

PSYCHOSOCIAL ACADEMIC BEHAVIORAL SKILLS AND COLLEGE ENROLLMENT:  
A QUANTITATIVE ANALYSIS USING LOGISTIC AND HIERARCHICAL  
GENERALIZED LINEAR MODELS

by

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of the requirements for the Doctor of Philosophy  
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PH.D. THESIS

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Dedication

For TE, SE, and KE

Love,  
DE

## ACKNOWLEDGEMENTS

Although these words fall on the first page of written text in my dissertation, it is actually the last page I sat down to write. This thesis represents the largest academic task I have undertaken, and in my current position near its completion, I feel privileged to have had the opportunity to pursue this degree. I dedicated countless hours to this project, but I know I did not get here entirely on my own.

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## ABSTRACT

Many high school students who want to attend college never actually enroll. Multiple factors like barriers (e.g., financial, discrimination) and poor academic achievement prevent some high school students from matriculating to college. Researchers must form a nuanced understanding of multidimensional factors that predict college enrollment. The purpose of this dissertation is to investigate the extent to which psychosocial academic behavioral skills (PABS) predict college enrollment in two and four year colleges.

A cross-sectional, survey-based methodology was used to address the research questions. Data from operational research by ACT, Inc. using the Engage 10-12 instrument were used to analyze students' psychosocial academic behavioral skills. Standardized test scores and high school GPA were used to measure academic achievement. College enrollment data were gathered from the National Student Clearinghouse. A large, diverse sample of over 4,100 high school students in 10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> grade was analyzed using logistic regression and hierarchical generalized linear models. Select psychosocial academic behavioral skills demonstrated positive relationships with four-year enrollment. Relationships between PABS and two-year college enrollment were smaller than the observed relationships between PABS and four-year college enrollment. Bootstrapping was used to determine if psychosocial academic behaviors predicted college enrollment or if this effect was mediated via academic achievement. Moderation and partial mediation effects were observed. By understanding student characteristics related to college enrollment, researchers and policymakers are better equipped to help young people matriculate to postsecondary institutions.

## PUBLIC ABSTRACT

Many high school students want to attend college. Despite their desires, many of these students are unfortunately unable to enter college for a variety of reasons. This is a problem because increasing numbers of jobs in the 21<sup>st</sup> century require some form of postsecondary training.

Researchers have studied multiple characteristics that predict college enrollment, such as academic readiness, financial standing, and social barriers that diminish students' chances of entering postsecondary training. In this dissertation, I supplemented this body of research by investigating whether students' psychosocial academic behavioral skills – for instance, academic self-confidence, working toward personal goals, and feeling socially connected to peers – connected with college enrollment at two and four-year postsecondary institutions. Using survey data from over 4,100 high school students, I concluded that specific psychosocial academic behavioral skills (e.g., commitment to college) demonstrated a small relationship with enrollment in two and four-year colleges. By understanding student characteristics related to postsecondary enrollment, researchers and policymakers are better equipped to help young people enroll in a two or four year college.



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# CHAPTER 1

## INTRODUCTION

Many high school students aspire to enroll in a two or four-year postsecondary institution (e.g., Engle, 2007; Farrington et al., 2012; Kena et al., 2015). Since the mid twentieth century, the number of people matriculating to college in the United States has seen ups and downs; during some years enrollments go up (Snyder & Dillow, 2013) and in some years they go down or remain relatively stable (Card & Lemieux, 2001; Heckman, 2008). Since 2008, enrollments have generally decreased, perhaps most notably for individuals from low-socioeconomic backgrounds (Nellum & Hartle, 2015). Overall, however, postsecondary enrollments have increased in recent decades, with nearly 14,000,000 people enrolled in college in 1990, over 15,000,000 in 2000, and a projected 24,000,000 by 2024 (Snyder & Dillow, 2013, p. 396). These numbers proffer an intuitive question: why are more and more people seeking postsecondary education?

One obvious factor affecting college enrollment rates is an overall growing population. But there are additional factors to consider, such as a burgeoning demand for educated, skilled workers who can effectively compete in the 21<sup>st</sup> century economy (Carnevale, Jayasundera, & Gulish, 2015; Goldin & Katz, 2008). Media outlets, academics, and politicians continually stress a widening income gap in the United States (Obama, 2009; Piketty, 2014; Reich, 2010), and champion a college degree as a distinguishing characteristic between increasingly polarized social classes (Goldin & Katz, 2008; White House, 2015). These persistent messages, the chance to improve one's knowledge and skills, and the promise of benefits associated with a college degree like a

high earning potential (e.g., Taylor et al., 2011; Goldin & Katz, 2008) all incentivize people to pursue higher education (Carnevale, Jayasundera, & Gulish, 2015).

### **The Problem: College Enrollment Aspirational Gap**

Many high school students in the United States who aspire to attend college never actually enroll (ACT, Inc., 2014; Engle, 2007; Farrington et al., 2012). In fact, only 70 percent of high school graduates matriculate to postsecondary institutions (Harvill, Maynard, Nguyen, Robertson-Kraft, & Tognatta, 2012). In 2014, 87% of high school students who took the ACT (n= 1,845,787) reported a desire to attend college, but unfortunately only 69% of these students actually enrolled (ACT, Inc., 2014). If this college enrollment aspirational gap closed, over 325,000 additional students would have enrolled in college in 2014 (ACT, Inc., 2014, p.3). This discrepancy is startling and damages the United States' economy; even if only 20% of these students who failed to enroll in college actually did enroll and then persisted to graduation, an additional 65,000 people would have entered the workforce in 2014 with skills afforded by a postsecondary education. It is imperative that the college enrollment aspirational gap be diminished to help people achieve education and workplace success.

There are many reasons why some high school students who want to go to college do not actually enroll. Some students who express interest in college, especially members of traditionally underrepresented populations (e.g., low-income, first generation college, racial and ethnic minority populations), encounter barriers that prohibit matriculation; financial status, lack of parental support, discrimination, and attitudes about the connection between education and work are powerful obstacles that diminish college

enrollment (e.g., Albert & Luzzo, 1999; Janiga & Costenbader, 2002; Lowman, 2014; Luzzo & McWhirter, 2001; McWhirter, 1997). College tuition rates have increased precipitously, barring many financially disadvantaged students from postsecondary opportunities that could enhance knowledge and skills relevant to future employment opportunities.

In addition to financial barriers, other students who want to enroll but never do might not have adequate achievement in core academic subjects like math, English, science and writing to persist through their first year of college (ACT, Inc., 2014; ACT, Inc., 2015a; Allen & Sconing, 2005; Engle, 2007). Consider that only 28% of all high school students who took the ACT in 2015 (n=1,924,436) met at least three college readiness benchmarks in math, English, science and reading (ACT Inc., 2015a, p. 4). Even more unsettling, traditionally underrepresented populations in postsecondary environments may be especially underprepared for academics in college. For instance, fewer than 20% of all students who are African-American and American Indian who took the ACT in 2015 met at least three of four academic readiness benchmarks for college (ACT Inc., 2015a, p. 4).

These statistics are troubling and shed light on the need to improve all high school students' overall level of academic preparedness for college in areas like English, math, science, and writing (Allen, 2013; Allen & Sconing, 2005). Academic preparedness for college is especially germane because it is generally believed that indicators of academic achievement, measured through standardized test scores and/or prior grades, are among the most robust predictors of postsecondary success, such as enrolling in college, earning

high grades, and persisting to graduation (Engberg & Wolniak, 2010; Kuncel & Hezlett, 2007; Sackett, Kuncel, Arneson, Cooper, & Waters, 2009).

### **Purpose of Dissertation**

Undoubtedly, financial and social barriers (e.g., Luzzo & McWhirter, 2001; Janiga & Costenbader, 2002) and low achievement in core academic subjects (e.g., ACT, Inc., 2015a; Allen & Sconing, 2005) are meaningful contributors to the aspirational gap. But an additional set of variables, commonly referred to as *non-cognitive factors*, may also incrementally influence rates of college enrollment. Within the educational and psychological literatures, non-cognitive factors have been defined in various ways (e.g., Farrington, 2012; Lipnevich & Roberts, 2012; Trilling & Fadel, 2009), but one common definition is any variable relating to “adjustment, motivations, and perceptions” that influence educational outcomes like grades or persistence (King & Bowman, 2006; Sedlacek, 2004, p. 26). In contrast, *cognitive factors* are markers of intellectual ability or academic achievement, such as cumulative GPA or standardized test scores of academic achievement. The bifurcation of non-cognitive and cognitive factors is somewhat arbitrary; indeed, some variables like motivation that are usually considered non-cognitive factors clearly require learners to engage in complex cognitive processes (e.g., meta-cognition). In this dissertation, non-cognitive factors called psychosocial academic behavioral skills (hereafter, referred to as PABS) are emphasized.

Psychosocial academic behavioral skills include, but are not limited to, abilities like showing commitment to complete academic tasks and putting forward consistent effort at school (Casillas, Way, & Burrus, 2015; Heckman, 2008; Pascarella & Terenzini,



2005; Robbins et al., 2004). Considering that standardized test scores and high school GPA are thought to collectively account for 30-40% of the variance in first-year college GPA (when discounting range restriction), it is clear that additional factors contribute to academic success in high school and college (Mouw & Khanna, 1993; Richardson, Abraham, & Bond, 2012). Although researchers know that non-cognitive factors influence academic performance (e.g., Duckworth & Seligman, 2005; Duckworth, Peterson, Matthews, & Kelly, 2007; Farrington et al., 2012; Lipnevich & Roberts, 2012), less is known about which factors predict actual college enrollment. Although researchers have connected select non-cognitive factors to college enrollment as early as middle school (San Pedro, Baker, Bowers, & Heffernan, 2013), “noncognitive characteristics are practically important, policy relevant, and yet in need of a more compelling evidentiary base” (Lipnevich & Roberts, 2012, p. 174). Therefore, the purpose of this dissertation is to investigate the extent to which PABS (*predictor variables*) predict two and four year college enrollment (*outcome variables*).

PABS were selected as appropriate predictor variables for several reasons. First, the relationship between PABS and college enrollment is not clearly understood, perhaps due to a lack of operationalization of PABS constructs in the education and psychology literatures. Second, at the present time it is unclear whether PABS have a direct, empirically measureable influence on college enrollment, no relationship, or an indirect relationship, where the effects of PABS are mediated by high school GPA and/or standardized test scores of academic achievement. Third, PABS may be especially salient college enrollment predictor variables for traditionally underrepresented populations. Allen, Robbins, Casillas, & Oh (2008), for example, postulated whether “the effect of

college commitment [on college persistence] may be more pronounced for African-American students” (p.661). Using the non-cognitive questionnaire (NCQ), Tracey and Sedlacek demonstrated that non-cognitive factors predict college GPA and persistence for both African-American and White college students, but that non-cognitive factors may be especially predictive of persistence for Black students (1985). However, it is important to recognize that the validity of inferences drawn from the NCQ has been called to question (King & Bowman, 2006). For each of these reasons, it is appropriate to study the influence of PABS on two and four year college enrollment. The predictor (e.g., PABS) and outcome variables (e.g., 2YCE and 4YCE) will now be described and a set of research questions will be put forward to guide this dissertation.

Former Secretary of Education Terrell Bell famously stated, “there are three things to emphasize in teaching: The first is motivation, the second is motivation, and the third is (you guessed it) motivation” (Ames, 1990, p. 409). Bell’s statement corroborates what many educators already know: motivation is integral to student learning (e.g., Covington, 2000; Dweck, 1986; Eccles & Wigfield, 2002; Pintrich, 1999). Consequently, some students who lack motivation receive poor grades compared to their peers (ACT, Inc., 2007), which could make enrolling in institutions of higher learning challenging due to a lack of academic preparedness and high admission standards. Intuitively, this makes sense; before many students can achieve academically they need to be *motivated, socially engaged*, and possess *self-regulation* skills to guide behavior and meet academic commitments like completing homework (ACT, Inc., 2011; Le, Casillas, Robbins, & Langley, 2005; Robbins et al., 2004; Tross, Harper, Osher, & Kneidinger, 2000). More simply, before many students can achieve academically they must engage in PABS. But

what exactly are PABS? Next, PABS will be more precisely defined and specific research questions will be put forward.

## Definitions

**PABS.** In their seminal *How College Affects Students*, Pascarella and Terenzini (1991; 2005) describe a vast body of research spanning multiple decades analyzing how psychosocial factors affect college outcomes like college grades and persistence. Yet, while the role of psychosocial factors in predicting college outcomes (e.g., earning high grades, persisting to graduation) has been heavily researched across educational and psychological domains of inquiry (e.g., Eccles & Wigfield, 2002; Pascarella & Terenzini, 1991; Robbins et al., 2004; Ting & Robinson, 1998; Tinto, 1993) this vast literature was not synthesized via meta-analysis until more recently (e.g., McAbee & Oswald, 2013; Poropat, 2009; Robbins et al., 2004).

In addition to lacking conceptual clarity (e.g., Block, 1995; Duckworth & Yeager, 2015), PABS have frequently been used as *outcomes* as opposed to *predictors* and are sometimes conflated with “background factors” like socio-economic status (SES) (Duckworth & Yeager, 2015; Messick, 1979; Robbins et al., 2004, p. 263). Moreover, in the general public PABS are sometimes used interchangeably with terms like *soft skills* and *21<sup>st</sup> century work skills* which adds to conceptual confusion (Binkley et al., 2012; Farrington, 2012; Lipnevich & Roberts, 2012; Mattern et al., 2014; Trilling & Fadel, 2009). For each of these reasons, PABS can be difficult to define.

There are many ways to conceptualize and define PABS, but Robbins and colleagues (2004) and Le and colleagues (2005) define PABS as a set of theoretically

derived behaviors centered around *motivation, social engagement, and self-regulation*, which, when applied consistently, foster positive academic outcomes like academic achievement and persistence (e.g., Allen et al., 2008; Allen & Robbins, 2010). In this dissertation, PABS are grouped within one of three theoretically informed domains of motivation, social engagement, and self-regulation (ACT, Inc., 2015b; Le et al., 2005). Each PABS construct is defined below (ACT, Inc., 2015b, pgs. 46-49).

### Motivation

- *Academic discipline*: “The amount of effort a student puts into schoolwork and the degree to which a student sees him-/herself as hardworking and conscientious”
- *Commitment to college*: “One’s commitment to staying in college and getting a degree”
- *Communication skills*: “Attentiveness to others’ feelings and flexibility in resolving conflicts with others”
- *General determination*: “The extent to which one strives to follow through on commitments and obligations”
- *Goal striving*: “The strength of one’s efforts to achieve objectives and end goals”
- *Study skills*: “The extent to which students believe they know how to assess an academic problem, organize a solution, and successfully complete academic assignments”

### Social Engagement

- *Social activity*: “One’s comfort in meeting and interacting with other people”
- *Social connection*: “One’s feelings of connection and involvement with the school”

community”

### Self-Regulation

- *Academic Self-Confidence*: “The belief in one’s ability to perform well in school”
- *Steadiness*: “One’s responses to and management of strong feelings”

These constructs are somewhat loosely defined and in chapter two of this dissertation I will more thoroughly discuss each to provide greater conceptual clarity. Chapter two of this dissertation will also address the theoretical frameworks that inform the selection of these constructs as PABS. In addition to PABS, the corresponding outcome variables of two-year and four-year college enrollment are necessary to define.

**College enrollment.** The outcome variable of interest is college enrollment at two-year and four-year colleges and universities. College enrollment is defined as one’s initial matriculation after high school to a two or four year college or university of higher learning. Both two and four year colleges were included as outcome variables for several reasons. First, the nature of higher education is changing to accommodate the needs of a 21<sup>st</sup> century economy (Brown & Lent, 2013; Trilling & Fadel, 2009) and increasing numbers of students are expected to attend two-year colleges in addition to four-year colleges. Second, accessibility to both two and four year colleges is a topic of great importance to society (e.g., White House, 2012); therefore, researchers and policymakers must understand which PABS predict enrollment at each type of institution in order to (a) inform interventions aimed at preparing high school students for postsecondary success and (b) gain knowledge about how PABS differentially predict two and four year college enrollment.

## Research Questions

Within the last twenty years, conceptual clarity has improved and PABS continue to be linked to college outcomes such as college GPA and persistence (Allen & Robbins, 2010; Le et al., 2005; Peterson, Casillas, & Robbins, 2006; Poropat, 2009; Robbins et al., 2004). Interestingly, some PABS constructs have even demonstrated direct, incremental predictive validity for college GPA and persistence beyond traditional predictors like high school GPA and standardized test scores of academic achievement (Allen et al., 2008; Robbins, Allen, Casillas, Peterson, & Le, 2006). But besides outcomes like college GPA and persistence, the influence of PABS are less well known on other college relevant criteria, and few published, peer-reviewed empirical studies have focused on the influence of high school PABS on college enrollment.

Additionally, few researchers have investigated the extent to which high school grades and/or standardized test scores mediate the relationship between high school PABS and two and four-year college enrollment. Since mediational effects of first year academic performance in college are known to exist for some PABS and timely degree attainment (Allen & Robbins, 2010, p. 31), it is logical to assume a similar mediation effect of high school academic performance between PABS and enrollment. It is also possible that high school GPA and composite ACT score act as mediators because these traditional indicators of college readiness are correlated with high school PABS. For both of these reasons, tests of mediation should be conducted. More precisely, in this dissertation I address two research questions:

1. To what extent do high school PABS predict two and four-year college enrollment in a population of 10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> grade students?
  - a. *Hypothesis:* Commitment to college, goal striving, study skills, and academic self-confidence will positively predict college enrollment at both two and four-year colleges.
2. To what extent is the relationship between high school PABS and two and four-year enrollment mediated by high school GPA and standardized test scores of academic achievement?
  - a. *Hypothesis:* High school GPA and standardized test scores of academic achievement will mediate the relationship between PABS and two and four-year enrollment.

As previously mentioned, there are many ways to investigate the extent to which PABS influence high school and college students. However, the purpose of this dissertation is to delve into the literature of PABS, identify salient constructs, and analyze the extent to which PABS constructs predict two and four-year college enrollment. Because the aforementioned research questions are predictive in nature, they necessitate the application of a quantitative methodology that puts forward specific hypotheses, tests these hypotheses using inferential statistical analyses, and provides evidence that findings can be generalized to appropriate environments (e.g., high schools in the United States). In chapter three, I discuss the methodology in order to provide clarity regarding epistemological assumptions and measurement applications.

## Summary

The first chapter of this dissertation consisted of two parts. First, the college enrollment aspirational gap was declared a problem that merits further study, and PABS were put forward as potential variables that predict college enrollment at two and four-year postsecondary institutions. Second, predictor (PABS) and outcome variables (two and four year college enrollment) were defined and specific research questions were put forward. Chapter two will review (a) pertinent educational persistence (Bean, 1980; 1985, Tinto, 1975, 1993), motivational (Covington, 2000; Dweck, 1986; Eccles & Wigfield, 2002), and other theories, such as personality (e.g., Ashton & Lee, 2007; Pintrich, 1999; Poropat, 2009), that inform the selection of PABS constructs, (b) PABS constructs themselves, and (c) literature about predictors of two and four-year college enrollment, with an emphasis on barriers that prohibit college matriculation.



## CHAPTER 2

### LITERATURE REVIEW

The literature about how PABS influence educational outcomes is vast and spans multiple areas of study, but perhaps most notably education (e.g., Astin, 1977, 1984; Bean, 1980, 1985; Cabrera, Nora, Castañeda, & Hengstler, 1992; Elkins, Braxton, & James, 2000; Pascarella & Terenzini, 1991, 2005; Tinto 1975, 1993), psychology (e.g., Bandura, 1993; Brown & Lent, 2013; Covington, 2000; Dweck, 1986; Eccles & Wigfield, 2002; Erikson, 1963; Urda, 1997), and sociology (e.g., Coleman, 1961; 1966; Rosenbaum, Deil-Amen, & Person, 2007; Tinto, 1975, 1993), among other areas. Given this expansiveness, a comprehensive review of the literature about the influence of PABS on educational outcomes is not possible for the purposes of this dissertation.

The scope of this literature review is focused on the work of Robbins and colleagues (2004) and Le and colleagues (2005) who prioritized theories of educational persistence, motivation, and personality to guide the selection of PABS constructs. The theories summarized in Robbins and colleagues (2004) and Le and colleagues (2005) are emphasized because the measure of PABS used in this dissertation (e.g., Engage 10-12) is informed by the educational persistence, motivation, and personality literatures (Le et al., 2005; Peterson et al., 2006).

## **Outline**

Chapter two is organized in the following way. First, salient educational persistence theories that inform the selection of PABS constructs will be presented. Second, relevant theories of motivation that provide theoretical support for PABS constructs will be reviewed. Next, I discuss germane theories about personality and affective factors like anxiety that relate to PABS variables. Fourth, literature summarizing each PABS predictor variable is presented to enhance conceptual clarity, analyze relevant literature, and provide more specific definitions of each construct. Problematically, much of the research investigating PABS considers outcomes like GPA and college persistence and not college enrollment. To address this issue, literature investigating predictors of two and four year college enrollment is reviewed in part five. In part six I summarize each section of the literature review – theories, PABS constructs, and predictors of two-year and four-year college enrollment – and additionally synthesize this material to explicate why it is important to expand the study of PABS to two and four-year college enrollment.

