or lower choice
12. What is the highest level of formal education completed by your father or guardian 1?
- Did not graduate from high school
  - Graduated from high school
  - Some college education
  - Graduated from college (a bachelor's degree)
  - Postgraduate or professional degree
13. What is the highest level of formal education completed by your mother or guardian 2?
- Did not graduate from high school
  - Graduated from high school
  - Some college education
  - Graduated from college (a bachelor's degree)
  - Postgraduate or professional degree
14. What is the highest level of formal education completed by any of your college age (18 years of age or older) siblings?
- Did not graduate from high school
  - Graduated from high school

- c. Some college education, but did not graduate
- d. Currently enrolled in college
- e. Graduated from college (a bachelor's degree or higher)
- f. I do not have any college age siblings

15. What was your approximate high school average?

- a. A
- b. B+
- c. B
- d. B-
- e. C+ or lower

16. What scholastic average do you expect to obtain in college?

- a. A
- b. B+
- c. B
- d. B-
- e. C+ or lower

17. Scholastically, where did you rank in your high school graduating class?

- a. Top 10%
- b. Top 20%
- c. Top 30%
- d. Top 50%
- e. Not among top 50%

18. In general, how well do you feel that your high school prepared you to do college work?

- a. Very well
- b. Fairly well
- c. Uncertain
- d. Poorly
- e. Very poorly

19. Have you decided on an academic major?

- a. Yes

b. No

20. Do you consider yourself a person who has a disability?

a. Yes

b. No

c. Uncertain

21. During the school year, on the average, how many hours do you plan to study per week?

a. None

b. 1 to 15 hours

c. 16 to 20 hours

d. 21 to 25 hours

e. More than 25 hours

Questions 22-25: During high school (grades 9-12), how many years did you study each of the following subjects?

For questions 22 through 25 use the following responses:

a. None

b. One

c. Two

d. Three

e. Four

22. English

23. Mathematics

24. Foreign Language

25. Natural Sciences

Questions 26-29: During high school (grades 9-12), on average, what was your grade in the following subjects?

For questions 26 through 29 use the following responses:

a. A

b. B+

c. B

d. B-

e. C+ or lower

- 26. English
- 27. Mathematics
- 28. Foreign Languages
- 29. Natural Sciences

Questions 30-36: How important were the following in your decision to go to college?

For questions 30 through 36 use the following responses:

- a. Very important
- b. Somewhat important
- c. Not important

- 30. I wanted to get a general education.
- 31. My family wanted me to go.
- 32. I wanted to get away from home.
- 33. I wanted to be able to get a better job.
- 34. I wanted to learn more about things that interest me.
- 35. I wanted to prepare myself for graduate or professional school.
- 36. It seemed like a good thing to do as a transition to work.

Questions 37-44: How important were the following in your finding out about or selecting Mid-Atlantic University?

For questions 37 through 44 use the following responses:

- a. Very important
- b. Somewhat important
- c. Not important
- d. Does not apply/did not attend

- 37. Personal call from Mid-Atlantic University student
- 38. Mid-Atlantic University social media channels (Facebook, Twitter, Instagram, etc.)
- 39. Mid-Atlantic University brochure or mailings
- 40. E-mail communication from Mid-Atlantic University
- 41. Mid-Atlantic University's web site
- 42. Mid-Atlantic University open house or reception
- 43. Regular campus visit
- 44. High school visit by Mid-Atlantic University representative or college fair

Questions 45-58: Below are some reasons that might have influenced your decision to attend Mid-Atlantic University. How important was each reason in your decision to come here?

For questions 45 through 58 use the following responses:

- a. Very important positive factor
- b. Somewhat important positive factor
- c. Not a positive factor

- 45. Affordable tuition
- 46. Mid-Atlantic University's student body size
- 47. Social atmosphere
- 48. Closeness to home
- 49. Urban location
- 50. Variety of academic programs available
- 51. Variety of co-curricular programs available
- 52. Reputation of Mid-Atlantic University
- 53. Reputation of your specific major at Mid-Atlantic University
- 54. Advice and experience of family
- 55. Advice and experience of friends
- 56. Meeting students with backgrounds and interests similar to yours
- 57. Meeting students with backgrounds and interests different from yours
- 58. Availability of financial aid
- 59. Mid-Atlantic University's commitment to environmental sustainability

Questions 60-74: What is the chance that you will do the following while you are at Mid-Atlantic University?

For questions 60 through 74 use the following responses:

- a. Very good chance
- b. Some chance
- c. Very little chance
- d. No chance

- 60. Change your major field of study
- 61. Be a student leader
- 62. Work full time while attending college

63. Join a social organization or club
64. Play varsity / intercollegiate athletics
65. Need more than 4 years to complete degree requirements
66. Make close friends
67. Work with a professor on a research project
68. Receive encouragement from family while you're in college
69. Get tutoring help in specific courses
70. Transfer to another college before graduating
71. Take an on-line course
72. Find a job after college in your chosen field of study
73. Participate in volunteer or community service work
74. Study abroad/away

Questions 75-83: Please indicate your level of agreement with each of the following statements:

For questions 75 through 83 use the following responses:

- a. Definitely agree
- b. Somewhat agree
- c. Neither agree nor disagree
- d. Somewhat disagree
- e. Definitely disagree

75. I want to live and work in Philadelphia after graduation.
76. Most of my teachers considered me one of the harder workers in their class.
77. I find it difficult to keep a plan of action in my school work.
78. I enjoy studying and reading about things on which I am working.
79. I know how to manage my time well.
80. I am self-confident.
81. My plans have frequently seemed so full of difficulties that I have had to give them up.
82. I am organized and have good study habits.
83. I prefer to be independent of others in deciding what I want to do.

## APPENDIX C

## ANALYSES SEPARATED BY TYPE OF PREPARATORY COURSE

*Research Question 1: Which students take preparatory-level courses?*

**Table A.1**

*Percentage of Total Sample Taking Preparatory Courses by Gender*

	English	Math
Male	9.1%	4.5%
Female	115.2%	17.2%

**Table A.2**

*Percentage of Total Sample Taking Preparatory Courses by Race*

	English	Math
African American	24.4%	17.5%
Asian	12.6%	2.2%
Hispanic	19.9%	12.2%
White	14.4%	5.7%

**Table A.3**

*Percentage of Total Sample Taking Preparatory Courses by ESL Status*

	English	Math
ESL	16.1%	16.0%
Non-ESL	7.4%	5.0%

**Table A.4**

*Percentage of Total Sample Taking Preparatory Courses by First Generation*

	English	Math
First Generation	20.8%	10.3%
Non-First Generation	15.2%	6.5%

**Table A.5***Mean SES for Students Taking or Not Taking a Preparatory Course by Subject*

	English	Math
Took Developmental Course	47.56	46.37
Did not Take Developmental Course	50.47	50.29

**Table A.6***Academic Preparation Variables*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
High School GPA	3.41	3.57	3.42	3.58
SAT ENG	555.72	615.97	545.06	624.61
SAT MATH	489.85	611.71	562.44	612.25

*Research Question 2: Is there a difference in academic success by student characteristics and other student variables amongst those who do take preparatory-level courses?*

**First to Second Semester Retention****Table A.7***First to Second Semester Retention by Gender*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
Male	92.41%	96.77%	95.21	96.85
Female	93.46%	96.69%	92.41	96.38

**Table A.8***First to Second Semester Retention by Race*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
African American	91.95%	93.45%	93.37%	95.24%
Asian	92.86%	94.84%	95.21%	97.80%
Hispanic	91.90%	94.35%	94.32%	95.64%
White	93.48%	97.06%	97.24%	97.24%

**Table A.9***First to Second Semester Retention by First Generation Status*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
First Generation	89.68%	94.43%	92.55%	94.76%
Not First Generation	93.93%	97.06%	95.18%	97.16%

**Table A.10***Mean SES for Students Retained or Not Retained from First to Second Semester*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
Retained	46.74	50.42	47.08	50.50
Not Retained	41.19	47.19	44.12	47.76

## First to Second Year Retention

**Table A.11**

*First to Second Year Retention by Gender*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
Male	81.93%	90.93%	86.15%	91.32%
Female	84.44%	91.16%	88.77%	90.22%

**Table A.12**

*First to Second Year Retention by Race*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
African American	80.79%	87.25%	83.33%	87.03%
Asian	78.59%	93.13%	93.38%	87.82%
Hispanic	82.58%	85.78%	83.22%	85.94%
White	86.99%	91.59%	88.80%	91.84%

**Table A.13**

*First to Second Year Retention by First Generation Status*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
First Generation	78.97%	82.34%	83.33%	87.31%
Not First Generation	85.27%	91.43%	88.30%	91.52%

**Table A.14***Mean SES for Students Retained or Not Retained from First to Second Year*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
Retained	47.09	50.58	48.07	50.35
Not Retained	42.30	47.81	44.17	47.95

**Four-Year Graduation****Table A.15***Four-Year Graduation by Gender*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
Male	40.59%	61.15%	48.90%	62.62%
Female	54.65%	70.72%	58.95%	71.23%

**Table A.16***Four-Year Graduation by Race*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
African American	41.60%	52.99%	42.54%	54.48%
Asian	37.50%	65.89%	53.80%	60.92%
Hispanic	43.93%	53.90%	46.89%	56.53%
White	60.44%	70.40%	59.60%	71.66%

**Table A.17***Four-Year Graduation by First Generation Status*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
First Generation	58.05%	68.09%	42.47%	58.24%
Not First Generation	38.02%	54.68%	55.75%	69.31%

**Table A.18***Mean SES for Students Who Did or Did not Graduate in Four Years*

	Took Preparatory Math	Did not Take Preparatory Math	Took Preparatory English	Did not Take Preparatory English
Graduated in Four years	48.55	51.25	49.21	51.39
Did not Graduate in Four Years	43.51	48.30	45.67	48.44