### **Part One: Theories of Educational Persistence**

Two prominent educational persistence theories that inform PABS are Tinto's Student Integration Model (Tinto, 1975, 1993) and Bean's Model of Student Departure (Bean, 1980, 1985). Although Tinto (1975, 1993) and Bean (1980, 1985) both greatly influence scholars' understanding of PABS constructs, in this dissertation no single theory serves as an overarching framework for conceptualizing PABS. Instead, Bean

(1980, 1985), Tinto (1975, 1993), and additional theories of motivation and personality, are reviewed because they selectively inform PABS constructs.

**Tinto's Student Integration Model.** The Student Integration Model, which is informed by Durkheim (1951) and Spady (1970), focuses on factors that influence attrition, or a student's departure from college prior to graduating (Cabrera et al., 1992; Tinto, 1975, 1993). Tinto's theory is an "interactive model of student departure," whereby students separate from their previous environments (Elkins et al., 2000), matriculate to college with personal characteristics, and interact with academic and social factors within their universities (Pascarella & Terenzini, 2005, p.54; Tinto, 1993, p.112). For example, Tinto (1975, 1993) states that students matriculate to college with a host of personal attributes, skills, motivations, and individual characteristics that affect their "initial dispositions and intentions with respect to college attendance and personal goals" (Pascarella & Terenzini, 2005, p. 54). In turn, the match between a student's personal factors and an institution's academic and social environment influence overall persistence (Tinto, 1975, 1993).

Tinto (1975, 1993) states that a strong match between personal (e.g., academic abilities) and institutional characteristics (e.g., academic expectations) encourages the student to feel integrated with their college environment, which leads to feeling committed to his or her institution (e.g., institutional commitment) and to completing his or her degree (e.g., goal commitment) (Cabrera et al., 1992; Elkins et al., 2000). With high levels of institutional and goal commitment Tinto (1975, 1993) states that students will be less likely to drop out before graduating, although empirical tests of his model have yielded inconsistent results (e.g., Cabrera et al., 1992; Nora, 1987; Pascarella &

Chapman, 1983). While some researchers have found inconsistent results, Pan (2010) meta-analyzed data from over 30,000 students and concluded that critical elements of Tinto's theory – commitment (e.g., weighted effect size  $r = .19$ ) and academic integration (e.g., weighted effect size  $r = .15$ ) – lead to increased grades.

In the Student Integration Model, a poor match results in a lack of integration, less institutional and goal commitment, and higher rates of attrition (Pascarella & Terenzini, 2005). Overall, Tinto (1975, 1993) states that attrition is a function of how one's personal characteristics or "pre-entry attributes" differentially interact with "institutional experiences," or the institution's social and academic environments (Tinto, 1993, p. 114). Consequently, one's level of institutional and goal commitment ultimately guide attrition decisions (Cabrera et al., 1992).

***Salient PABS constructs.*** With the Student Integration Model, Tinto (1975, 1993) informs the selection of several PABS constructs. Perhaps most obvious is Tinto's (1975, 1993) emphasis on commitment to both an institution and to one's personal degree attainment, which both influence persistence and a student's departure decision (Cabrera et al., 1992; Elkins et al., 2000; Pascarella & Terenzini, 2005). Tinto (1973, 1993) also recognizes the influence of social integration on departure decisions via one's level of institutional and goal commitment. Historically, this factor has been especially influential on departure decisions (e.g., Pascarella & Chapman, 1983; Stoecker, Pascarella, & Wolfe, 1988).

Another PABS construct embedded within Tinto's model, although perhaps not as heavily emphasized, is a student's overall level of motivation to persist in college

(Cabrera et al., 1992). Motivation, along with background variables like initial dispositions about college, are examples of pre-entry “attributes” (Tinto, 1993, p. 114) that heavily affect a student’s level of commitment to college after matriculating. Finally, although more recent scholars investigating the influence of PABS on college outcomes (e.g., Allen et al., 2008; Allen et al., 2010; Le et al., 2005; Robbins et al., 2004) do not consider background characteristics such as SES to be PABS per se, Tinto (1975; 1993) called attention to the idea of characteristics like SES as relevant to college outcomes.

***Limitations and strengths.*** Tinto’s (1975; 1993) Student Integration Model has been criticized by several scholars (e.g., Attinasi, 1992; Elkins et al., 2000; Kraemer, 1997; Pascarella & Terenzini, 2005; Rendon, Jalomo, & Nora, 2000; Tierney, 1992). For example, Tinto’s theory has been criticized for failing to adequately address the role of ‘external factors’ like a student’s perceptions of college, financial stability, or pre-college parental support (Cabrera et al., 1992). Additionally, the applicability of Tinto’s (1975, 1993) model to traditionally underserved learning populations (e.g., African-American students, first-generation students, adult learners in college) has been questioned (e.g., Biggs, Torres, & Washington, 1998; Kraemer, 1997).

As demographics shift and increasing numbers of first-generation and traditionally underserved learning populations matriculate to college the merit of these criticisms will be tested and additional research will need to reexamine the applicability of Tinto’s (1973, 1995) model. Despite these criticisms, Tinto’s (1975, 1993) model has strong empirical support (e.g., Braxton, Sullivan, & Johnson, 1997) and is a foundational theory that informs PABS constructs. However, alternative conceptualizations of student

persistence have been offered (e.g., Braxton, 2000; Pascarella & Terenzini, 2005). One prominent alternative is Bean's (1980, 1982, 1985) Student Attrition Model.

**Bean's (1980, 1985) student attrition model.** Bean's (1980, 1985) Student Attrition Model, which is influenced by the organizational employee retention literature (e.g., Price, 1977), conceptualizes student attrition as somewhat similar to employee turnover (Bean, 1980). In his model, Bean (1982) states that behavioral intentions to either stay or leave college affect one's attitudes and beliefs about college (Cabrera et al., 1992). Additionally, behavioral intentions to stay or leave college are molded by a student's experiences with "organizational determinants" such as one's relationships with staff and faculty (Bean, 1980, p. 158) and environmental factors like family approval (Bean, 1982). Once shaped, Bean (1980, 1985) states that behavioral intentions are meaningful predictors of dropout decisions, and that these behavioral intentions develop through a complex interplay between one's attitudes, beliefs, and institutional characteristics. Bean's (1980, 1982) model stands out because it emphasizes the role external factors including finances and SES have on attitudes and decisions about college (Cabrera et al., 1992), which in turn inform behavioral intentions to stay or leave a university environment.

Although Bean (1980, 1985) and Tinto (1975, 1993) present distinct models of student persistence they share common elements. For example, Cabrera and colleagues (1992) contend that both Bean (1980, 1985) and Tinto (1975, 1993) believe student persistence is a complex process influenced by multiple variables over several years. Both theories stress that a student's overall compatibility with his or her college environment greatly influences college persistence and drop out decisions (Cabrera et al.,

1992). In this dissertation, each theory highlights psychosocial variables like institutional commitment, goal commitment, and social support as meaningful predictors of dropout decisions.

***Salient PABS constructs.*** While Tinto's (1975, 1993) theory emphasizes a student's overall academic and social integration in college and his or her corresponding institutional and goal commitment, Bean's (1980, 1982, 1985) model emphasizes institution fit, behavioral intentions, and one's attitudes towards college. Behavioral intentions, according to Bean's (1980, 1982, 1985) model, are produced by a complex interplay between organizational features (e.g., grades), environmental considerations (e.g., family approval), personal (e.g., goals) variables, and one's attitudes and beliefs about college. One of Bean's (1980, 1982, 1985) most significant contributions is his emphasis on the connection between psychosocial constructs like attitudes and beliefs and behaviors like dropping out. In this way, the Student Attrition Model provides two meaningful theoretical contributions that inform the selection of PABS constructs in this dissertation. First, his model identifies psychosocial constructs that can be considered PABS, like educational goals, institution fit, and attitudes about one's career. Second, Bean (1980, 1982, 1985) provides a means to conceptualize complex, interacting relationships between PABS constructs and behavioral intentions (Pascarella & Terenzini, 2005).

***Limitations and strengths.*** A notable strength of Bean's (1980, 1982, 1985) model is the emphasis of environmental factors on college persistence. In Bean's model, environmental variables are especially influential for non-traditional college students (e.g., Bean & Metzner, 1985b), which helped provide a theoretical rationale for

researchers to conceptualize college persistence in different ways for majority and non-majority populations. For example, Bean & Metzner (1985b) note that the persistence patterns of older, part-time students are more heavily affected by environmental variables than by social integration and socialization variables seen in Tinto's (1973, 1995) model. In addition to theories of educational persistence, PABS are also informed by psychological theories of motivation, many of which are summarized by Covington (2000), Eccles and Wigfield (2002), Dweck (1986, 1999), and Urdan (1997). Each of these theories will be discussed next.

## **Part Two: Theories of Motivation**

A student's motivation influences his or her academic achievement (e.g., Covington, 2000; Eccles & Wigfield, 2002; Dweck, 1999; Urdan, 1997). In his comprehensive review of the motivation literature, Covington (2000) summarized the connection between motivation and academic achievement as follows: "the will to continue learning depends closely on an interaction between the kinds of social and academic goals students bring to the classroom, the motivating properties of these goals and prevailing classroom reward structures" (Covington, 2000, p. 171).

In this section, salient theories within the motivation literature, especially those summarized by Covington (2000), Eccles & Wiggfield (2002), and Urdan (1997), are reviewed. Specific attention is dedicated to motivational theories such as "motives as drives" and "motives as goals," which inform the selection of PABS constructs used in this dissertation (Covington, 2000, p. 173). Similar to aforementioned theories of educational persistence, the following review of the motivation literature is not meant to



be comprehensive or to serve as an overarching theoretical framework for this dissertation. Reviewing the motivation literature identifies additional, relevant theories that inform PABS constructs.

**Motives as Drives.** According to Covington (2000), the motives as drives theory states there is an “internal state, need, or condition that impels individuals toward action” (p. 173). Stated differently, conflicts of internal physiological drive, emotions, or psychological states lead to individuals taking motivated actions directed toward a goal or to maintain a state of equilibrium (Covington, 2000; Le et al., 2005). Historically, the motivation as drive theory emphasized physiological conflicts as a basis for motivated actions, such as a need to meet homeostatic needs of hunger and thirst (Covington, 2000; Woodworth, 1918). For instance, when a person feels hungry (internal drive) they experience motivation to address this need by eating (motivated action) in order to feel satiated (satisfied need).

Over time, the motives as drives perspective evolved to consider conflicts of emotions like pride and shame (e.g., Covington, 2000; McClelland, 1961), and later psychological states (e.g., Covington, 2000) as a basis for motivated action in classroom environments. As such, a student’s sense of feeling hopeful to earn high grades (internal drive) produces achievement drive (He et al., 2005; McClelland, 1980), which in turn leads to actions like study skills to successfully complete academic commitments (satisfied need). Alternatively, a student’s fear of performing poorly in comparison to his or her peers (internal drive) could produce a sense of shame and elicit achievement drive to achieve comparably with classmates (Covington, 2000). The motives as drives theory of emotions has direct theoretical implications for specifying PABS constructs.

***Salient PABS constructs.*** The motives as drives theory informs PABS constructs. For example, when students experience a conflict of emotions, such as hope to perform well in school and concern about low performance compared to one's peers, they may experience heightened achievement drive (e.g., Atkinson, 1964; Le et al., 2005; McClland, 1980), or an increased sense of determination to perform well academically. Students who feel compelled to achieve comparably to their peers may apply study skills and demonstrate a sense of determination more regularly than peers who do not experience a similar level of achievement drive. Additionally, motives as drives theory contends that the manner in which a student balances conflicting emotions or psychological states informs his or her quality of achievement motivation (Atkinson, 1964; Covington, 2000). In this way, motives as drives theory informs PABS constructs by (a) establishing that achievement drive produces PABS constructs like study skills and general determination, and (b) identifying a mechanism that determines the quality of a student's overall achievement drive (Covington, 2000).

**Motives as Goals.** Whereas motives as drives theory focuses on one's need to satisfy an internal drive, the emphasis of motives as goals theory is on students' goals in relation to academic achievement (Ames, 1992; Covington, 2000). From this perspective, a student's goals influence his or her actions in school (Dweck, 1986; Elliott & Dweck, 1988). Covington (2000) describes *performance goals*, or "outperforming peers," (e.g., Covington, 2000, p. 174; Skaalvik, 1997) and *learning goals*, or "increasing one's competency," (e.g., Ames, 1992; Anderman & Midgley, 1997; Covington, 2000, p. 174; Dweck, 1986) as mechanisms of academic achievement. These different goal types help shape behaviors and students' self-regulation processes; that is, how students plan and

organize their time to successfully complete academic tasks and the extent to which students invest personal energy in the learning process (Kitsantas, Winsler, & Huie, 2008; Pintrich, 1999). This self-regulation process, coupled with the type of goals students possess, is often referred to as motives as goals (e.g., Covington, 2000), but is more formally called achievement goal theory (Ames, 1992; Covington, 2000, Urdan, 1997).

While much scholarly work stemming from achievement goal theory focuses on students' academic goals in relation to school performance, some scholars (e.g. Farmer, Vispoel, & Maehar, 1991; Mayer & Geher, 1996; Schneider, Ackerman, & Kanfer, 1996; Urdan, 1997) have investigated the intersections between effective interpersonal tendencies (e.g., working well with classmates, developing healthy friendships) and academic achievement and motivation (Covington, 2000). According to Schneider and colleagues (1996), individuals who are socially empowered (e.g., people who are gregarious, socially close, and agreeable with others) are better equipped to experience positive outcomes like academic achievement than persons who lack this sense of social empowerment. In turn, a sense of social belonging in one's academic environment promotes academic outcomes like grades and satisfaction with school. Likewise, persons who consistently engage and cooperate with others are similarly equipped to outperform peers who lack such prosocial goals (Covington, 2000; Schneider et al., 1996).

***Salient PABS constructs.*** Motives as goals theory informs multiple PABS constructs. Perhaps most obvious is goal striving, since a central tenet of motives as goals theory is that a student's academic goals, namely performance and learning goals (e.g., Dweck, 1986), influence his or her academic performance and self-regulation skills

(Ames, 1992; Covington, 2000). Additionally, motives as goals theory substantiates self-regulation skills, such as how students manage academic tasks and invest in the learning process itself (Covington, 2000; Pintrich, 1999). Prosocial goals also inform PABS constructs by calling attention to the importance of communication skills in academic contexts, such as effectively resolving conflicts with others and showing attention to others' feelings. In addition to motives as drives and motives as goals theories, expectancy theories of motivation inform the selection of PABS constructs (Dweck, 1986; 1999; Eccles & Wigfield, 2002; Le et al., 2005).

**Expectancy theories of motivation.** According to Eccles & Wigfield (2002), expectancy theories of motivation revolve around one's answer to an important question: am I able to successfully complete a particular task? (p. 110). Several prominent expectancy theories, such as social cognitive theory (Bandura, 1997; Eccles & Wigfield, 2002) and locus of control theory (e.g., Rotter, 1966), reveal that persons who believe they can successfully complete tasks generally perform at higher levels than persons without such beliefs (Bandura, 1997; Bandura, Barbaranelli, Caprara, & Pastorelli, 2001; Eccles & Wigfield, 2002).

One's self-belief to successfully complete tasks is referred to as perceived self-efficacy (Bandura, 1997; Bandura et al., 2001). Self-efficacy is a multidimensional construct that comprises one part of Bandura's (1997) seminal social cognitive theory. Social cognitive theory is primarily a learning theory positing that learning occurs within a social context and depends, in addition to self-efficacy, on observational learning, outcome expectations, goal setting, and self-regulation, all of which reciprocally interact with a student's environment (Bandura, 1997; Eccles & Wigfield, 2002). Of these areas,

self-efficacy, goal setting, and self-regulation inform PABS constructs; for example, self-efficacy informs general determination and academic self-confidence, goal setting informs goal striving, and Bandura's (1997) emphasis on learning engagement provides theoretical justification for the self-regulation domain (Eccles & Wigfield, 2002; Le et al., 2005; Peterson et al., 2006).

In addition to social cognitive theory, Rotter's (1966) locus of control theory affects self-belief about one's capability to complete academic tasks. More specifically, locus of control theory focuses on the extent to which a person believes he or she controls a situation, called internal locus of control, or if situational forces dictate outcomes, called external locus of control (Rotter, 1966). As Eccles & Wigfield (2002) summarize, maintaining internal locus of control generally promotes motivation to complete academic tasks and leads to greater perceived self-competence. As such, PABS constructs like determination, commitment, and goal striving are informed by internal locus of control, which correlates with intrinsic motivation (Deci & Ryan, 1985; 1999), or gaining motivation via authentic, internal enjoyment of an academic task itself. According to Deci & Ryan (1985; 1999), intrinsic motivation contrasts with extrinsic motivation, or a desire to engage in academic tasks due to external rewards or recognitions (e.g., wanting to perform well in school exclusively to earn high grades). Beyond theories of educational persistence and motivation PABS are also informed by the personality literature.

### **Part Three: Theories of Personality**

There is a considerable support for the notion that personality encompasses a specific set of constructs (e.g., Le et al., 2005; Poropat, 2009). These constructs are typically referred to as the big five and include openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism (e.g., McCrae & Costa, 1987). More recently, a sixth factor, honesty-humility, emerged in the literature and formed a basis for the HEXACO model, which is seen as a viable alternative to the traditional big five model (Ashton & Lee, 2007).

A notable strength of the HEXACO model is its broad applicability and cultural inclusiveness, as the honesty-humility factor was originally documented in non-Western societies and has since been replicated in predominantly Western samples (Ashton & Lee, 2007). Of these six factors, researchers have found that conscientiousness, agreeableness, and neuroticism are linked to traditional work and educational outcomes, with conscientiousness, agreeableness, and openness generally leading to positive outcomes like school and academic performance (Poropat, 2009; McAbee & Oswald, 2013). Alternatively, neuroticism is generally predictive of negative outcomes (Laidra, Pullmann, & Allik, 2007). Informed by these findings, conscientiousness, emotional stability, and agreeableness were considered in original scale development for the Engage measure (Le et al., 2005). Additional affective components, like management of test anxiety, also inform PABS constructs (e.g., Le et al., 2005; Pintrich, Smith, Garcia, & McKeachie, 1993) and are reflected in the “steadiness” scale of Engage.

In this dissertation PABS are informed by theories of educational persistence, motivation, personality, and affective factors. While these theories provide a lens through which to understand and anticipate how PABS constructs contribute to positive educational outcomes, they are admittedly broad and at times have overlapping components (Le et al., 2005). To address this limitation and enhance conceptual clarity, relevant empirical literature is reviewed to explicate and substantiate each PABS construct as relevant to positive educational outcomes.

#### **Part Four: PABS Constructs**

**Academic discipline.** In this dissertation, academic discipline is, “the amount of effort a student puts into schoolwork and the degree to which a student sees him-/herself as hardworking and conscientious” (ACT, Inc., 2015b, p.47). Underlying this definition is the personality trait conscientiousness, which Le and colleagues (2005) described as, “the extent to which a student is self-disciplined, achievement oriented, responsible, and careful” (p. 487).

Considerable research supports the notion that students who genuinely perceive themselves as hard working and who authentically put forward effort to complete academic tasks experience improved educational outcomes like persistence and high GPAs (e.g., Allen et al., 2008; Lounsbury, Saudargas, & Gibson, 2004; McAbee & Oswald, 2013; Poropat, 2009; Robbins et al., 2006; Robbins et al., 2004). In fact, Robbins and colleagues (2006) analyzed over 14,000 participants and found that academic discipline as measured by Engage predicts first-year academic performance in college after controlling for standardized test scores of academic achievement and other

PABS constructs. All of this research highlights the important role of academic discipline on students' academic achievement and persistence in college.

In his 2009 study, Poropat meta-analyzed data from over 65,000 participants and found that conscientiousness ( $\rho = .22$ ;  $d = .46$ ), agreeableness ( $\rho = .07$ ;  $d = .14$ ), and openness to experience ( $\rho = .12$ ;  $d = .24$ ) significantly correlated with academic performance. More striking, Poropat (2009) found the correlation between conscientiousness and secondary academic performance to be independent of intelligence. This finding highlights the importance of students' academic discipline in predicting positive educational outcomes. Further, Poropat (2009) demonstrated that many students who see themselves as hardworking and who put forward consistent, authentic effort experience higher persistence rates and elevated GPAs. Poropat's (2009) finding is especially interesting because it isolates academic discipline, and the corresponding trait of conscientiousness, as a variable that incrementally contributes to academic outcomes beyond raw intellect.

In 2000, Tross, Harper, Osher, and Kneidinger studied how one's personality, high school GPA, and standardized test scores of academic achievement predicted college academic performance and retention. With a sample of 844 first-year college students from the United States (84.6% White), Tross and colleagues (2000) used forward variable, stepwise multiple regression and found that conscientiousness explained significant, incremental variance (7%) above and beyond high school GPA and standardized tests of academic achievement. Using a mediation model, Tross and colleagues (2000) also found that conscientiousness directly and indirectly predicted college retention by influencing college GPA. In combination with research from Poropat



(2009), these researchers suggest that in many cases one's overall level of conscientiousness and willingness to work hard in school predict academic outcomes like grades.

**Commitment to college.** Commitment to college is defined as, "one's commitment to staying in college and getting a degree" (ACT, Inc., 2015b, pgs. 46-49). More specifically, commitment to college is characterized by a person's overall satisfaction with and attachment to their college environment (Robbins et al., 2004, p. 267). Many scholars have found that a strong sense of commitment during college predicts a variety of positive outcomes like retention (e.g., Cabrera, Nora, & Castañeda, 1993; Davidson, Beck, & Milligan, 2009; Robbins et al., 2004; Robbins et al., 2006), earning a high GPA (e.g., Kluger & Koslowsky, 1988; Robbins et al., 2004) and performing well during a summer internship (Gault, Leach, & Duey, 2010). Additionally, previous research with the Engage measure by Allen and colleagues (2008) analyzed 6,800 college students and found that college commitment directly and positively predicted college retention ( $\beta = .150, p < .01, p.657$ ). These findings highlight the positive influence satisfaction with and attachment to a college environment can have on educational outcomes. When students feel committed to and invested in their college environments, they are more likely to stay in school, enjoy classes, earn satisfactory grades, and develop job-relevant skills by securing and performing well in internship opportunities.

**Communication skills.** Communication skills also correlate with academic success (McCroskey, Booth-Butterfield, & Payne, 1989; Robbins et al., 2004).

Specifically, students who adeptly share thoughts and feelings with others, cogently

express ideas to peers and supervisors, and who effectively collaborate (ACT, 2015b) are better equipped to succeed in academic environments than peers without such skills.

Arguably, the value of communication skills for educational success is intuitive, and most college graduates would likely agree that the ability to clearly, verbally express thoughts and ideas is important for many academic tasks (e.g., group projects and presentations). Moreover, researchers find that communication skills predict retention in college (e.g., Hawken, Duran, & Kelly, 1991) and promote students' likelihood of forming close relationships during college (e.g., Rubin, Graham, & Mignerey, 1990). For example, Rubin and colleagues (1990) investigated communication skills in fifty college students over the course of four years and found that completing a communication skills class during high school significantly predicted GPA in college four years later. The generalizability of this study is limited due to a small sample size and limited statistical power, but the findings complement additional literature about the importance of communication skills in relation to persistence and grades (e.g., Hawken et al., 1991; McCroskey et al., 1989; Robbins et al. 2004).

**General determination.** General determination is defined as “the extent to which one strives to follow through on commitments and obligations” (ACT, 2015b, p. 46). This construct is characterized by a student's tendency to follow through or take actions that reflect his or her overall commitment to completing school tasks. A student who is generally determined not only feels committed to his or her school, but also strives to complete academic tasks like following through on assignments and equitably contributing to group projects. Consequently, peers and teachers may perceive students

without general determination as undependable, whereas generally determined students are more likely to be seen as reliable (ACT, 2015b).

In a sample of over 14,000 participants at 48 different postsecondary institutions, Robbins and colleagues (2006) found that general determination, as measured by Engage, predicted first year GPA ( $\beta = .15$ ) in college. However, the strength of this relationship decreased when general determination was analyzed jointly with other PABS constructs like academic discipline (Robbins et al., 2006). This could be because both academic discipline and general determination are informed by the personality trait conscientiousness (Le et al., 2005; Robbins et al., 2006), but it could also suggest that academic discipline is a more robust predictor of GPA than general determination. The findings of Robbins and colleagues (2006) in conjunction with additional literature (e.g., Casillas et al., 2015; Le et al., 2005) illustrate the salience of general determination in predicting first-year GPA.

**Goal striving.** Goal striving is defined as, “the strength of one’s efforts to achieve objectives and end goals” (ACT, 2015b, p. 47). In this dissertation, a student high in goal striving has clear academic goals (e.g., graduating from high school, matriculating to a postsecondary institution), puts forward consistent effort to achieve those goals, and feels confident in his or her ability to attain those goals. Conversely, a student who is low in goal striving is uncertain of his or her academic goals, fails to work toward those goals perhaps due to a lack personal of understanding, and lacks sufficient confidence to establish goals that are personally meaningful. The importance of academic goals is well documented, and it is clear that students who set academic goals, understand and work toward those goals, and are confident in their ability to attain their goals are more likely

to persist through college and attain high GPAs (e.g. Robbins et al., 2004). Additionally, goals have been empirically connected to outcomes like career exploration and planning (Rogers, Creed, & Glendon, 2008; Rogers & Creed, 2011), positive affect (Haase, Heckhausen, & Köller, 2008), vocational identity achievement (Turner et al. 2006), self-reported learning among business students (Beenen & Mrousseau, 2010) and improved decision-making skills (Creed, Fallon, & Hood, 2009).

In 2006, Robbins and colleagues found that goal striving, as measured by ACT's Engage measure, predicted both first-year GPA and retention at two and four year colleges. They also found that academic discipline appeared to be the most robust predictor of these outcomes. In another study, Richardson and colleagues (2012) meta-analyzed thirteen studies and over 2,500 participants and found a correlation between grade goals and GPA to be .35 (p. 371), suggesting a medium effect of goals on one's academic achievement. In this meta-analysis, grade goal was defined as "one's self-assigned goal standard [for college GPA]" (p. 357). All of this research suggests that students with clear academic goals experience positive academic outcomes like high GPAs more regularly than peers who do not set such goals.

**Study skills.** Study skills are defined as "the extent to which students believe they know how to assess an academic problem, organize a solution, and successfully complete academic assignments" (ACT Inc., 2015b, p. 47). For example, students who apply effective study skills take interpretable, organized notes during classes, efficiently read, understand, and follow directions on academic assignments, and outline important components of academic tasks prior to beginning. Conversely, students who do not engage in effective study skills behaviors are generally unprepared to take interpretable,

accurate notes during class, struggle with comprehending and following directions, and inconsistently complete academic assignments in the allotted time.

In their meta-analysis, Robbins and colleagues (2004) analyzed 33 studies and over 16,000 participants and found that study skills predicted GPA in college ( $r = .129$ ,  $\beta = .264$ ). Specifically, Robbins and colleagues (2004) stated that study skill behaviors “were found to have relatively high beta weights, indicating that they can be valuable predictors of retention, equal to or even better than the other traditional predictors (SES, high school GPA, and ACT/ SAT)” (p. 273). Additional researchers have investigated the relationship between study skills (Aaron & Skakun, 1999) and related constructs like study motivation (Melancon, 2002) and attitudes (Credé & Kuncel, 2008; Zimmerman, Parks, Gray, & Michael, 1977). In their meta-analysis, Credé and Kuncel (2008) examined over 6,200 subjects from 13 studies and found the observed correlation ( $\rho$ ) between admission test scores (e.g., ACT) and study skills was .23 (p. 437). Study skills were claimed to “explain significant and meaningful variance in college academic performance above and beyond that explained by admissions criteria such as HSGPA and SAT/ACT scores” (Credé & Kuncel, 2008, p. 437).

**Social activity.** Social activity is defined as “comfort in meeting and interacting with other people” (ACT, Inc., 2015b, p. 48). In this dissertation, students scoring low in social activity are less likely to participate in extracurricular opportunities and clubs with other people, may regularly feel nervous, and are more likely to feel isolated in comparison to students who interact with peers in social settings on a more regular basis. Conversely, students high in social activity are more likely to engage their peers and participate in personally meaningful extracurricular activities or clubs. Although a

sizeable body of research supports the positive influence social activity and interpersonal skills have on academic outcomes (e.g., DiPerna & Elliott, 1999; Farrington et al., 2012; Robbins et al., 2004; Robbins et al., 2006; Robu, 2013), much of this literature confounds social activity with other psychosocial constructs. Thus, it is difficult to isolate the incremental effects of social activity from other non-cognitive variables (Farrington et al. 2012).

While the incremental influence of social activity on GPA and persistence is somewhat unclear, there is general consensus amongst researchers that some participation in social activities predicts positive academic outcomes (Eccles, Barber, Stone, & Hunt, 2003; Robbins et al. 2004). In 2008, Kuh, Cruce, Shoup, and Kinzie analyzed data from over 6,000 college students and found that participating in at least six hours of co-curricular activity per week significantly predicted second year retention in college (OR = 2.077,  $p < .001$ ). In their study, Kuh and colleagues (2008) concluded that “student engagement in educationally purposeful activities is positively related to academic outcomes as represented by first-year student grades and by persistence between the first and second year of college” (p. 555).

Conversely, Robbins and colleagues (2006) found that social activity, as measured by the Engage measure, had little effect on GPA and no effect on retention when considered in isolation of other PABS. More specifically, Robbins and colleagues (2006) concluded that “students who engage in too little or too much social activity are likely to see diminished academic performance” (p. 613). Overall, social activity generally encourages positive academic outcomes, but the strength of this relationship is

influenced by the amount of time a student dedicates to social activities and the type of activity itself (e.g., extracurricular activities or clubs).

**Social connection.** Social activity and social connection are related but unique constructs. While social activity involves one's level of comfort in meeting new people and participating in social activities, social connection is defined as "one's feelings of connection and involvement with the school community" (ACT, Inc., 2015b, p. 48). When college students feel connected to their university they are more likely to feel a sense of belongingness on campus, form meaningful relationships with peers and professors, and feel involved with activities that complement their interests. On the other hand, students who do not feel connected to campus are less likely to be involved with campus groups, don't feel like part of their college's overall community, and are more likely to transfer or drop out (Robbins et al., 2004).

Several studies demonstrate that social connection predicts academic performance and college retention. In 2008, Allen and colleagues found that social connectedness had a direct predictive relationship with third-year retention ( $\beta = .152, p < .01, p. 609$ ). Robbins and colleagues (2006) also found that social connection predicted retention; specifically, they found that a student's odds of retention increased by a factor of 1.2 per standard deviation increase in a student's social connection score. More broadly, the effects of social integration (e.g., Berger & Milem, 1999; Robbins et al. 2004), socialization (e.g., Cable & Parsons, 2001; Perrot et al., 2014; Saks, Uggerslev, & Fassina, 2007), and student friendships (e.g., Bowman & Denson, 2014) on positive educational and work outcomes are well documented at the high school, postsecondary, and workforce levels.

**Academic self-confidence.** Academic self-confidence is defined as “the belief in one’s ability to perform well in school” (ACT, Inc., 2015b, p.48). Students high in academic self-confidence genuinely believe they will efficiently learn academic material, perform well in school, and achieve outcomes like high GPAs. Students without such confidence frequently believe they will perform poorly in school, may be more likely to struggle achieving high GPAs, and are less likely to persist through their college education.

Perhaps the most significant PABS construct underlying academic self-confidence is the multidimensional construct self-efficacy (e.g., Bandura, 1993, 1997, 2001; Lent, Brown, & Hackett, 1994). Many scholars have illustrated the positive influence of self-efficacy on a wide variety of career and education outcomes at the elementary school, middle school (e.g., Bandura et al., 2001; Hirschi, 2011), high school (e.g., Diseth, Danielsen, & Samdal, 2012), college (e.g., Brown et al., 2008; Chemers, Hu, & Garcia, 2001; Lent et al., 2001) and workforce levels (e.g., Abele & Spurk, 2009). Across the career continuum, self-efficacy is one of the most heavily studied psychosocial constructs and has been investigated in academic (Bandura, 2001; Diseth et al., 2012), career decision-making (e.g., Choi et al., 2012) and workforce contexts (e.g., Brown, Cober, Kane, Levy, & Shalhoop, 2006; Guan et al. 2014), among others. However, this dissertation prioritizes academic self-efficacy, as this form of self-efficacy is most directly applicable to academic self-confidence.

In their 1991 study, Multon, Brown, & Lent (1991) meta-analyzed data from 18 samples and over 1,190 participants and found the unbiased effect size estimate between academic self-efficacy and persistence in college to be .34 (p. 34). More recently, Diseth



and colleagues' (2012) used path analysis to determine that academic self-efficacy predicted achievement level ( $\beta = .42, p < .01$ ) and academic performance ( $\beta = .24, p < .01$ ) in a sample of 240 eighth, ninth, and tenth grade students (p. 346). Taken together, these studies offer evidence that academic self-confidence and self-efficacy are predictors of positive educational outcomes like academic achievement and persistence.

**Steadiness.** Steadiness is defined as “one’s responses to and management of strong feelings” (ACT, Inc., 2015b, p. 49). In this dissertation, persons with high and low steadiness scores may report diminished GPAs and be more likely to drop out of school. For example, persons with high steadiness scores may attempt to over-control feelings of stress and anxiety and consequently feel unable to appropriately cope with challenging emotions and stressful situations that can occur in postsecondary environments. On the other hand, students scoring low in steadiness may be unable to appropriately control stress and anxiety and may feel easily overwhelmed, which could contribute to diminished academic performance. Students with balanced steadiness scores between the “high” and “low” composite values are most likely to respond to emotional stressors in a way that promotes their academic development.

Many scholars have studied the influence of emotional control on academic and work outcomes (e.g., MacCann, Fogerty, Zeidner, & Roberts, 2011; Judge & Bono, 2001; Stringer, Kerpelman, & Skorikov, 2012). In 2001, MacCann and colleagues found that effectively coping with challenging emotions predicted GPA in a sample of high school adolescents ( $\beta = .28$ ). With a sample spanning high school students to adults in the workforce, Stringer and colleagues (2012) reported that emotional stability negatively predicted career indecision ( $\beta = -.25$ ). At the workforce level, Peter and colleagues

(2009) found that adults who reported high levels of emotional control also reported higher levels of job search intensity ( $\beta = .23$ ). In addition to Peter and colleagues (2009), other researchers have highlighted the significance of steadiness on job satisfaction and job performance at the workforce level.

In their 2001 meta-analysis, Judge and Bono analyzed 274 correlations and over 7,500 subjects and determined the correlation between job satisfaction and emotional stability (e.g., low neuroticism) was .24 ( $\rho = .24$ ). In the same meta-analysis, Judge and Bono (2001) determined the correlation between emotional stability and job performance was .19, stating that emotional stability was “among the best dispositional predictors of job satisfaction and job performance” (p. 80). Some scholars suggest these relationships are artificially low, and that in reality the correlations between emotional stability and job performance and satisfaction are higher (Judge, Van Vianen, & De Pater, 2004). This is because it is believed that emotional stability is measured in different ways by different researchers and that emotional stability may be one part of a broader construct called core-self evaluations (Judge et al., 2004), along with self-esteem (e.g., Rosenberg, 1965), generalized self-efficacy, and locus of control. All of this research suggests that steadiness, or one’s ability to manage strong feelings, robustly predicts positive education and work outcomes at high school, postsecondary, and workforce levels.

**Summary.** So far, I have reviewed the following segments of the literature: (1) salient educational persistence theories, (2) theories of motivation, and (3) personality theories that inform the selection of PABS constructs. In addition, I reviewed extant literature about each PABS predictor variables in Engage to enhance conceptual clarity,

analyze relevant literature, and provide contextualized definitions of each construct. In part five, I explore literature about college enrollment.

### **Part Five: College Enrollment**

Many scholars have studied factors that predict college enrollment (e.g., Coleman, 1988; Engberg & Wolniak, 2010; Erdman, 1983; Hurtado, Inkelas, Briggs, & Rhee, 1997; Kena et al., 2015; Perna, 2000; Perna, 2006; Perna & Thomas, 2009; Perna & Titus, 2005; Ross et al., 2012). I review predictors of college enrollment and dedicate special attention to barriers that diminish rates of college enrollment for traditionally underrepresented racial and ethnic minority populations. In addition to barriers, additional factors that increase one's chances of college enrollment are reviewed, such as taking a rigorous high school curriculum, earning a high GPA, and performing well on standardized tests like the ACT (Engberg & Wolniak, 2010).

**Predictors of college enrollment.** In 2015, over 20,000,000 students enrolled in a two-year or four-year college or university in the United States (United States Department of Education, 2015). When deciding where to apply, many students consider factors like a school's location, size, reputation/prestige, the quality of the academic programs, and/or their parents' or counselors' recommendations (Erdman, 1983). Additionally, college enrollment is heavily influenced by cost and personal or family income (Perna & Titus, 2005; Plank & Jordan, 2001), level of academic achievement (e.g., prerequisite grades/test scores; Engberg & Wolniak, 2010; Perna & Titus, 2005), personal preferences (e.g., social or religious atmosphere), a student's high school

context (e.g., Engberg & Wolniak, 2010), one's gender (e.g., Ross et al., 2012), and/or racial membership (e.g., Kena et al., 2015).

As family income increases, students are more likely to enroll at both two and four year colleges (Perna & Titus, 2005; Plank & Jordan, 2001), although this effect may be stronger at four-year colleges (Engberg & Wolniak, 2010). In 1997, Hurtado and colleagues found that students in low-income families typically applied to fewer colleges, and that students with higher SAT scores typically applied to more colleges than peers with lower SAT scores. Perhaps not surprisingly, students from high-income families who seek to attend four-year institutions are more likely to immediately enroll in college than students from low or middle-income families (Kena et al., 2015).

Overall, rates of immediate college enrollment – or enrolling in college the fall after graduating high school – “increased from 60 percent [of graduating high school seniors] in 1990 to 66 percent in 2013; however, this rate has decreased in recent years—down from 70 percent in 2009” (Kena et al., 2015, p. 184). This decreasing trend in recent years is especially problematic because Adelman (2006) found that entering college immediately after high school increased eventual bachelor's degree completion by approximately 21%. Additionally, students who are able to apply for financial aid (Plank & Jordan, 2001) and receive Pell (Bettinger, 2009) or merit grants (Kuh et al., 2008; St. John, Hu, Simmons, Carter, & Weber, 2004) are more likely to enroll and persist through their postsecondary experiences.

For many students, earning high grades and participating in a rigorous academic program in high school relates to sending a higher number of college applications

(Hurtado et al., 1997), as is taking courses in mathematics (Engberg & Wolniak, 2010; Perna & Titus, 2005). In regards to preferences, students who emphasize a college's overall academic reputation will likely send more college applications than peers who place less emphasis on academic reputation, perhaps because of lower acceptance rates at colleges and universities that are deemed to be prestigious (Hurtado et al., 1997).

High school students with family and friends who want them to attend college are more likely to enroll, pointing to the powerful influence family and friends can have on students' postsecondary choices (Coleman, 1988; Engberg & Wolniak, 2010; Perna & Titus, 2005). However, it is important to note that students who report having parents who are highly involved at their high school are more likely to enroll at four-year colleges, but less likely at two-year colleges (Engberg & Wolniak, 2010; Lowman, 2014). Similarly, students who are forced to move multiple times (Perna & Titus, 2005) and students who do not have conversations with parents about their post-high school plans (Engberg & Wolniak, 2010) are less likely to immediately enroll in college after graduating high school.

In addition to family income, level of academic preparedness, preferences, and school context, there are also established gender and racial differences in college enrollment. In their *Condition of Education 2015* report, Kena and colleagues (2015) found that the percentage of high school completers who enrolled in two or four-year colleges the fall after high school completion varied by gender. In every year since 1990 more women enrolled in college than men and it is apparent that “females participate and persist in education at higher rates than their male counterparts” (Ross et al., 2012, p. iii). Kena and colleagues (2015) predict this pattern will continue well past the year 2024. It is

also well known that rates of college enrollment differ by racial group, with 80% of Asian students enrolling, followed by Caucasian (67%), Latino (66%), and African-American (56%) students (Kena et al., 2015, p. 187). Hurtado and colleagues (1997) found that Asian-American students reported the highest aspirations for a graduate education (46.8%), followed by African-Americans (34.6%), Caucasians (31.5%), and Latino students (30.5%) (p. 51).

Hurtado and colleagues (1997) also found that after excluding “students who did not submit college applications in the 12th grade and controlling for family background, ability, and college preferences...students of color tend to submit somewhat more applications to college than white students” (p. 56). It is also known that race alone “does not influence college enrollment generally” (Engberg & Wolnniak, 2010, p. 148), and that, “after controlling for factors such as high school course taking among National Education Longitudinal Study (NELS) sample members, gender and race [are] *not* associated with the completion of a 4-year college degree” (Ross et al., 2012, p. 83). These findings highlight an interesting discrepancy: fewer African-American and Latino students are enrolling in postsecondary environments the fall after graduating high school than White students, yet some African-American and Latino students have been shown to send more college applications than their White peers. This discrepancy, in combination with the findings of Engberg and Wolnniak (2010) and others, suggests that factors besides race and ethnicity are primarily responsible for explaining differences in college enrollment across these different populations (Perna & Titus, 2005). To better understand these discrepancies, barriers that reduce rates of postsecondary enrollment for African-American and Latino populations are described.

Many terms are used to describe different racial and ethnic groups in the United States. For example, terms such as African American, Alaska Native, American Indian, Asian, Asian American, Black, Caucasian, Hispanic, Latino, Pacific Islander, and White, among others, are frequently used. Problematically, these terms are frequently conflated, used incorrectly, or improperly defined, which makes interpreting statistics about rates of college enrollment across racial and ethnic populations challenging. Each of these groups, and others that are not listed, are distinct racial or ethnic populations with unique histories that face particular and sometimes similar barriers that influence rates of college enrollment. In this dissertation, it is not possible to comprehensively review all barriers that differentially influence the rates of college enrollment for each of these groups. Instead, examples of salient barriers that diminish rates of college enrollment for traditionally underrepresented racial or ethnic populations at postsecondary institutions in the United States (e.g., African American, Latino, Hispanic) are reviewed. This review does not intend to identify all barriers influencing college enrollment patterns of African American, Latino, and Hispanic populations, but instead provides the reader with context about the types of barriers that diminish rates of college enrollment for these populations.

**Barriers.** Many barriers affect postsecondary enrollment patterns of traditionally underrepresented college student populations (e.g., Albert & Luzzo, 1999; Ali & Saunders, 2006; Hurtado et al., 1997; Luzzo & McWhirter, 2001; McWhirter, 1997; Perna & Thomas, 2009). In 2005, Perna and Titus' cogently summarized several barriers that influence the enrollment patterns of African-American and Hispanic populations:

African Americans and Hispanics not only possess fewer of the types of capital that promote college enrollment but also attend schools with fewer of the resources that promote college enrollment. Specifically, descriptive analyses show that African Americans and Hispanics not only average lower levels of family income, parental education, and math coursework than Whites and Asian Americans average but also are relatively concentrated in schools in the lowest quartiles of average family income and parental education (p. 509).

For some high school students from high-income families, the process of applying to college is somewhat pre-determined. This means that many students with privileged identities are not faced with questions about *whether* they will attend college, but instead work to discover *which particular institution* they will attend (Tierney, 2009). Applying to and enrolling in college is much different for some minority students, some of whom are from low-income families seeking admission to predominantly White institutions. Tierney (2009) summarizes the process of applying to college for three 17 year-old male Latino youth when he states:

Unlike their well-off counterparts who apply to college in the fall and know that they will go somewhere when the applications have been sent, low-income students face unique challenges that extend the process in a manner entirely different from the wealthy...issues such as where to go to college, how to pay for college, how to prepare for college, and even whether to go to college are commingled and nonlinear. Such an interpretation helps us think through issues about how to approach



college-going in a manner different from those who think that what one merely needs to do is duplicate what takes place in well-off schools and the poor will attend college...college-going is a cultural interpretation circumscribed by constantly shifting forces and events rather than a rational choice made by fully informed actor (p. 94).

Many barriers that influence college enrollment also relate to students' experiences during college. In their article investigating obstacles faced by college students who are African-American women, Henry, Butler, and West (2011) wrote about barriers that impede college retention. For instance, socio-political forces like racism, sexism, and classism all produce negative consequences for African-American women who seek to enter and persist through college at pre-dominantly White colleges. These consequences include receiving racist and sexist micro-aggressions (Henry et al., 2011; Sue et al., 2007), feeling socially isolated (Allen, 1992; Henry et al., 2011), being reluctant to seek help (Schwitzer, Griffin, Kancis, & Thomas, 1999), experiencing challenges with self-concept because of stereotypes (Emerson, 2002), and challenges related to identity development at predominantly White institutions (e.g., Allen, 1992; Cross, 1991; Watt, 2006).

In their 2007 study, McWhirter, Torres, Salgado and Valdez examined perceived barriers to postsecondary educational plans of 140 Mexican-American and 296 White high school students. McWhirter and colleagues (2007) found that Mexican-American high school students reported more perceived barriers about ability (e.g., possessing skills and confidence to succeed academically in college) and overall preparedness and motivation (e.g., study skills, understanding one's academic interests) for college in

comparison to White students. McWhirter and colleagues (2007) concluded that, “Mexican American students anticipated encountering more internal and external barriers to pursuing postsecondary education, and expected those barriers to be more difficult to overcome, than their White counterparts” (p. 135). Likewise, in a 1997 study, McWhirter analyzed over 1,100 Mexican-American and White high school juniors and seniors and found that Mexican-American students reported significantly more career barriers than White students.

In their 2005 meta-analysis, Fouad and Byars analyzed data from over 19,500 participants and concluded that racial and ethnic minorities reported experiencing higher levels of career barriers and fewer overall career opportunities when compared to White participants ( $g = .375$ ,  $p < .02$ , 95% CI = .06, .69). In this meta-analysis, examples of barriers included feeling harassed at work or school, feeling like one doesn't belong in postsecondary environments, a perceived lack of academic ability, and experiencing negative attitudes about college from family (McWhirter, 1997). Taken together, this research suggests that non-White high school students report experiencing disproportionately higher rates of barriers than White students due to lacking financial and social support, lower levels of parental education, familial expectations and attitudes, exposure to racism, insufficient academic preparedness, and a lack of self-knowledge about interests, among other reasons. All of these barriers influence rates of college enrollment for non-White high school students and help explain meaningful portions of the college aspiration gap.

**Summary.** In part five of chapter two, I reviewed predictors of college enrollment and barriers that disproportionately diminish rates of college enrollment for

marginalized populations. Many factors, such as location, size, cost, academic quality, and recommendations from family, friends, and counselors, may influence where a high school student decides to apply to college (Erdman, 1983). But the process of applying to college – and eventually enrolling – is oftentimes a complicated, non-linear process for many students, perhaps especially for adolescents who lack social and financial capital (Lowman, 2014; Tierney, 2009).

In isolation of other variables, race is not a strong predictor of college enrollment. This is partly because barriers like institutional racism, negative attitudes in one's family, a lack of perceived belongingness in school environments, and poor financial and social capital diminish rates of enrollment for African-American and Hispanic students in comparison to White students (e.g., Engberg & Wolniak, 2010; Lowman, 2014). Gender is also not a singularly robust predictor of enrollment, but for several decades females have matriculated to postsecondary environments at higher rates than males. Moreover, family income is clearly related to eventual college enrollment for many students (Kena et al., 2015; Ross et al., 2012). Perhaps not surprisingly, students who are not prepared to succeed academically in college, as indicated by low GPAs and standardized test scores, are less likely to enroll and succeed in postsecondary environments (Hurtado et al., 1997; Perna & Titus, 2005).

Despite years of research investigating predictors of college enrollment, discrepant rates of college matriculation between races and genders persist and the aspirational gap continues to be a meaningful problem. Although much of this research acknowledges the importance of psychosocial factors like social support and belief in one's capability to perform academically in college, the broader educational and

psychological literatures lack a sufficient empirical basis to explain the extent to which PABS influence college enrollment at two and four year colleges. In part six, sections one through five of chapter two are synthesized to explicate why it is important to study the impact of PABS on college enrollment.

### **Part Six: Conclusion**

To date, much research involving PABS considers criteria like persistence or retention and college GPA. Persistence and college GPA are clearly significant outcomes in college, but there are additional criteria to consider when using PABS as predictor variables, such as postsecondary enrollment. Indeed, before a student can persist through college and earn a high GPA he or she must first enroll. College enrollment is a particularly important outcome variable to study because a significant number of high school students who aspire to attend a postsecondary institution never actually enroll. As demand for postsecondary education increases across the globe, it is likely that a majority of high school students will continue to report a desire to attend college.

Knowing whether and how PABS variables predict college enrollment at different types of postsecondary institutions could shed light on which PABS behaviors are most important for students to master. Although some scholars have investigated how psychosocial and cultural factors predict enrollment (e.g., Engberg & Wolniak, 2010), more research is needed to operationalize motivational, self-regulatory and social engagement variables, and to investigate how these factors differentially predict enrollment patterns at different types of colleges. Therefore, this study aims to investigate the extent to which PABS predict college enrollment at two and four-year colleges.

Traditionally, a student's readiness for college is measured by his or her high school GPA and standardized test scores of academic achievement, but it is clear that multifaceted variables like PABS play a meaningful role in determining students' academic endeavors. Problematically, "noncognitive characteristics are practically important, policy relevant, and yet in need of a more compelling evidentiary base" (Lipnevich & Roberts, 2012, p. 174). With a better understanding of how PABS predict college enrollment at two and four year colleges, perhaps policymakers and educators can form a more holistic appreciation of the varied skills students need to enroll and eventually succeed in college.

## CHAPTER 3

### METHODS

In chapter three, I review the methodological approach of this study. In this study, I used a large, cross-sectional survey data set to address the research questions. The data analyzed in this study are drawn from an intact database provided by ACT, Inc.

In the first part of chapter three, I describe the data and relevant cleaning procedures, statistical assumptions, and steps taken to detect and address multicollinearity. Second, I review characteristics of the student (level one) and high school (level two) of the data. Level one demographic data include grade, gender, ethnicity, race, parent/guardians' total income, parents' or guardians' highest level of education, high school type (e.g., public/private), high school location (e.g., rural, urban, suburban), and total enrollment (e.g., number of students in a school). In part three, I outline characteristics of the study instruments, define pertinent psychometric characteristics, and provide information about the source of the outcome variable (e.g., The National Student Clearinghouse; NSC). Finally, in part four I address the proposed statistical analysis plan.

#### **Part One: Representative Data**

The data in this dissertation are drawn from a sample of high school students who attend schools with preexisting relationships with ACT, Inc. Schools were invited to assess students' psychosocial attributes using Engage 10-12 and were contacted via previous participation in a field study or through pre-existing relationships using ACT

products. The dataset contains operational as opposed to research data, which means the data come from live assessment administrations rather than data collected strictly for research purposes. Administrations occurred intermittently during the years 2009 – 2014.

A total of 63,864 students in 10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> grade completed the Engage measure during the years 2009 – 2014. Students from a large number of high schools around the United States completed the Engage 10-12 measure. For students with racial categorization data, 8,115 (12.7%) reported being African American/Black, 38,279 (59.9%) indicated Caucasian/White, 3,652 (5.7%) stated Asian, and 2,497 (3.9%) American Indian. The distribution of sex was relatively balanced; 32,375 (50.7%) students self-reported female and 31,398 (49.1%) indicated male. The balance of grades was skewed toward 10<sup>th</sup> grade students with 27,698 (43.3%), while the number of 11<sup>th</sup> grade students equaled 16,612 (26%) and 12<sup>th</sup> grade students totaled 9,891 (15.5%). Of all students who completed Engage between 2009-2014, postsecondary enrollment status was known for 7,468 students. About 64% enrolled in either a two or four-year college after high school and about 36% did not enroll in any college. Data cleaning procedures further reduced the number of students in the final dataset. Some students did not provide information about one or more demographic characteristics.

**Missing data and cleaning.** Data cleaning involved five steps. First, participants missing one or more of the ten PABS predictor values were deleted. Participants with one or more missing PABS values were removed to ensure all respondents completed the same number of items measuring PABS. Of all 7,468 students with college enrollment data, 98.9% were missing three or fewer PABS values and 98.5% had zero missing

PABS values (refer to Table 1 below). Deleting all 112 participants missing one or more PABS variables resulted in a sample of 7,356.

Table 1

*Frequency of Missing PABS Data*

<b>Number missing</b>	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>
0	7356	98.5	98.5
1.00	8	.1	.1
2.00	15	.2	.2
3.00	9	.1	.1
4.00	15	.2	.2
5.00	2	.0	.0
6.00	3	.0	.0
7.00	7	.1	.1
8.00	4	.1	.1
9.00	11	.1	.1
10.00	38	.5	.5
<b>Total</b>	<b>7468</b>	<b>100.0</b>	<b>100.0</b>

To monitor if deleting these values influenced the sample, frequency distributions of demographic variables (e.g., gender, race grade, parents' income, mother's highest level of education, father's highest level of education, public or private high school status, geographic setting in urban, rural, town, or suburban environments, and high school enrollment) were compared before and after eliminating values with one or more missing PABS values. This comparison revealed that the cumulative percentages of each variable changed by .4% or less, meaning removing these values likely had little influence on the overall demographic characteristics of the sample.

Second, participants missing three or more demographic values were deleted.

Since the research questions require statistical control of demographic variables,



participants who fail to provide important information about their backgrounds make interpreting the results more challenging. Of all 7,356 participants with college enrollment data, 76.6% were missing data for two or fewer demographic variables (47.8% were missing data for zero demographic variables). I did not remove participants with one or two missing demographic characteristics from the final analysis. Deleting all 1,726 participants missing data for three or more key demographic variables resulted in a sample of 5,630.

Third, participants flagged by a heterogeneity validity index were deleted. The heterogeneity index monitors participants by reporting atypical response patterns on the study instrument. When a response pattern is flagged by the validity index this typically means the respondent may not have been paying close attention to the items. For instance, a student who selects the same response option for each item would be flagged for inconsistent, homogeneous responding. Another student who consistently provides contradictory answers to distinct, but theoretically similar items would similarly be flagged by the heterogeneity index. This step reduced error by removing participants who may not have adequately understood the items. Of all 5,630 participants, 366 participants (6.5%) were deleted resulting in a sample of 5,264. A small number of participants (n=57) were eliminated from the final dataset because ACT records indicated the highest grade at the school these students attended was the eighth grade. Because the research questions in this dissertation do not pertain to students middle school, these participants were removed. Deleting these participants lowered the overall sample to 5,207.

The original number of high schools in the dataset was 537, but the number of students who completed Engage 10-12 in each of these schools varied greatly. For

instance, 357 of these schools had just one student complete the study instrument, 42 schools had two students take the survey, 17 schools had three students complete the survey, and 11 schools had four students take the survey. In step four, high schools with fewer than five students who completed the study instrument were removed for several reasons. One of these reasons is that a proposed analytic technique in this dissertation (e.g., multi-level modeling) requires that multiple participants be clustered in each high school. Another reason is that students who were the only person at their high school to complete Engage 10-12 may have completed the survey for different reasons than other students. Removing high schools with fewer than five students complete the study instrument diminishes potential selection bias within the sample. Deleting high schools with fewer than five students complete the survey is somewhat arbitrary (as opposed to, for example, four or fewer students), but selecting the number five was strategic because it helped reduce selection bias while also promoting statistical power at the high school level of data. As part of this step, 536 individual students and 427 high schools were deleted, resulting in 4,671 individual participants (level one sample) and 110 different high schools (level two sample).

**Statistical assumptions.** Statistical assumptions of minimal presence of outliers and multicollinearity were analyzed. To detect outliers in PABS variables as measured by Engage 10-12, I considered Mahalanobis' distance value. Mahalanobis' distance has been described as a useful technique for detecting outlier data points (Cousineau & Chartier, 2015). Assuming a significance level of .05 and 10 degrees of freedom (e.g., one for each independent variable), the chi-square critical value of interest was 18.31. Deleting

participants with a Mahalanobis value of greater than 18.31 resulted in a sample of 4,160 participants.

**Multicollinearity.** Next, the level of multicollinearity between predictor variables was assessed by analyzing Pearson bivariate correlations, tolerance values, and variance inflation factor (VIF) statistics. Overall, the PABS predictor variables showed low to moderate correlations, but some did yield higher correlations. For example, general determination and goal striving ( $r = .816, p < .01$ ), general determination and academic discipline ( $r = .704, p < .01$ ), general determination and communication skills ( $r = .639, p < .01$ ), goal striving and academic discipline ( $r = .637, p < .01$ ), general determination and study skills ( $r = .637, p < .01$ ), and goal striving and study skills ( $r = .633, p < .01$ ) were moderately if not highly correlated. Since each of these variables theoretically relate to the motivation factor of Engage 10-12, some correlation among them is expected. Refer to Table 2 for PABS predictor variable bivariate correlations.

Table 2

*Pearson Bivariate Correlations Between PABS Predictor Variables*

Variables		DISCIP	DETER	GOAL_ST	COMMIT	STUDY
DISCIP	Correlation	1	.704**	.637**	.565**	.516**
	Significance (2-tailed)		.000	.000	.000	.000
DETER	Correlation	.704**	1	.816**	.587**	.637**
	Significance (2-tailed)	.000		.000	.000	.000
GOAL_ST	Correlation	.637**	.816**	1	.598**	.633**
	Significance (2-tailed)	.000	.000		.000	.000
COMMIT	Correlation	.565**	.587**	.598**	1	.433**
	Significance (2-tailed)	.000	.000	.000		.000
STUDY	Correlation	.516**	.637**	.633**	.433**	1
	Significance (2-tailed)	.000	.000	.000	.000	
COMMUN	Correlation	.441**	.639**	.566*	.453**	.569**
	Significance (2-tailed)	.000	.000	.000	.000	.000
CONNECT	Correlation	.373**	.461**	.495**	.381**	.348**
	Significance (2-tailed)	.000	.000	.000	.000	.000
SOC_ACT	Correlation	.209**	.320**	.415**	.251**	.210**
	Significance (2-tailed)	.000	.000	.000	.000	.000
CONFIDEN	Correlation	.505**	.483**	.556**	.402**	.392**
	Significance (2-tailed)	.000	.000	.000	.000	.000
STEADI	Correlation	.375**	.390**	.413**	.301**	.378**
	Significance (2-tailed)	.000	.000	.000	.000	.000
** Correlation is significant at the .01 level (2-tailed)						
* Correlation is significant at the .05 level (2-tailed)						

Table 2 Continued

Variables		COMMUN	CONNECT	SOC_ACT	CONFIDEN	STEADI
DISCIP	Correlation	.441**	.373**	.209**	.505**	.375**
	Significance (2-tailed)	.000	.000	.000	.000	.000
DETER	Correlation	.639**	.461**	.320**	.483**	.390**
	Significance (2-tailed)	.000	.000	.000	.000	.000
GOAL_ST	Correlation	.566**	.495**	.415**	.556**	.413**
	Significance (2-tailed)	.000	.000	.000	.000	.000
COMMIT	Correlation	.453**	.381**	.251**	.402**	.301**
	Significance (2-tailed)	.000	.000	.000	.000	.000
STUDY	Correlation	.569**	.348**	.210**	.392**	.378**
	Significance (2-tailed)	.000	.000	.000	.000	.000
COMMUN	Correlation	1	.536**	.352**	.296**	.430**
	Significance (2-tailed)		.000	.000	.000	.000
CONNECT	Correlation	.536**	1	.561**	.276**	.230**
	Significance (2-tailed)	.000		.000	.000	.000
SOC_ACT	Correlation	.352**	.561**	1	.324**	.299**
	Significance (2-tailed)	.000	.000		.000	.000
CONFIDEN	Correlation	.296**	.276**	.324**	1	.394**
	Significance (2-tailed)	.000	.000	.000		.000
STEADI	Correlation	.430**	.230**	.299**	.394**	1
	Significance (2-tailed)	.000	.000	.000	.000	
** Correlation is significant at the .01 level (2-tailed)						
* Correlation is significant at the .05 level (2-tailed)						

When enrollment at either a two or four-year college was used as the criterion, tolerance values for general determination (.26) and goal striving (.27) were below the threshold of .4, which is a general indicator of multicollinearity (Menard, 1995). Additionally, the variance inflation factor (VIF) statistics for general determination, goal striving, and academic discipline were 3.8, 3.7, and 2.4, respectively, suggesting moderate levels of multicollinearity. Since there is debate about how problematic multicollinearity should be considered in studies with large sample sizes (e.g., O'Brien, 2007), the weighting of variance proportion values were examined. Variance proportion values provide one indication of whether the predictor variables are uniquely associated with the outcome. When considering collinearity diagnostics, variance proportion values were weighted heavily to one dimension on the general determination, commitment to college, communication skills, steadiness, and study skills PABS predictors. Variance proportion values were weighted primarily on two dimensions for the academic confidence, academic discipline, goal striving, social connection, and social activity variables.

Upon evaluating the tolerance, VIF, and variance proportion weighted values, and after considering the underlying research questions, multicollinearity was determined to be most notably present within the motivation factor (specifically, the motivation subscales of general determination, goal striving, and academic discipline). Eliminating these predictor variables helped balance the total number of predictor variables in each Engage 10-12 factor (e.g., motivation, self-regulation, and social engagement). The motivation factor is comprised of six variables, whereas the self-regulation and social engagement factors both have two. To limit the extent to which PABS predictors were correlated with each other, the general determination, goal striving, and academic

discipline variables were removed from subsequent analyses. As cited in Barch (2015), Kline (2005) noted that eliminating potentially redundant variables is one way to address concerns about multicollinearity.

## **Part Two: Final Sample**

**Student level.** The final sample consisted of 4,160 students. Of these, 862 (20.8%) went to two-year colleges, 1,995 (47.9%) to four-year colleges, and 1,303 (31.3%) did not go to two or four-year colleges (these represent the first college or university students attended). Of these students, 2,390 (57.5%) were female, 1,762 (42.4%) were male, and 8 (.1%) were missing data. At the time they took the survey, 365 (8.8%) were in 10<sup>th</sup> grade, 2,287 (55%) were in 11<sup>th</sup> grade, 1,501 (36.1%) were in 12<sup>th</sup> grade, and 7 (.1%) were missing data (Figure 1). The sample consisted of students from different racial and ethnic backgrounds. For instance, 2,077 (49.9%) identified as White, 909 (21.9%) as Hispanic/Latino, 601 (14.4%) as African-American/Black, 176 (4.2%) as two or more races, 153 (3.7%) as Asian, 62 (1.5%) as American Indian/Alaska Native, and 6 (.1%) as Native Hawaiian/Pacific Islander. Additionally, 126 (3%) choose not to report their racial or ethnic identity and 50 (1.2%) were missing data (Figure 2). Although the final sample consisted of participants from different racial and ethnic identities, categorizing participants to the most appropriate group is often challenging. Some students may have held racial, ethnic, sexual, or gender identities other than those reported in this dissertation.

While no single variable is used to conceptualize social class in this dissertation, students came from families of varied incomes. Specifically, 292 (7%) came from

families earning over \$120,000 per year, 272 (6.5%) from families earning between \$100,00-120,000 per year, 325 (7.8%) between \$80,000-100,000 per year, 383 (9.2%) between \$60,000-80,000 per year, 318 (7.6%) between \$50,000-60,000 per year, 568 (13.7%) between \$36,000-50,000, 706 (17%) between \$24,000-36,000, and 892 (21.4%) made less than \$24,000 annually. Data were missing from 404 (9.7%) of participants. Overall, the data show a heterogeneous mix of family incomes, but over half of the students (n=2,166) came from families earning \$50,000 or less annually (Figure 3).

Students came from families with parents/guardians of mixed educational backgrounds. For guardian 1/mother's highest level of education, 317 (7.6%) persisted through at least one year of graduate study (e.g., MA, PhD, MD), 669 (16.1%) earned a bachelor's degree, 385 (9.3%) earned an associate's degree, 611 (14.7%) completed technical school, earned a vocation specific certificate, or completed some college, 824 (19.8%) were high school graduates or earned a GED, and 620 (14.9%) did not complete high school. Data were missing from 734 (17.6%) of students. For guardian 2/father's highest level of education, 348 (8.4%) persisted through at least one year of graduate study, 561 (13.5%) earned a bachelor's degree, 219 (5.3%) earned an associate's degree, 574 (13.8%) completed business/technical school, earned a vocation specific certificate, or completed some college, 949 (22.8%) were high school graduates or earned a GED, and 673 (16.2%) did not complete high school. Data were missing from 836 (20%) of students. Overall, a range of educational backgrounds existed in the final sample, but the level with the highest frequency for both guardian one/mother's (n=824) and guardian two/father's (n=949) highest level of education was high school graduate/GED.



**High school level.** Of the 110 high schools in the final sample, 100 (90.9%) were public and 10 (9.1%) were private. The high schools were located in various settings; 27 (24.5%) were in rural areas, 25 (22.7%) were in suburban areas, 11 (10%) were in small to medium sized towns, 44 (40%) were in urban communities, and three were missing data (2.8%). The high schools in the final sample also varied by total enrollment. For example, 10 (9%) had 149 students or fewer, 19 (17.3%) had between 150-349 students, 33 (30%) had between 350-799 students, 36 (32.8%) had between 800-1999 students, and 12 (10.9%) had more than 2,000 total students (Figure 4). The high schools came from 30 states around the country. The highest number of high schools in any particular state was 14 and 15 states had at least two high schools. Overall, the high schools in the final sample were varied, but most were public, located in either suburban or urban communities, and had at least 350 total students.

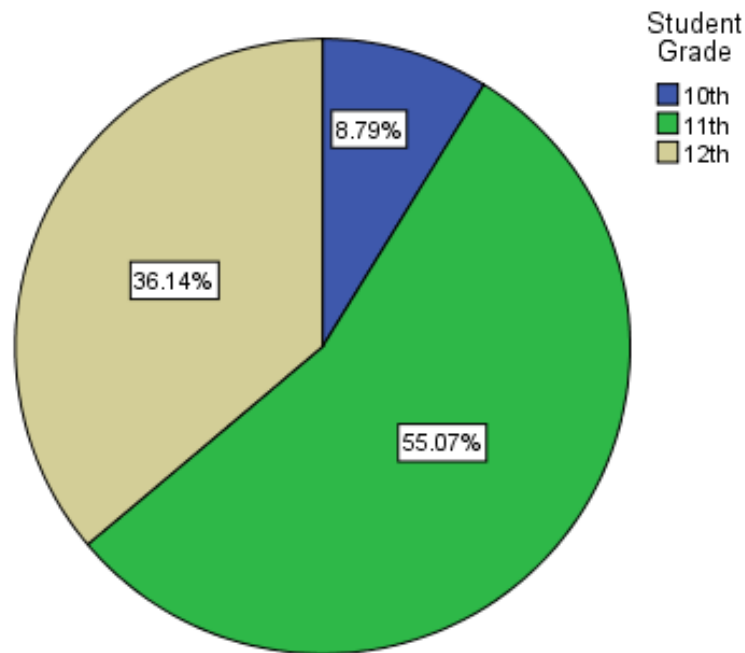


Figure 1. Distribution of student grade levels in the final sample.

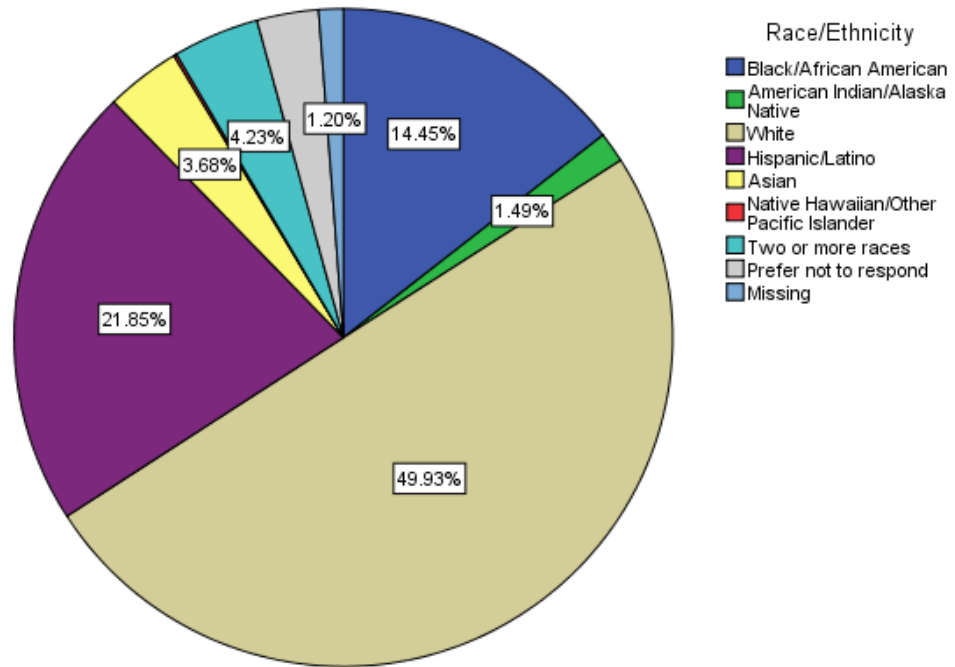


Figure 2. Distribution of race/ethnicity in the final sample.



Figure 3. Distribution of combined parents' income in the final sample.

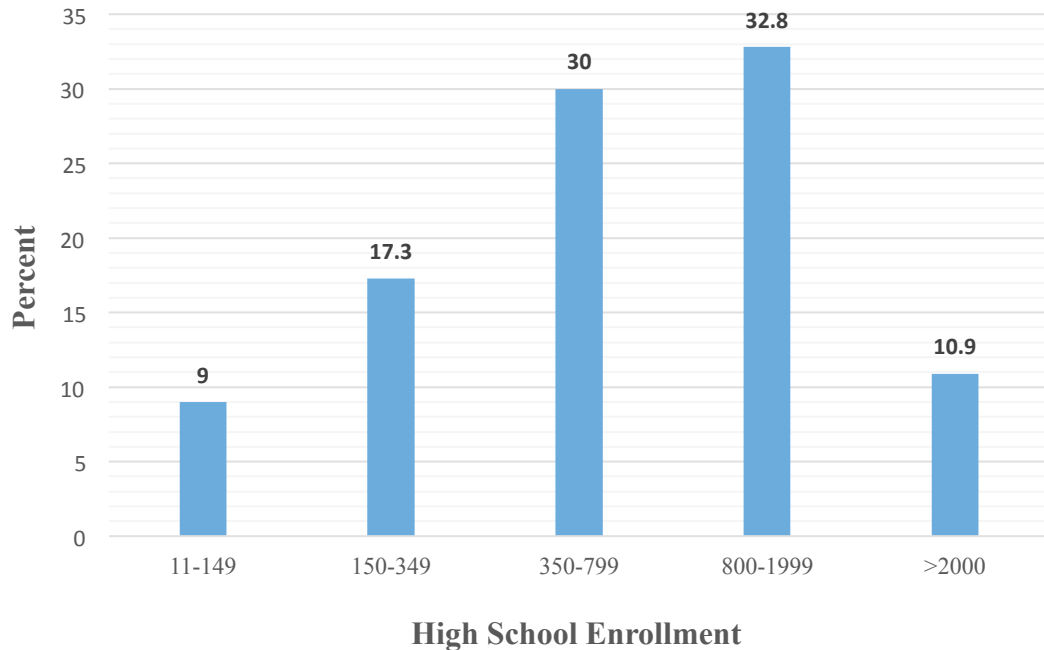


Figure 4. Distribution of high school enrollment in the level two final sample.

### Part Three: Study Instruments

**Engage 10-12.** PABS predictor variables were measured using Engage 10-12. Previously, Engage 10-12 was referred to as the Student Readiness Inventory (SRI; Le et al., 2005). Engage 10-12 is a 108-item survey designed to measure academic behaviors and psychosocial attributes that predict educational outcomes like persistence and high GPAs (ACT, 2012). Engage 10-12 is a low-stakes, voluntary assessment that typically requires about 30 minutes for students to complete, thus it does not induce high levels of stress that might be associated with longer, standardized assessments of academic achievement. When completing Engage 10-12, students report the extent to which an item reflects their self-perception using a Likert-type scale ranging from one (“strongly disagree”) to six (“strongly agree”). Although Engage is available for students in grades

6-9, 10-12, and students in college, the 10-12 version is used in this dissertation to address the research questions.

Engage 10-12 has 10 scales with 10-12 items each, including academic discipline (e.g., people describe me as a hard worker), general determination (e.g., I am serious about fulfilling my obligations) goal striving (e.g., once I set a goal, I do my best to achieve it), commitment to college (e.g., I am committed to attend and finish college regardless of obstacles), study skills (e.g., I organize my thoughts before I prepare an assignment), communication skills (e.g., I'm willing to compromise when resolving a conflict), social connection (e.g., I have a sense of connection with others at school), social activity (e.g., I make friends easily), academic self-confidence (e.g., I am a fast learner), and steadiness (e.g., I stay calm in difficult situations). Please refer to chapter two of this dissertation for a more detailed description of the constructs underlying each scale.

Engage is an appropriate instrument to use in this dissertation because it provides meaningful information about high school students' psychosocial attributes compared to other measures that have more questionable psychometric characteristics (e.g., NCQ; Bowman & King, 2006). Engage 10-12 is also appropriate to use because the factor structure is heavily informed by eminent motivational and educational persistence theories and it is additionally supported by meta-analytic empirical literature (Robbins et al., 2004). Additionally, Engage 10-12 is a relatively easy, low-stakes measure to complete and does not place a heavy burden on students who complete scale items.

**Reliability.** ACT researchers conducted a field study of the Engage 10-12 measure to assess scale reliability (ACT, 2012). This field study analyzed data from 2,912 11<sup>th</sup> and 12<sup>th</sup> grade students from six different high schools across the Southern and Midwestern United States. Information about the field study such as participants' demographic characteristics, study procedures, and analytic techniques can be found in the Engage 10-12 User's Guide (ACT, 2012). As shown in Table 3, Engage 10-12 predictor variables have adequate Cronbach alpha coefficients (ACT, 2012, p. 54). These values are similar to reported Cronbach coefficient values for the Engage college scales (ACT, 2012).

Table 3

*Internal Consistency Coefficients of Engage Grades 10-12 Scales*

<b>Scale</b>	<b>Items</b>	<b>Alpha</b>
Academic discipline	10	.87
Academic self-confidence	12	.84
Commitment to college	10	.89
Communication skills	10	.85
General determination	11	.88
Goal striving	10	.87
Social activity	10	.86
Social connection	11	.83
Steadiness	12	.87
Study skills	12	.88

N = 2,676

Le and colleagues (2005) reported that Engage scales are generally not correlated with ethnicity, income, and age, suggesting the constructs do not practically differentiate based on these demographic characteristics alone (Le et al., 2005). The response patterns

to Engage 10-12 scales for participants of different racial and ethnic groups in this dissertation are provided in Table 4 below.

Table 4

*Engage Response Patterns for Participants of Different Racial/Ethnic Groups*

<b>Race/Ethnicity</b>	<b>Scale</b>	<b>Range</b>	<b>Mean</b>	<b>SD</b>
African-American/Black (n = 601)	Commitment to college	29	54.9	5.8
	Study skills	40	46.1	7.5
	Communication skills	32	49.8	6.5
	Social connection	39	44.9	7.2
	Social activity	41	42.3	8.3
	Academic self-confidence	36	46.2	7.1
	Steadiness	43	41.4	9.3
Asian/Asian-American (n = 153)	Commitment to college	23	54.9	5.1
	Study skills	32	45.1	7.7
	Communication skills	25	50.4	5.8
	Social connection	39	45.3	7.6
	Social activity	40	40.6	8.6
	Academic self-confidence	32	43.7	7.5
	Steadiness	42	42.1	8.2
Hispanic/Latino (n = 909)	Commitment to college	34	53.2	7.0
	Study skills	42	44.2	7.9
	Communication skills	31	49.5	6.2
	Social connection	39	44.0	7.5
	Social activity	44	41.7	8.3
	Academic self-confidence	37	43.9	7.4
	Steadiness	47	42.2	8.8

Table 4 continued

White/Caucasian (n = 2077)	Commitment to college	33	53.9	6.1
	Study skills	42	43.6	7.9
	Communication skills	32	50.7	6.2
	Social connection	41	46.8	7.6
	Social activity	45	43.7	9.0
	Academic self-confidence	42	45.8	8.2
	Steadiness	48	42.1	8.7

Le and colleagues (2005) did find small correlations between some scales (e.g., academic discipline, commitment to college, communication skills) and being female, which suggests that in their sample females more often than not scored higher than males. One common concern regarding self-report measures like Engage 10-12 relates to the influence of social desirability, or respondents misrepresenting their actual behavioral tendencies to correspond with societally preferred actions (e.g., Farrington et al., 2012). This concern persists in the literature, but some researchers conclude that social desirability may be less problematic to intended measurement outcomes than previously believed (Ones, Viswesvaran, & Reiss, 1996).

In their meta-analysis, Ones and colleagues (1996) found that social desirability reflects differences in personality (e.g., emotional stability, conscientiousness), and that social desirability is not a robust predictor of salient performance based outcomes (e.g., grades in school). Moreover, as mentioned previously Engage 10-12 scoring procedures consider response pattern indicators, meaning that students displaying non-varied response patterns are flagged and removed (ACT, 2012). For example, a student who selects the same response option for every item would be flagged as demonstrating an

atypical pattern of responding. In a field study, 8.6% of students provided non-varied response patterns, meaning over 90% of students in this study reported varied response patterns (ACT, 2012, p. 54). These findings support the appropriateness of self-report measures of psychosocial constructs with sufficient psychometric characteristics and sample sizes, perhaps especially in low-stakes situations.

**Validity.** The development of Engage 10-12 items involved several steps. First, ACT researchers developed definitions of target constructs (e.g. academic self-confidence) and acquired constructive feedback from a cohort of subject matter experts (e.g., experts in student advising/counseling, personality psychology scholars, education scholars) (ACT, 2012). Second, three applied psychologists incorporated feedback from the subject matter experts and refined existing items for a total of 320 items (ACT, 2012). Third, ACT researchers distributed the items to 38 high school students who rated the comprehensibility of test items, resulting in some items being deleted or altered to promote test takers' ease of understanding (ACT, 2012). Next, items were reviewed by a second team of subject matter experts in the fields of education, counseling/advising, and personality psychology (ACT, 2012). After incorporating expert feedback, the item pool consisted of 305 items (ACT, 2012).

The fifth step of Engage 10-12 item development involved empirical item selection procedures. In this step, 5,970 first-year college students and high school seniors from 49 different institutions and diverse backgrounds completed the Engage 10-12 items (ACT, 2012). Exploratory and confirmatory factor analyses were used to identify the underlying scale structure. The exploratory factor analysis resulted in 10 factors and the selection of 145 items for subsequent confirmatory factor analysis using



the maximum likelihood estimation method (ACT, 2012). Model fit was analyzed using fit indexes (e.g., RMSEA, CFI, SRMR), and ten to twelve items were selected for each factor resulting in 108 total items (ACT, 2012).

In regards to convergent and discriminant validity, inter-correlations between factors demonstrated that conceptually similar scales correlated positively with one another (e.g., general determination and academic discipline), whereas scales lacking conceptual similarities were less positively correlated (e.g., social activity and study skills). Inter-correlation coefficients suggested an internal factor structure clustered around motivation, social engagement, and self-regulation (ACT, 2012). To test the accuracy of a three-factor structure, a confirmatory factor analysis was implemented to test the appropriateness of the hypothesized internal factor structure (ACT, 2012). Fit index values (e.g., CFI, RMSEA, SRMR) revealed acceptable levels of fit for the three-factor model (ACT, 2012, p.55). The three-factor model is also present in the Engage college measure (Le et al., 2005).

Construct validity was analyzed by comparing the relationship between Engage 10-12 scores and grades and standardized test scores (ACT, 2012). Overall, all Engage 10-12 predictor variables were positively correlated with current grades, high school GPA, and negatively correlated with number of failed classes (ACT, 2012). Additionally, all Engage 10-12 predictor variables were positively correlated with scores on standardized tests of academic achievement like the ACT, although these correlations were more modest when compared to high school GPA (ACT, 2012). Engage 10-12 predictor variables were not correlated with school-level factors like percent of students

who are racial minorities, percent of students receiving free lunch, and average class size (ACT, 2012).

In 2006, Robbins and colleagues expanded upon previous research (e.g., Le et al., 2005; Robbins et al., 2004) by examining the incremental influence of Engage predictors on grades and persistence. Using a sample of over 14,000 postsecondary students from over 45 institutions around the country, Robbins and colleagues (2006) used hierarchical regression models and concluded that Engage constructs incrementally predicted college grades and retention. Additionally, dominance analysis procedures demonstrated that the proportion of variance in high school GPA predicted by the Engage 10-12 scales was 31%, as compared to 69% accounted for by standardized tests of academic achievement (ACT, 2012). According to Azen and Budescu (2003), dominance analysis allows researchers to test the percent of variance accounted for by different predictor variables that are oftentimes correlated with each other. Despite this evidence supporting the use of Engage 10-12 to measure important educational outcomes, less is known about the extent to which Engage 10-12 predicts college enrollment. Indeed, Robbins and colleagues (2006) note that future research should consider, “the salience of these measures (Engage) over the entire college experience” (p. 598).

**ACT.** Standardized tests of academic achievement are one common measure of students’ future academic success (e.g., Kuncel & Hezlett, 2007; Sackett, Kuncel, Arneson, Cooper, & Waters, 2009). In this dissertation, academic achievement was determined using ACT composite score and high school grade point average (HSGPA). Typically, the ACT is taken during a student’s junior year of high school and measures students’ knowledge of mathematics, English, science, and writing. Researchers have

demonstrated the ACT is an adequate predictor of first-year grades in college (e.g., Robbins et al. 2004), and that the ACT is correlated with scores on other standardized tests of academic achievement (e.g., SAT). No students in these data had more than one ACT score.

**College enrollment.** The dichotomous outcome variables of interest included two and four-year college enrollment. In this dissertation, National Student Clearinghouse (NSC) data were used to determine participants' immediate enrollment status at two and four year universities the fall after graduating high school. Established in 1993, the NSC is a national non-profit organization that stores, distributes, and helps corroborate and confirm students' education information for various stakeholders and agencies (Button, 2009; National Student Clearinghouse, 2016). The NSC mission statement asserts their role in the "facilitation, exchange and understanding of student enrollment, performance and related information" to researchers and other interested parties (National Student Clearinghouse, 2016). It is estimated that the NSC provides data storage services for the majority of postsecondary institutions in the United States, serving more than 3,000 colleges and universities across the nation (Button, 2009; National Student Clearinghouse, 2016). As of 2017, the NSC tracks postsecondary student data for approximately 97% of enrolled undergraduates (N. Bowman, personal communication, May 12, 2017). Data from the NSC was linked to each student's Engage 10-12 and academic achievement scores using a unique student identification number.

## **Part Four: Data Analysis Plan**

Data analysis will involve several steps. Descriptive statistics will be compiled to describe characteristics of the predictor variables using frequencies, means, and standard deviations. Chi square tests will be conducted to test for relationships among categorical study variables. Bivariate and partial correlation coefficients will be used to explore initial relationships between PABS variables and two and four-year college enrollment. Logistic regression and hierarchical generalized linear models using a logit link (HGLM) will be applied to address research question one. Research question two will be analyzed using a bootstrap mediation model approach. Each of these analytic approaches are explained in greater detail in chapter four.

## CHAPTER 4

### RESULTS

There are two hypotheses in this dissertation. Hypothesis one is that commitment to college, study skills, and academic self-confidence will positively predict college enrollment at both two and four-year colleges. Hypothesis two is that high school GPA and standardized test scores of academic achievement will mediate the relationship between select PABS and two and four-year college enrollment.

#### **Outline**

Data analysis will consist of four parts. In part one, I provide descriptive statistics for PABS predictors and perform chi square tests to detect significant differences within the sample. In part two, I examine bivariate and partial correlation coefficients between PABS and two and four-year enrollment. In part three, binary logistic regression, HGLM, and bootstrap mediation models are used to explore potential relationships between PABS and two and four-year college enrollment.

Although students are nested within schools, I present binary logistic regression models prior to my HGLM models for several reasons (as opposed to only presenting nested models). First, describing models of varying complexity in order from least to most complex allows readers to better understand differences and similarities between distinct analytic techniques. Second, there is value in understanding the extent to which PABS coefficients change after high school code is treated as a random effect, such as

whether coefficients retain statistical significance after controlling for variation across high schools. In part four, I specifically address the hypotheses.

### Part One: Descriptive Statistics

Descriptive statistics for commitment to college, study skills, communication skills, social connection, social activity, academic self-confidence, and steadiness are provided in Table 5.

Table 5

*Descriptive Statistics for PABS Predictor Variables (N = 4,160)*

<b>Variable</b>	<b>Range</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>	<b>Std. Deviation</b>
Commitment to college	34	26	60	53.87	6.13
Study skills	42	18	60	44.14	7.88
Communication skills	32	28	60	50.20	6.23
Social connection	43	17	60	45.63	7.65
Social activity	45	15	60	42.75	8.83
Academic self-confidence	42	18	60	45.27	7.87
Steadiness	48	12	60	41.93	8.81

Social activity and steadiness have the highest standard deviations (8.83 and 8.81, respectively). This means that participants' response patterns on items measuring these variables were more heterogeneous when compared to other predictor variables.

Conversely, the variables communication skills and commitment to college have the smallest ranges (32 and 34, respectively) and lowest standard deviations (6.23 and 6.13, respectively), which means that response patterns for items measuring these variables were more consistent compared to other predictors. Students scored higher on the commitment to college and communication skills scales than on the other PABS scales, as reflected by mean values of 53.87 and 50.20, respectively. A high mean value

indicates that students' tended to respond affirmatively to items measuring a particular construct.

### **Group Differences**

Chi square tests were conducted to detect mean differences between categorical variables. Pearson bivariate correlations are reported to provide readers one indication of the relative magnitude of a particular relationship. Correlation coefficients less than .05 are not reported due to the overall high number students in the data.

Female students were slightly more likely to enroll at two-year colleges than students who were not female ( $\chi^2(1, n = 2,165) = 4.623; p = .03$ ). Similarly, female students were somewhat more likely to enroll in four-year colleges (Pearson  $r = .06; n = 4,160; p < .01$ ) than students who were not female ( $\chi^2(1, n = 4,160) = 11.00; p < .01$ ). Although statistically significant, the percentages of female and male students in the sample who enrolled in four-year colleges were similar (e.g., 52 and 47%, respectively).

Students who identified as African-American/Black were not more or less likely to enroll at two-year colleges than students who did not identify as African-American/Black ( $\chi^2(1, n = 2,165) = .399; p = .53$ ). However, students who identified as African-American/Black were more likely to enroll at four-year colleges ( $\chi^2(1, n = 4,160) = 5.60; p = .02$ ). Students who reported a Hispanic ethnicity were not more or less likely to enroll in two-year colleges ( $\chi^2(1, n = 2,165) = 3.89; p = .05$ ) than students without a Hispanic ethnicity. At the four-year level, Hispanic students were less likely to enroll in four-year colleges ( $\chi^2(1, n = 4,160) = 137.13; p < .01$ ) than students who did not identify as Hispanic. Pearson bivariate correlations suggest that status as a student with a

Hispanic identity negatively related to enrollment in four-year postsecondary institutions (Pearson  $r = -.18$ ;  $n = 4,160$ ;  $p < .01$ ).

The percentage of students enrolled in four-year colleges goes up as parents' income increases (e.g., Perna, 2000). In these data, 33.5% of students with parents earning less than \$24,000 enrolled in a four-year college, whereas 76% of students with parents earning more than \$120,000 annually enrolled in a four-year institution. This trend was consistent across all eight levels of the parent income variable (Pearson  $r = .23$ ;  $n = 4,160$ ;  $p < .01$ ). As parents' income increases, the percentage of students enrolled in two-year colleges goes up until parents' earnings exceeds \$80,000, suggesting a curvilinear relationship between two-year college enrollment and parents' combined income. For instance, in these data 49% of students with parents who earned a combined income between \$60-80,000 enrolled in a two-year college. However, when parents' combined earnings fell within \$80-100,000, 47% of students enrolled in a two-year college. Beyond combined earnings of \$100,000, the percentage of students matriculating to two-year colleges continued to decrease. Overall, there was a small, positive relationship between parents' income and two-year college enrollment (Pearson  $r = .05$ ;  $n = 2,165$ ;  $p = .02$ ).

Students who attended private high schools were less likely to attend two-year colleges ( $\chi^2 (1, n = 2,165) = 8.6$ ;  $p < .01$ ) and more likely to attend four-year colleges ( $\chi^2 (1, n = 4,160) = 226.5$ ;  $p < .01$ ). Pearson correlation coefficients reflect these findings, since status as a student in a private high school correlates to decreased two-year (Pearson  $r = -.06$ ;  $n = 2,165$ ,  $p < .01$ ) and increased four-year (Pearson  $r = .23$ ;  $n = 4,160$ ,  $p < .01$ ) enrollment. Bivariate correlations between total high school enrollment (e.g.,



how many students attended a particular high school) and students' matriculation to two and four-year colleges were non-significant. Cross tabulation statistics show similar percentages of students from high schools of different sizes go on to enroll in two and four-year colleges. Consider that 44.9% of students attending high schools with enrollments between 150-349 matriculated to four-year colleges, whereas 46.3% of students attending high schools with enrollments exceeding 2,000 persisted to a four-year institution.

Students from suburban high schools were not more or less likely to enroll in two-year colleges ( $\chi^2(1, n = 2,165) = .357, p = .55$ ) than students who attended non-suburban schools. Suburban students were more likely to enroll in four-year colleges ( $\chi^2(1, n = 4,160) = 89.8, p < .01$ ; Pearson  $r = .147, n = 4,160, p < .01$ ) than peers who did not attend suburban schools. Students attending rural high schools were more likely to enroll in two-year colleges than students enrolled in non-rural schools ( $\chi^2(1, n = 2,165) = 5.8, p = .02$ ). Students from urban high schools were less likely to attend two-year colleges ( $\chi^2(1, n = 2,165) = 4.2, p = .04$ ).

Overall, parents' combined income and status at a private school had the strongest relationships with enrollment in a four-year college. The level of education for students' mothers/guardian one and fathers/guardian two correlated to college enrollment similarly to parents' income, but with slightly weaker coefficients. At the two-year level, few demographic variables had strong, positive relationships with college enrollment, although students in rural districts were slightly more likely to attend an associate's degree institution than students from non-rural high schools. While differences in college enrollment between demographic groups existed in these data, the correlations were

generally small. Readers are cautioned against interpreting demographic variables as singularly indicative of students' future likelihood of enrolling in either a two or four-year college.

### **Part Two: Correlation Matrices**

I conducted bivariate and partial correlations to test the relationships between PABS and two and four-year enrollment (Refer to Tables 6-9 below). Bivariate correlations between PABS and two-year enrollment included persons who enrolled in two-year college (coded as 1) and persons who did not enroll in any college (coded as 0). Bivariate correlations between PABS and four-year enrollment included persons who enrolled in four-year college (coded as 1) and persons who did not enroll in any college or enrolled in a two-year college (coded as 0).

At two-year colleges, bivariate correlation coefficients were small for all PABS predictor variables. Commitment to college and social connection had small, positive coefficients with two-year college enrollment (Table 6).

Table 6

*Bivariate Correlations Between PABS and Two-Year Enrollment (N=2,165)*

Variable		enroll2	COMMIT	STUDY	COMMUN	CONNECT	SOCACT	CONFIDEN	STEADI
<b>enroll2</b>	Correlation	1.000	.103**	.031	.036	.075**	.040	.031	.037
	Significance (2-tailed)	.	.000	.149	.093	.000	.064	.155	.088
<b>COMMIT</b>	Correlation	.103**	1.000	.443**	.457**	.380**	.229**	.385**	.291**
	Significance (2-tailed)	.000	.	.000	.000	.000	.000	.000	.000
<b>STUDY</b>	Correlation	.031	.443**	1.000	.587**	.350**	.189**	.408**	.385**
	Significance (2-tailed)	.149	.000	.	.000	.000	.000	.000	.000
<b>COMMUN</b>	Correlation	.036	.457**	.587**	1.000	.525**	.330**	.312**	.425**
	Significance (2-tailed)	.093	.000	.000	.	.000	.000	.000	.000
<b>CONNECT</b>	Correlation	.075**	.380**	.350**	.525**	1.000	.525**	.267**	.202**
	Significance (2-tailed)	.000	.000	.000	.000	.	.000	.000	.000
<b>SOCACT</b>	Correlation	.040	.229**	.189**	.330**	.525**	1.000	.335*	.272**
	Significance (2-tailed)	.064	.000	.000	.000	.000	.	.000	.000
<b>CONFIDEN</b>	Correlation	.031	.385**	.408**	.312**	.267**	.335**	1.000	.412**
	Significance (2-tailed)	.155	.000	.000	.000	.000	.000	.	.000
<b>STEADI</b>	Correlation	.037	.291**	.385**	.425**	.202**	.272**	.412**	1.000
	Significance (2-tailed)	.088	.000	.000	.000	.000	.000	.000	.
** Correlation is significant at the .01 level (2-tailed)									
* Correlation is significant at the .05 level (2-tailed)									

When controlling for HSGPA, ACT composite score, parents' income, and status at a private school, the magnitude of each PABS coefficient decreased (Table 7).

Commitment to college and social connection retained small, positive correlations with two-year college enrollment.

Table 7

*Partial Correlations Between PABS and Two-Year Enrollment Controlling for HSGPA, ACT score, Private School, and Parents' Income (N = 2,165)*

Variable		enroll2	COMMIT	STUDY	COMMUN	CONNECT	SOCACT	CONFIDEN	STEADI
<b>enroll2</b>	Correlation	1.000	.069**	.011	.014	.058*	.039	-.020	.023
	Significance (2-tailed)	.	.003	.642	.539	.011	.093	.374	.317
<b>COMMIT</b>	Correlation	.069**	1.000	.406**	.434**	.357**	.222**	.322**	.259**
	Significance (2-tailed)	.003	.	.000	.000	.000	.000	.000	.000
<b>STUDY</b>	Correlation	.011	.406**	1.000	.579**	.340**	.189**	.410**	.378**
	Significance (2-tailed)	.642	.000	.	.000	.000	.000	.000	.000
<b>COMMUN</b>	Correlation	.014	.434**	.579**	1.000	.505**	.318**	.254**	.409**
	Significance (2-tailed)	.539	.000	.000	.	.000	.000	.000	.000
<b>CONNECT</b>	Correlation	.058*	.357**	.340**	.505**	1.000	.520**	.212**	.174**
	Significance (2-tailed)	.011	.000	.000	.000	.	.000	.000	.000
<b>SOCACT</b>	Correlation	.039	.222**	.189**	.318**	.520**	1.000	.315**	.259**
	Significance (2-tailed)	.093	.000	.000	.000	.000	.	.000	.000
<b>CONFIDEN</b>	Correlation	-.020	.322**	.410**	.254**	.212**	.315**	1.000	.386**
	Significance (2-tailed)	.374	.000	.000	.000	.000	.000	.	.000
<b>STEADI</b>	Correlation	.023	.259**	.378**	.409**	.174**	.259**	.386**	1.000
	Significance (2-tailed)	.317	.000	.000	.000	.000	.000	.000	.
** Correlation is significant at the .01 level (2-tailed)									
* Correlation is significant at the .05 level (2-tailed)									

At the four-year level, bivariate correlation coefficients between PABS and enrollment were higher (in terms of magnitude) than at two-year institutions (Table 8). Although small, all of the PABS coefficients significantly, positively correlated with four-year college enrollment (when not controlling for any other variables). For example, without controlling for demographic characteristics, college commitment, social connection, and academic self-confidence yielded the strongest relationships with four-year college enrollment (Pearson  $r = .265$ ,  $N = 4,160$ ,  $p < .01$ ; Pearson  $r = .219$ ,  $N = 4,160$ ,  $p < .01$ ; Pearson  $r = .292$ ,  $N = 4,160$ ,  $p < .01$ , respectively). After controlling for HSGPA, ACT score, parents' income, and status at a private school, all coefficient values decreased in magnitude and steadiness became non-significant (Table 9). As in Table 7, commitment to college (Partial  $r = .146$ ,  $N = 4,160$ ,  $p < .01$ ) and social connection (Partial  $r = .096$ ,  $N = 4,160$ ,  $p < .01$ ) retained a small, positive correlations coefficients.

Table 8

*Bivariate Correlations Between PABS and Four-Year Enrollment (N=4,160)*

Variables		enroll4	COMMIT	STUDY	COMMUN	CONNECT	SOCACT	CONFIDEN	STEADI
<b>enroll4</b>	Correlation	1.000	.265**	.132**	.164**	.219**	.138**	.292**	.102**
	Significance (2-tailed)	.	.000	.000	.000	.000	.000	.000	.000
<b>COMMIT</b>	Correlation	.265	1.000	.433**	.453**	.381**	.251**	.402**	.301**
	Significance (2-tailed)	.000	.	.000	.000	.000	.000	.000	.000
<b>STUDY</b>	Correlation	.132**	.433**	1.000	.569**	.348**	.210**	.392**	.378**
	Significance (2-tailed)	.000	.000	.	.000	.000	.000	.000	.000
<b>COMMUN</b>	Correlation	.164**	.453**	.569**	1.000	.536**	.352**	.296**	.430**
	Significance (2-tailed)	.000	.000	.000	.	.000	.000	.000	.000
<b>CONNECT</b>	Correlation	.219**	.381**	.348**	.536**	1.000	.561**	.276**	.230**
	Significance (2-tailed)	.000	.000	.000	.000	.	.000	.000	.000
<b>SOCACT</b>	Correlation	.138**	.251**	.210**	.352**	.561**	1.000	.324**	.299**
	Significance (2-tailed)	.000	.000	.000	.000	.000	.	.000	.000
<b>CONFIDEN</b>	Correlation	.292*	.402**	.392**	.296**	.276**	.324**	1.000	.394**
	Significance (2-tailed)	.000	.000	.000	.000	.000	.000	.	.000
<b>STEADI</b>	Correlation	.102**	.301**	.378**	.430**	.230**	.299**	.394**	1.000
	Significance (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.
** Correlation is significant at the .01 level (2-tailed)									
* Correlation is significant at the .05 level (2-tailed)									

Table 9

*Partial Correlations Between PABS and Four-Year Enrollment Controlling for HSGPA, ACT score, Private School, and Parents' Income (N=4,160)*

Variables		enroll4	COMMIT	STUDY	COMMUN	CONNECT	SOACT	CONFIDEN	STEADI
<b>enroll4</b>	Correlation	1.000	.146**	.067**	.051**	.096**	.062**	.034*	.022
	Significance (2-tailed)	.	.000	.000	.002	.000	.000	.037	.168
<b>COMMIT</b>	Correlation	.146**	1.000	.386**	.408**	.329**	.224**	.300**	.255**
	Significance (2-tailed)	.000	.	.000	.000	.000	.000	.000	.000
<b>STUDY</b>	Correlation	.067**	.386**	1.000	.550**	.324**	.197**	.374**	.359**
	Significance (2-tailed)	.000	.000	.	.000	.000	.000	.000	.000
<b>COMMUN</b>	Correlation	.051**	.408**	.550**	1.000	.502**	.331**	.218**	.411**
	Significance (2-tailed)	.002	.000	.000	.	.000	.000	.000	.000
<b>CONNECT</b>	Correlation	.096**	.329**	.324**	.502**	1.000	.550**	.194**	.197**
	Significance (2-tailed)	.000	.000	.000	.000	.	.000	.000	.000
<b>SOACT</b>	Correlation	.062**	.224**	.197**	.331**	.550**	1.000	.309**	.285**
	Significance (2-tailed)	.000	.000	.000	.000	.000	.	.000	.000
<b>CONFIDEN</b>	Correlation	.034*	.300**	.374**	.218**	.194**	.309**	1.000	.362**
	Significance (2-tailed)	.037	.000	.000	.000	.000	.000	.	.000
<b>STEADI</b>	Correlation	.022	.255**	.359**	.411**	.197**	.285**	.362**	1.000
	Significance (2-tailed)	.168	.000	.000	.000	.000	.000	.000	.
** Correlation is significant at the .01 level (2-tailed)									
* Correlation is significant at the .05 level (2-tailed)									

### Part Three: Logit and HGLM Analyses

In part three, binary logistic regression, HGLM, and bootstrap mediation models are presented. Binary logistic and HGLM models are first presented for two-year enrollment and then four-year enrollment. Bootstrap mediation models are only presented for PABS variables with the strongest relationships to enrollment when compared to other predictors. All models were run using SPSS (v. 24) and SAS (v. 9.4).

**Two-year enrollment.** Expressed in simple terms, logistic regression is defined as:

$$P(Y) = \frac{1}{(1 + e^{-(b_0 + b_1X_{1i} + b_2X_{2i} + \dots + b_nX_{ni})})} \quad (1)$$

In equation one,  $P(Y)$  represents the probability of event  $Y$  (e.g., college enrollment) taking place and  $e$  is the base of the natural logarithm (Field, 2009). A high value of  $P(Y)$  means the outcome of interest is likely to have occurred, whereas a small value suggests a lower likelihood of occurrence (Field, 2009). The constant or  $Y$ -intercept value ( $b_0$ ), predictor values for student  $i$  (e.g.,  $X_{1i}$ ), and corresponding regression coefficients (e.g.,  $b_1$ ), are similar to what occurs in a linear or multiple regression analysis (Berry, 1993; Field, 2009). Logistic regression accommodates for a dichotomous outcome variable via the logarithmic transformation (Field, 2009; Berry & Feldman, 1985).

For the two-year model, students not enrolled in any college were coded as zero ( $n = 1,303$ ) and students enrolled in two-year colleges were coded as one ( $n = 862$ ). All variables were entered simultaneously because there is no a priori, theoretical rationale



about which PABS variable(s) predict enrollment. To ascertain which PABS are most relevant to college enrollment, each must be entered in a way that allows for unique comparison to the other predictors. Independent variables of interest included PABS. For all models in this dissertation, categorical covariates included:

- Female (1 = Female, 0 = not Female)
- African-American/Black (1 = African-American/Black, 0 = not African-American/Black)
- Hispanic (1 = Hispanic, 0 = not Hispanic)
- Parents' combined income (1 = combined earnings of \$60,000 or more, 0 = combined earnings of less than \$60,000)
- Mother and father's highest level of education (1 = earned at least a bachelor's degree, 0 = earned less than a bachelor's degree)
- School type (e.g., rural, urban, suburban, and private) (1 = relevant school type, 0 = not relevant school type)

Similar to Robbins and colleagues (2006), in all logistic and HGLM models in this dissertation the variables ACT composite score, high school GPA, and all PABS were standardized via z-score transformation.

When  $P(Y)$  was defined as two-year college enrollment, the model fit the data poorly. Although significant ( $p < .01$ ), the Cox and Snell and Nagelkerke R square values were low at .03 and .05, respectively. Of the PABS variables, only commitment to college retained a positive relationship with two-year college enrollment (OR: 1.16; 95% CI: 1.05-1.29;  $p < .01$ ), reflecting the previously reported partial correlations reported in Table 7. This means that when all other variables equaled zero, the log odds of enrolling

in a two-year college were 1.16 times higher for each one-standard deviation increase in the commitment to college variable (95% CI: 1.05-1.29;  $p < .01$ ).

In addition to commitment to college, high school GPA was positively related to two-year college enrollment (OR: 1.24; 95% CI: 1.11-1.39;  $p < .01$ ), meaning students who earned high grades were more likely to attend a two-year degree institution than students who received low grades. Conversely, the variables father's highest level of education (OR: .60; 95% CI: .43-.85;  $p < .01$ ) and private school (OR: .39; 95% CI: .19-.79;  $p = .01$ ) were negatively related to two-year enrollment. This means that students who attended a private school and/or had fathers with at least a bachelor's degree were less likely to matriculate to a two-year college. This finding reflects the previously described curvilinear relationship between family income and two-year college enrollment. The negative parameter estimate for academic self-confidence (-.17) suggests the presence of potential moderation across variables in the model. Due to poor model specification, interactions between PABS and indices of academic achievement will be investigated when four-year enrollment is the outcome. Logistic regression results for two-year enrollment are shown in Table 10.

Table 10

*Logistic Regression Results Predicting Two-Year College Enrollment*

<b>Variables</b>	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>df</b>	<b>Sig.</b>	<b>Exp(B)</b>	<b>95% CI</b>
<i>Student Characteristics</i>							
Female	.08	.10	.60	1	.44	1.08	.89-1.32
African-American/Black	-.06	.16	.13	1	.72	.95	.69-1.29
Hispanic	-.06	.12	.28	1	.60	.94	.74-1.19
ACT Composite Score	.04	.09	.30	1	.58	1.04	.90-1.21
High School G.P.A.*	.22	.06	14.43	1	.00	1.24	1.11-1.39
<i>Parent Characteristics</i>							
Parent Income	.17	.12	1.81	1	.18	1.18	.93-1.51
Mother Education*	.35	.15	5.21	1	.02	1.42	1.05-1.91
Father Education*	-.51	.18	8.31	1	.00	.60	.43-.85
<i>School Characteristics</i>							
Rural School	.18	.19	.93	1	.34	1.20	.83-1.72
Urban School	.06	.17	.12	1	.73	1.06	.76-1.47
Suburban School	.12	.18	.45	1	.51	1.12	.80-1.58
Private School*	-.95	.36	6.90	1	.01	.39	.19-.79
<i>PABS Variables</i>							
Commitment to College*	.15	.05	8.14	1	.00	1.16	1.05-1.29
Study Skills	.01	.06	.02	1	.90	1.01	.89-1.14
Communication Skills	-.11	.07	2.76	1	.10	.89	.78-1.02
Social Connection	.10	.07	2.41	1	.12	1.11	.97-1.26
Social Activity	.05	.06	.76	1	.38	1.05	.94-1.18
Academic Self Confidence*	-.17	.07	5.85	1	.02	.85	.74-.97
Steadiness	.09	.06	2.25	1	.13	1.09	.97-1.22
Cox & Snell R Square	.03						
Nagelkerke R Square	.04						
Classification	59%						

\*p&lt;.05

I also completed an HGLM model controlling for variation across high school code (ICC = .11;  $z(104) = 2.98$ ;  $df = 104$ ;  $p < .01$ ). When allowing the variable high school code to covary, commitment to college and academic self-confidence retained similar parameter estimates as observed in Table 10. However, the variables in these models did not demonstrate adequate fitness, as observed by the increasing BIC values shown in Table 11. To avoid redundancy, these parameter estimates will be explained further when the outcome of interest is four-year enrollment, which provides better specification (e.g., see Tables 12, 13, 14, and 15). Beyond a connection between commitment to college and two-year college enrollment, I generally did not observe strong, positive relationships between PABS variables and matriculation at associate level postsecondary institutions.

Table 11

*Two-Level HGLM Results of Two-Year College Enrollment*

	Model 1 B (SE)	Model 2 B (SE)	Model 3 B (SE)	Model 3 ORs (95% CI)
<i>Fixed Effects</i>				
Intercept	-.50 (.10)	-.46** (.14)	-.41** (.14)	
<i>Student Level</i>				
Female		.06 (.11)	.06 (.11)	1.06 (.86-1.30)
African-American/Black		.01 (.18)	.01 (.18)	1.00 (.71-1.43)
Hispanic		-.15 (.14)	-.14 (.14)	.87 (.66-1.14)
ACT Composite Score		-.04 (.08)	-.02 (.08)	.98 (.83-1.15)
High School G.P.A.		.23** (.06)	.23** (.06)	1.26 (1.12-1.43)
Parent Income		.18 (.13)	.18 (.03)	1.19 (.92-1.54)
Mother Education		.41* (.16)	.41* (.16)	1.52 (1.11-2.09)
Father Education		-.50** (.19)	-.48** (.19)	.62 (.43-.89)
Commitment to College		.15** (.05)	.15** (.05)	1.16 (1.04-1.30)
Study Skills		.01 (.07)	.00 (.07)	1.01 (.88-1.15)
Communication Skills		-.11 (.07)	-.11 (.07)	.89 (.78-1.03)
Social Connection		.09 (.07)	.10 (.07)	1.11 (.97-1.27)
Social Activity		.04 (.06)	.04 (.06)	1.04 (.92-1.17)
Academic Self Confidence		-.14* (.07)	-.14* (.07)	.87 (.75-.99)
Steadiness		.09 (.06)	.08 (.06)	1.10 (.97-1.22)
<i>School Level</i>				
Private School			-.81 (.45)	.44 (.18-1.07)
<i>Error Variance</i>				
Level-2 Intercept	.40** (.13)	.39** (.13)	.35** (.12)	
<i>Model Fit</i>				
-2LL	2544.4	2492.4	2489.1	
AIC	2548.4	2526.4	2525.1	
BIC	2553.7	2571.6	2572.8	

Note: \*p< .05; \*\*p<.01; ICC = .11; Values based on SAS 9.4 PROC GLIMMIX. Entries show parameter estimates with standard errors in parentheses; Estimation Method = Laplace

**Four-year enrollment.** When four-year college enrollment was the dependent variable, I ran three separate binary logistic models to identify a parsimonious set of predictors with acceptable model specification. Between each model, theory (e.g., aforementioned educational persistence theories), logic, examination of variable parameter estimates, and previous research (e.g., Perna, 2000; Engberg & Wolniak, 2010) were used to selectively remove individual predictor variables. In each model, all independent variables were entered simultaneously (e.g., non-hierarchically). Students were coded as zero if they were not enrolled in any college or if they enrolled in a two-year college (n = 2,165). Students who enrolled in four-year colleges were coded as one (n = 1,995). I applied the same categorical covariate coding mechanisms as observed in Tables 10 and 11.

**Binary logistic regression.** In model one, all variables were included in the model. With all variables included, approximately 75% of students were correctly classified as either enrolled or not enrolled in four-year colleges. The omnibus test of model coefficient was significant ( $\chi^2 = 1403.21$ ,  $df = 19$ ,  $p < .01$ ). The Cox and Snell R square value was .31 and the Nagelkerke R square value was .41, indicating acceptable model fit (Field, 2009).

Readers are cautioned against erroneously interpreting the Cox and Snell and Nagelkerke coefficients of determination values as the percent of variance in the criterion explained by the predictor variables (Menard, 2000; Peng, So, Stage, & John, 2002). One reason for this is that logistic regression uses maximum likelihood estimation, as opposed to ordinary least squares estimation typically observed in a linear regression (Menard, 2000). The full model is seen in Table 12.

Table 12

*Model One Logistic Regression Results Predicting Four-Year College Enrollment*

<b>Variables</b>	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>df</b>	<b>Sig.</b>	<b>Exp(B)</b>	<b>95% CI</b>
<i>Student Characteristics</i>							
Female	.05	.08	.32	1	.56	1.05	.89-1.24
African-American/Black*	1.09	.13	72.8	1	.00	2.97	2.31-3.82
Hispanic	.09	.11	.74	1	.38	1.10	.89-1.37
ACT Composite Score*	.84	.06	187.55	1	.00	2.31	2.05-2.60
High School G.P.A.*	.64	.06	134.14	1	.00	1.90	1.71-2.12
<i>Parent Characteristics</i>							
Parent Income*	.23	.09	5.78	1	.02	1.26	1.04-1.51
Mother Education	.34	.12	2.103	1	.15	1.18	.94-1.48
Father Education*	.34	.12	7.45	1	.01	1.40	1.10-1.78
<i>School Characteristics</i>							
Rural School	-.15	.15	.91	1	.34	.86	.64-1.17
Urban School	-.05	.14	.12	1	.73	.95	.73-1.25
Suburban School	.11	.14	.62	1	.43	1.12	.85-1.48
Private School*	1.13	.19	34.38	1	.00	3.10	2.12-4.51
<i>PABS Variables</i>							
Commitment to College*	.39	.05	53.18	1	.00	1.48	1.33-1.64
Study Skills	.03	.05	.375	1	.54	1.03	.93-1.14
Communication Skills	-.11	.06	3.52	1	.06	.897	.80-1.00
Social Connection*	.17	.05	10.25	1	.00	1.19	1.07-1.32
Social Activity	.03	.05	.31	1	.58	1.03	.93-1.14
Academic Self Confidence*	-.13	.06	5.01	1	.02	.88	.79-.98
Steadiness	-.01	.05	.04	1	.83	.99	.90-1.09
Cox & Snell R Square	.31						
Nagelkerke R Square	.41						
Classification	75%						

\*p&lt;.05

Previous literature, theory, and logic were used to identify predictors retained in model two. Perna (2000) and Engberg and Wolniak (2010) collectively examined the influence of race, sex, costs and benefits, ability, and social and cultural capital on four-year college enrollment. Upon reviewing this research, identity as an African-American, ACT composite test score, high school GPA, parents' income level, parents' education level, and status at a rural, urban, suburban, and private school were retained in model two. Also retained in model two were PABS variables including commitment to college, study skills, social connection, and academic self-confidence due to correspondence with psychosocial predictors of college retention identified by Robbins and colleagues (2004). These particular PABS variables were also retained in model two to address hypothesis one.

Again, the omnibus tests of model coefficient was significant ( $\chi^2 = 1398.03$ ,  $df = 14$ ,  $p < .01$ ). The Cox and Snell R square value was .31 and the Nagelkerke R Square value was .41, suggesting a similar level of model fit compared to model one. Slightly more than 76% of students were correctly classified as either enrolled or not enrolled at four-year colleges using the variables in the model. Refer to Table 13 to see model two coefficients.



Table 13

*Model Two Logistic Regression Results Predicting Four-Year College Enrollment*

<b>Variables</b>	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>df</b>	<b>Sig.</b>	<b>Exp(B)</b>	<b>95% CI</b>
<i>Student Characteristics</i>							
African-American/Black*	1.07	.12	80.50	1	.000	2.91	2.30-3.67
ACT Composite Score*	.81	.06	188.26	1	.000	2.25	2.00-2.53
High School G.P.A.*	.65	.05	142.23	1	.000	1.91	1.72-2.13
<i>Parent Characteristics</i>							
Parent Income*	.22	.09	5.52	1	.002	1.25	1.04-1.50
Mother Education	.17	.11	2.13	1	.15	1.18	.94-1.48
Father Education*	.33	.12	7.05	1	.00	1.38	1.09-1.76
<i>School Characteristics</i>							
Rural School	-.14	.15	.78	1	.38	.87	.64-1.18
Urban School	-.03	.14	.06	1	.80	.97	.74-1.27
Suburban School	.12	.14	.67	1	.41	1.12	.85-1.45
Private School*	1.13	.19	34.6	1	.000	3.11	2.13-4.53
<i>PABS Variables</i>							
Commitment to College*	.38	.05	51.83	1	.00	1.45	1.32-1.61
Study Skills	-.01	.05	.08	1	.79	.99	.90-1.08
Social Connection*	.15	.04	11.51	1	.00	1.16	1.07-1.27
Academic Self Confidence*	-.12	.05	5.3	1	.02	.89	.79-.98
Cox & Snell R Square	.31						
Nagelkerke R Square	.41						
Classification	76%						

\*p&lt;.05

In model three, shown in Table 14, the PABS variable study skills was removed ( $p = .79$ ). Since little empirical research clearly operationalizes study skills while simultaneously supporting its incremental usefulness in predicting four-year college enrollment, it is unlikely this variable contributes to model specification in these data. Status as a high school student in rural, urban, and suburban areas, in addition to both parents' level of education and incomes, were retained to stay consistent with previous research (Perna, 2000; Engberg & Wolniak, 2010). In model three, the omnibus test of model coefficients was significant ( $\chi^2 = 1410.07$ ,  $df = 16$ ,  $p < .01$ ). The Cox and Snell R square value was .31 and the Nagelkerke R Square value was .41, suggesting a similar level of model fit compared to models one and two. As in model one, slightly more than 75% of students were correctly classified as either enrolled or not enrolled in four-year colleges. Refer to Table 14 to see model three coefficients.

Before interpreting odds ratios in logistic regression, researchers should investigate potential interaction effects (Peng et al., 2002). Binary logistic interaction tests were conducted between PABS variables (e.g., commitment to college, social connection, and academic self-confidence) and indicators of academic achievement (e.g., GPA and ACT composite score) on four-year college enrollment. Composite ACT scores and high school GPA were selected as potential moderators due to their influence on future educational outcomes like retention (e.g., Robbins et al., 2006). In addition, binary logistic interaction tests were conducted between PABS variables (e.g., commitment to college, social connection, and academic self-confidence) and select demographic variables (e.g., female, African-American/Black, Hispanic, and parents' combined income) on four-year college enrollment.

Of these relationships, one negative interaction term was found between academic self-confidence and ACT composite score on four-year college enrollment ( $B = -.17$ ;  $SE = .06$ ;  $Wald = 9.23$ ;  $df = 1$ ;  $p < .01$ ). Interestingly, the interaction term between academic self-confidence and high school GPA on four-year college enrollment was not significant ( $p = .80$ ). There are several potential reasons for this, but one could be that the nature of standardized tests of academic achievement (e.g., high stakes situation) provides a relevant context for students to apply academic self-confidence skills. When I included the previously listed interaction terms in the model, model fit and variable coefficient size were similar to Table 14.

The negative interaction term means that as ACT composite score increased the effect of academic self-confidence on the log odds of four-year college enrollment decreased slightly. Conversely, as ACT composite score decreased, the effect of academic self-confidence on the log odds of four-year college enrollment increased slightly. Due to the small size of this interaction term, I caution researchers against generalizing this interaction term to data beyond this dissertation without secondary replication. However, proper interpretation of odds ratios in logistic regression models requires examination of statistically significant interaction terms (e.g., Peng et al., 2002).

As shown in Figure 5 below, for students with low average to high average ACT composite scores (e.g., 18-23), the slope for low academic self-confidence (e.g., 0-30; blue line) is steeper than the slope for students with high academic self-confidence (e.g., 51-60; purple line). In fact, the slopes of low and high academic self-confidence intersect at this point on the graph. A similar pattern is observed for students with low average to high average composite ACT scores (e.g., 18-23) who reported academic self-confidence

levels between 31-40 (e.g., green line) and 41-50 (e.g., yellow line). The slope of the green line, or students with academic self-confidence values ranging from 31-40, is slightly steeper than the slope of the yellow line, or students with academic self-confidence value ranging from 41-50. For students with high academic self-confidence (e.g., 51-60; purple line), the steepness of the slope gradually decreased as ACT composite score went up, whereas for students with low academic self-confidence (e.g., 0-30; blue line), the steepness of the slope increased as ACT score went up.

This means the positive effect of academic self-confidence on the log odds of enrolling in a four-year college was greater for students with low average to high average ACT composite scores (e.g., 18-23) than students with high ACT composite scores (e.g., 31-36). Students with the highest ACT scores (e.g., 31-36) also tended to report higher academic self-confidence scores than students who scored in the low to average range (e.g., 18-23). Unsurprisingly, students with high ACT scores (e.g., 31-36) were also more likely to enroll in college than students with low to average ACT scores (e.g., 18-23).

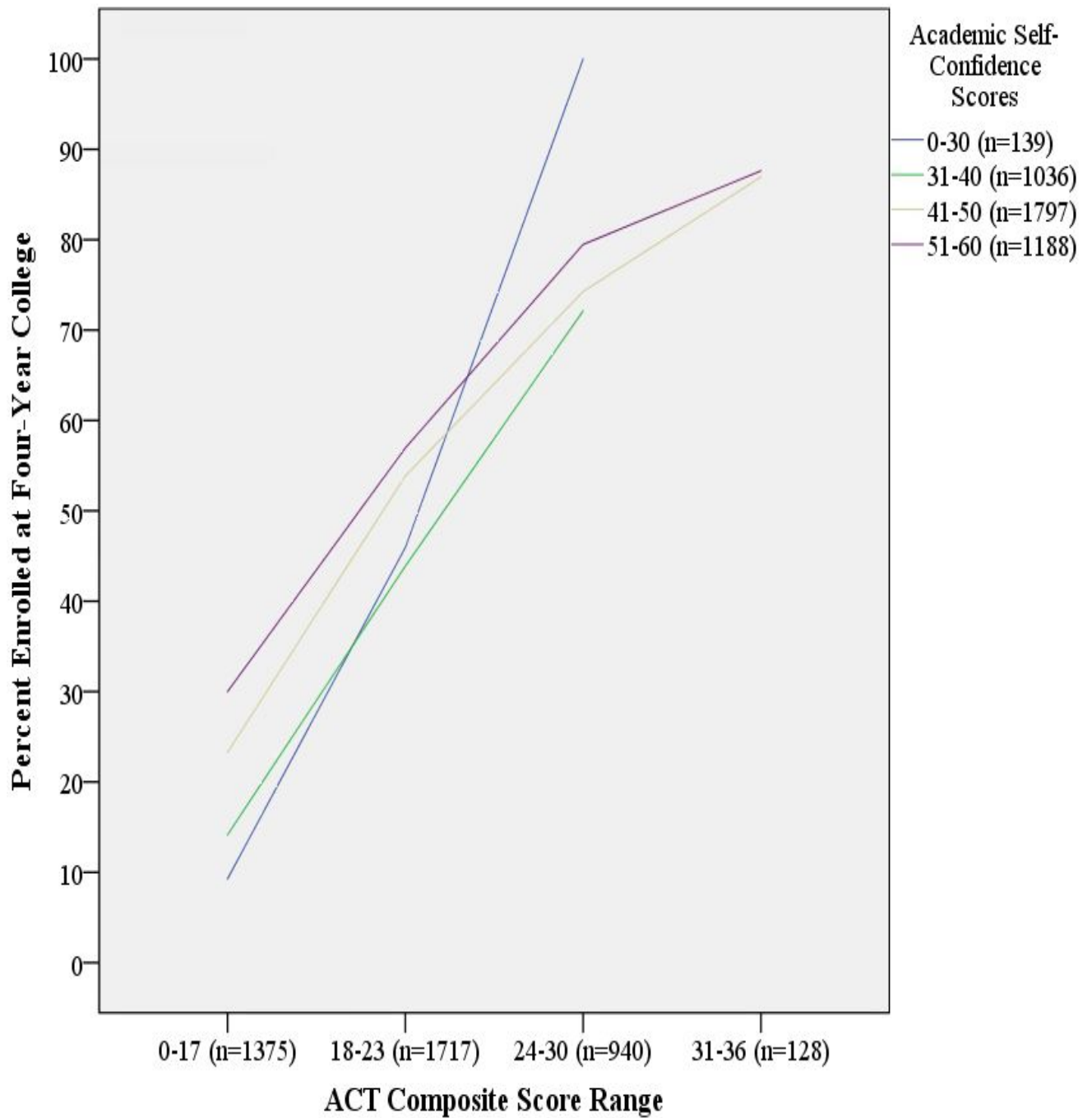


Figure 5. Interaction between academic self-confidence and ACT composite score on four-year enrollment.

Note: Academic self-confidence and ACT composite scores were recoded. Score ranges were selected after reviewing the distributions of the ACT composite score and academic self-confidence variables.

Table 14

*Model Three Logistic Regression Results Predicting Four-Year College Enrollment*

<b>Variables</b>	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>df</b>	<b>Sig.</b>	<b>Exp(B)</b>	<b>95% CI</b>
<i>Student Characteristics</i>							
African-American/Black*	1.06	.12	78.06	1	.00	2.88	2.28-3.64
ACT Composite Score*	.87	.06	197.27	1	.00	2.38	2.11-2.69
High School G.P.A.*	.64	.06	136.47	1	.00	1.90	1.71-2.11
<i>Parent Characteristics</i>							
Parent Income*	.22	.09	5.48	1	.02	1.24	1.04-1.49
Mother Education	.17	.11	2.24	1	.13	1.19	.95-1.48
Father Education	.32	.12	7.12	1	.01	1.39	1.09-1.76
<i>School Characteristics</i>							
Rural School	-.14	.15	.83	1	.36	.87	.64-1.17
Urban School	-.03	.14	.07	1	.79	.96	.74-1.27
Suburban School	.11	.14	.57	1	.45	1.11	.84-1.47
Private School*	1.11	.19	33.25	1	.00	3.05	2.09-4.45
<i>PABS Variables</i>							
Commitment to College*	.38	.05	51.84	1	.00	1.46	1.31-1.62
Social Connection*	.15	.04	11.47	1	.00	1.16	1.07-1.27
Academic Self Confidence*	-.13	.05	5.87	1	.02	.88	.79-.98
<i>Interaction Terms</i>							
Confidence X ACT*	-.17	.06	9.23	1	.00		
Confidence X HSGPA	-.02	.06	.08	1	.80		
Cox & Snell R Square	.31						
Nagelkerke R Square	.41						
Classification	75%						

\*p&lt;.05

Drawing from the reported odds ratios in Table 14, earning a high GPA, receiving a high composite score on the ACT and having parents with a high combined income related to increased log odds of four-year college enrollment. If a student attended a private school, the log odds of enrolling in a four-year college increased by 3.05 times (95% CI = 2.09 – 4.45;  $p < .01$ ). Identity as a person who is African-American/Black increased the log odds of enrolling in a four-year college by 2.88 times (95% CI = 2.28 – 3.64;  $p < .01$ ). In regards to the PABS variables, several relationships were observed. First, the log odds of enrolling in a four-year college were 1.46 times higher for each one-standard deviation increase in the commitment to college variable (95% CI = 1.32 – 1.62;  $p < .01$ ). A similar, but smaller pattern was observed for social connection. In these data, the log odds of enrolling in a four-year college were 1.16 times higher for each one-standard deviation increase in the social connection variable (95% CI = 1.07 – 1.27;  $p < .01$ ). To address the nested structure of the data (e.g., students clustered within schools), an HGLM model was conducted on the outcome four-year college enrollment.

***Hierarchical generalized linear models.*** HGLM is an appropriate multi-leveling modeling technique to use because the dependent variable is dichotomous (e.g., enrolled in a four-year college vs. not enrolled in a four-year college), as opposed to other hierarchical linear models more commonly used with continuous outcome variables (Raudenbush & Byrk, 2002; Ene, Leighton, Blue, & Bell, 2015). In HGLM, the Bernoulli distribution and a logit/logistic link function are used to estimate odds ratios (Ene et al., 2015). First, I calculated the intraclass correlation coefficient using equation two:

$$ICC = \frac{\tau_{00}}{\tau_{00} + 3.29} = \frac{1.23}{1.23 + 3.29} = .27 \quad (2)$$

In this equation,  $\tau_{00}$  represents the covariance parameter estimate of the null model (e.g., the model with no fixed effects where high school code was entered as a random effect), and 3.29 is a transformed constant defined by Snijders & Bosker (1999). The covariance parameter estimate was statistically significant (e.g.,  $z(109) = 5.22$ ;  $df = 109$ ;  $p < .0001$ ). This equation indicates that approximately 27% of the variance in four-year college enrollment occurred across high schools (Ene et al., 2015). Subtracting this ICC value from one reveals that 73% of the variance in enrollment at four-year colleges was accounted for by characteristics of the students, their schools, or other unknown variables.

HGLM helps control for school level variance, therefore providing further evidence relevant to research question one about the extent to which PABS variables predict four-year college enrollment. To help account for variation across high schools, I treated the variable high school code as a random effect using the PROC GLIMMIX function provided by SAS (v.9.4). All other variables (e.g., PABS) were treated as fixed effects. In its simplest form, a two level HGLM is defined by equation three:

$$\eta_{ij} = Y_{00} + Y_{10}X_{ij} + Y_{01}W_j + e_{oj} \quad (3)$$

In equation three, the log odds of enrolling in a four-year college ( $\eta_{ij}$ ) for student  $i$  in school  $j$  is predicted by the log odds of a typical student at a typical school entering college ( $Y_{00}$ ), the average effects of student level predictors ( $Y_{10}X_{ij}$ ), school level predictors ( $Y_{01}W_j$ ), and error variance ( $e_{oj}$ ) (Ene et al., 2015).



As shown in Table 15, three HGLM models were conducted in which all variables were entered simultaneously. Similar to the aforementioned binary logistic regression models, entering predictor variables simultaneously, as opposed to hierarchically or via step-wise procedures, allows for better comparison between different PABS. In model one, no predictors were entered in the model (e.g., null model). This model provided information about the variability in rates of four-year college enrollment across all 110 high schools in the level two sample. In model two, student characteristics (e.g., ACT score), parent characteristics (e.g., parents' income), and PABS variables (e.g., commitment to college) were entered to examine the relationships between level one characteristics and four-year college enrollment. Characteristics of the high school (e.g., status as a private school) were included in model three to better examine relationships between level two predictors and enrollment in a four-year postsecondary institution.

The -2 log likelihood (-2LL), Akaike information criterion (AIC), and Bayesian information criterion (BIC) values provide an indication of model fit and help identify a set of predictors properly specified to the data (Snijders & Bosker, 1999). When in the process of comparing models, smaller -2LL, AIC, and BIC values typically denote better model specification, but the numerical value of these indices, considered in isolation of other models, do not necessarily reflect poor or acceptable model fit (Snijders & Bosker, 1999). Across all three models the -2LL value decreases, but since model one is the null model it is not surprising that -2LL goes down as more variables are entered. The decreasing value of the -2LL value across all three models could simply reflect the increasing complexity of model parameters.

Since a decreasing -2LL does not necessarily indicate a better fitting model, I completed a deviance test between models 2 and 3 (since there are no predictor variables in model 1, it is assumed that model 2 is a better fitting model than model 1). Using a chi-square distribution ( $\alpha = .01$ ), I compared the difference in -2LL values between models 2 and 3 (e.g., 22.1) with degrees of freedom set to the difference in parameters included in both models (e.g., 3; Ene et al., 2015). The difference in -2LL between models 2 and 3 exceeded the chi-square critical value of 11.35, so I concluded the difference was statistically significant at the .01 level. This provides evidence that model 3 is the best model and that introducing school level (e.g., status at a private school) variables improved overall model fit.

Besides the -2LL value, the AIC value also decreases across all three models, providing additional evidence of improved model fit (e.g., Akaike, 1973; Kass & Raftery, 1995). Since I am primarily interested in selecting a model that maximizes my ability to predict four-year enrollment with a specified set of variables, I consider this decreasing AIC value to be evidence of improved model fit. The BIC value also decreases between models two and three, but since I am less interested in selecting a particular model among a number of numerous, competing models, I am inclined to place more emphasis on the AIC as evidence of parameter specification. Even in instances when the BIC value increases slightly between different models (e.g.,  $\Delta 2$ ), some researchers contend that such small value changes do not necessarily provide strong evidence against the model with the higher value (Kass & Raftery, 1995).

Table 15

*Two-Level HGLM Results of Four-Year College Enrollment*

	Model 1 B (SE)	Model 2 B (SE)	Model 3 <sub>b</sub> B (SE)	Model 3 ORs (95% CI)
<i>Fixed Effects</i>				
Intercept	-.04 (.12)	-.30** (.13)	-.33** (.12)	
<i>Student Level</i>				
Female		.01 (.09)	.00 (.09)	1.00 (.84-1.20)
African-American/Black**		.76** (.15)	.78** (.15)	2.19 (1.64-2.93)
Hispanic		.07 (.13)	.08 (.13)	1.08 (.84-1.39)
ACT Composite Score**		.77** (.07)	.83** (.07)	2.28 (1.98-2.61)
High School G.P.A.**		.66** (.06)	.65** (.06)	1.91 (1.70-2.15)
Parent Income*		.23* (.09)	.23* (.09)	1.26 (1.04-1.54)
Mother Education		.06 (.12)	.05 (.12)	1.06 (.83-1.34)
Father Education*		.33* (.13)	.30* (.03)	1.35 (1.05-1.74)
Commitment to College**		.41** (.06)	.41** (.06)	1.52 (1.36-1.69)
Study Skills		-.01 (.05)	.00 (.05)	.99 (.89-1.10)
Communication Skills		-.08 (.06)	-.09 (.06)	.91 (.81-1.03)
Social Connection**		.17** (.06)	.17** (.06)	1.18 (1.06-1.32)
Social Activity		.04 (.05)	.03 (.05)	1.03 (.93-1.14)
Academic Self Confidence		-.09 (.06)	-.09 (.06)	.91 (.81-1.02)
Steadiness		.00 (.05)	.00 (.05)	.99 (.90-1.10)
<i>School Level</i>				
Private School**			1.12** (.33)	3.17 (1.6-6.1)
<i>Interactions</i>				
Confidence X ACT**			-.17** (.06)	
Confidence X Female*			.21* (.09)	
<i>Error Variance</i>				
Level-2 Intercept	1.2** (.25)	.55** (.13)	.45** (.11)	
<i>Model Fit</i>				
-2LL	4678.6	3788.4	3766.3***	
AIC	4682.6	3822.4	3806.3	
BIC	4688.0	3868.3	3860.3	

Note: \*p<.05; \*\*p<.01; \*\*\*=deviance test significant; ICC = .27; Values based on SAS 9.4 PROC GLIMMIX. Entries show parameter estimates with standard errors in parentheses; b = best model; Estimation Method = Laplace

Several parameter estimates in model three were significant and positive. As expected, earning a high GPA and ACT composite score, having parents with high incomes, having a father with at least a bachelor's degree, and attending a private high school increased the log odds of matriculating to a four-year university. Notably, I believe the parameter estimate for private high school should be interpreted with caution. This is because there are likely many factors influencing this variable that I do not control for in this dissertation. For example, I do not consider the influence of factors like advanced placement courses or participation in extracurricular activities.

Using the PROC GLIMMIX function (SAS v. 9.4), I conducted interaction tests between PABS variables (e.g., commitment to college, social connection, and academic self-confidence) and indicators of academic achievement (e.g., GPA and ACT composite score) on four-year college enrollment. I also conducted interaction tests between PABS variables (e.g., commitment to college, social connection, and academic self-confidence) and select demographic characteristics (e.g., female, African-American/Black, Hispanic, and parents' combined income) on four-year college enrollment. Of these tests, academic self-confidence by ACT composite score ( $B = -.17$ ;  $SE = .06$ ;  $p = .03$ ) and academic self-confidence by gender ( $B = .21$ ;  $SE = .09$ ;  $p = .02$ ) were statistically significant. A three-way interaction between academic self-confidence, ACT composite score, and gender was not statistically significant ( $B = .04$ ;  $SE = .09$ ;  $p = .67$ ). The interaction between the academic self-confidence and gender variables is shown in Figure 6 below.

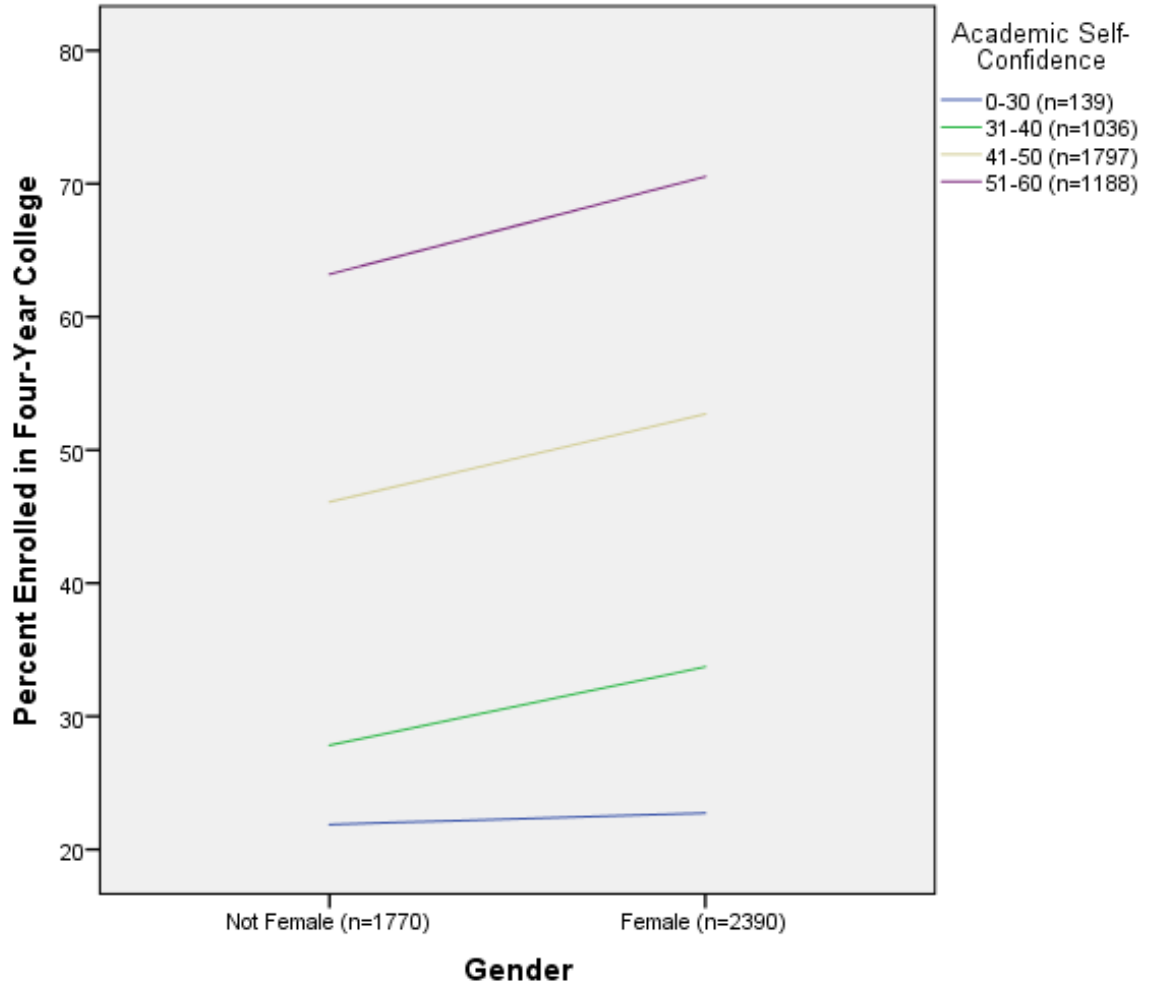


Figure 6. Interaction between academic self-confidence and gender on four-year enrollment.

Note: Academic self-confidence was recoded.

As shown in Figure 6 above, the influence of low academic self-confidence (e.g., scores of 0-30 shown in the blue line) on the odds of enrolling in a four-year college was similar for students who self-reported as female and students who reported they were not female. This is shown in Figure 6 by the blue line that is nearly parallel to the x-axis. However, as students' levels of reported academic self-confidence go up, the influence of this confidence on the odds of enrolling in a four-year college becomes dependent on the

student's reported gender (e.g., not female or female). For instance, compare the slopes of the green (e.g., scores of 31-40), yellow (e.g., scores of 41-50) and purple (e.g., scores of 51-60) lines, which increases across the gender conditions on the x-axis, to the slope of the blue line (e.g., scores of 0-30), which remains close to parallel along the x-axis. This change in slope represents moderation between academic self-confidence and self-reported gender on the log odds of matriculating to a bachelor's level university; that is, the influence of high academic self-confidence on the log odds of attending a four-year college appeared to be greater for students who identified as female than for students who did not identify as female.

Interestingly, in Table 15, academic self-confidence was not significant as a main effect in either model two or three, but there were significant interactions between academic self-confidence and several variables (e.g., ACT composite score and female) on the odds of enrolling in a four-year postsecondary institution. As previously shown in Figure 5, the interaction between academic self-confidence and ACT composite score on four-year enrollment was disordinal, suggesting that interpreting the influence of academic self-confidence on the log odds of four-year enrollment in isolation of other predictor variables in the model is problematic. Considering this information, the influence of academic self-confidence on the log odds of attending a bachelor's level college should be should interpreted as a function of other variables in the model. In these data, perhaps most notably ACT composite score and status as a female.

After controlling for variance in four-year enrollment across high schools, both commitment to college and social connection retained positive parameter estimates.

When all other variables equaled zero, the log odds of enrolling in a four-year college

were 1.52 times higher for each one-standard deviation increase in the commitment to college variable (95% CI = 1.36 – 1.69;  $p < .01$ ). Likewise, when all other variables equaled zero, the log odds of enrolling in a four-year college were 1.18 times higher for each one-standard deviation increase in the social connection variable (95% CI = 1.06 – 1.32;  $p < .01$ ). I encourage readers to examine the reported confidence intervals for these odds ratios to better understand how these variables relate to four-year college enrollment.

To calculate the percent of students who enrolled in a four-year college in these data, I divided the total number of students who attended a four-year college ( $n=1,995$ ) by the total number of students in the dataset ( $n=4,160$ ). This is shown below in equation four.

$$\varphi_{enroll} = \frac{1995}{4160} = .479 \quad (4)$$

Conversely, the percent of students who did not enroll in a four-year college was .521 (e.g.,  $1 - .479$ ). These percentages are similar to the 2014 immediate four-year college enrollment rate reported by the National Center for Education Statistics, which was .44 (NCME, 2014). Hence, this provides evidence that the percent of students immediately going to a four-year college in these data is comparable to national trends.

Building off these findings, I calculated a series of predicted probabilities to more closely examine a proxy effect size of the commitment to college Engage 10-12 subscale on four-year college enrollment (as shown below in equations five and six).

$$\varphi_{enroll} = \frac{e^{\eta_{ij}}}{1 + e^{\eta_{ij}}} \quad (5)$$

$$\varphi_{not\ enroll} = 1 - \varphi_{enroll} \quad (6)$$

In equations five and six,  $e$  represents the base of the natural logarithm (e.g., 2.72),  $\eta_{ij}$  is the log odds of success (e.g., enrolling in a four-year college) for student  $i$  in school  $j$ , 1 is a constant value,  $\varphi$  is the predicted probability of enrolling in four-year college, and  $1 - \varphi$  is the predicted probability of not enrolling in a four-year college (Ene et al., 2015).

Using equation five, I transformed the log odds of a commitment to college subscale score that fell one standard deviation above and at the mean to calculate the predicted probability that students with these respective subscale scores would matriculate to a four-year university. More specifically, I calculated the log odds of enrolling in a four-year college by taking the summation of the model intercept estimate and the appropriate standardized z-score value (e.g., 1 or 0), and then multiplying this value by the parameter estimate for the variable of interest. Next, I transformed this value to the odds of enrolling in a four-year college via the natural logarithm. Finally, I calculated the predicted probability using equation five.

When calculating predicted probabilities, all other variables in the model were held constant to more specifically interpret the unique influence of the commitment to college subscale score on the predicted probability of four-year college enrollment. Including the transformed log odds of a high commitment to college subscale score (e.g.,



one standard deviation above the mean) in the predicted probability formula resulted in equation seven:

$$\varphi_{enroll} = \frac{e^{.31}}{1 + e^{.31}} = .57 \quad (7)$$

Thus, when all other student and school variables were held constant, the predicted probability that a student with a high commitment to college subscale score (e.g., one standard deviation above the mean) would enroll in a four-year college was .57.

Conversely, the predicted probability that a student with an average commitment to college subscale score (e.g., a z score of zero) would matriculate to college was .46 when holding all other variables constant. This calculation is shown below in equation eight:

$$\varphi_{enroll} = \frac{e^{-.15}}{1 + e^{-.15}} = .46 \quad (8)$$

For a comparison, I completed a similar calculation by transforming the log odds of an ACT composite score that fell one standard deviation above the mean. By doing this calculation, I determined the predicted probability that students with an ACT composite score one standard deviation above the mean would matriculate to a four-year university when holding all other variables constant. Including the transformed log odds of a high ACT composite score (e.g., one standard deviation above the mean) in the predicted probability formula resulted in equation nine:

$$\varphi_{enroll} = \frac{e^{.57}}{1 + e^{.57}} = .64 \quad (9)$$

Comparing equations 7 and 8 to 9, it appears that the influence of ACT composite score on the predicted probability of enrolling in a four-year college is greater than that of

a student's commitment to college subscale score (e.g., when both ACT composite score and the commitment to college subscale were one standard deviation above the mean and all other variables were held constant).

The commitment to college subscale score appears to be empirically linked to four-year college enrollment. Despite this connection, there are several limitations to acknowledge with regards to the reported predicted probabilities. First, ACT composite score and the Engage 10-12 subscales have different scoring metrics (e.g., 36 score points vs. a six point self-report Likert scale, respectively), so readers should interpret the reported odds ratios and predicted probabilities with the awareness that an unstandardized, one-unit change in these variables are not interchangeable.

Second, readers should consider that the distributions of these variables are quite different. For instance, the ACT composite score variable distribution was relatively normal with a slight positive or right leaning skew, whereas the commitment to college subscale variable had negative or left leaning skewness. Despite these limitations, students' motivation – as measured by the Engage 10-12 commitment to college subscale – remains empirically connected to four-year college enrollment when accounting for academic achievement, a finding that should be of interest to educators and policymakers alike. This finding corroborates what many teachers already know: many students' academic behavioral skills are associated with key education outcomes (in this instance, college enrollment). Armed with this knowledge, teachers can more easily point to the benefits of implementing school programming activities (e.g., career exploration activities) that foster student development in areas that fall outside of traditional student success metrics (e.g., high school grades, test scores of academic achievement). Next, I

perform bootstrap modeling to ascertain whether high school GPA and ACT composite score mediated the influence PABS variables on four-year enrollment.

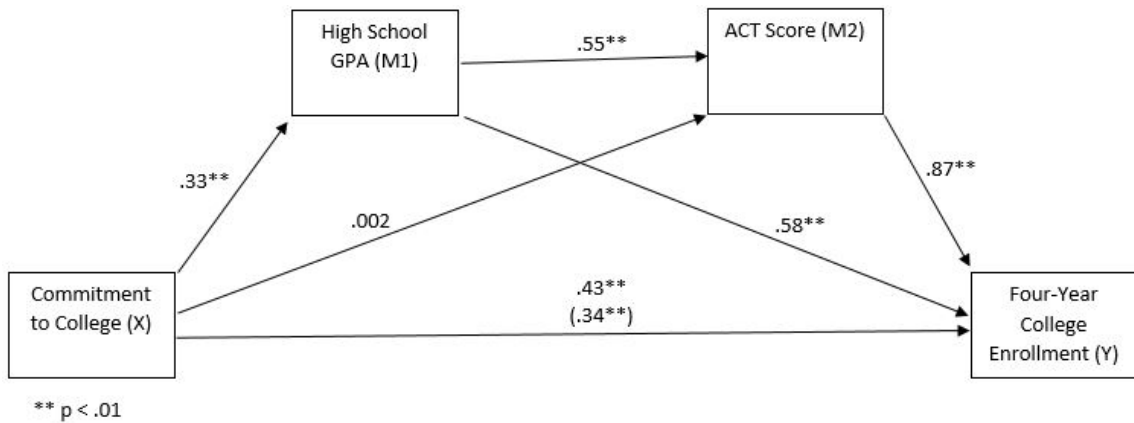
A double mediation model using bootstrapping was conducted to address research question two. This mediation model was conducted to test for a direct effect of commitment to college on four-year postsecondary enrollment, and the indirect effect of high school GPA and ACT composite score between these variables. I calculated mediation metrics using 5,000 bootstrap samples for bias correction via the PROCESS macro for SPSS (v. 2.16.1) and SAS (v. 9.4) (Hayes, 2013). Bootstrapping was selected as the most appropriate mediation technique because other methods (e.g., test of joint significance, Sobel test) are thought to be sensitive to type I and type II errors, respectively (Baron & Kenny, 1986; Preacher & Hayes, 2004).

There is debate about the extent to which various mediation modeling techniques agree despite their various limitations (Hayes & Scharkow, 2013). For these data, bootstrapping is an appropriate technique because it allows for mediation modeling on non-normal data and on dichotomous outcome variables specifically (MacKinnon, 2015). Commitment to college was selected as the independent variable of interest because in previous analyses it was the strongest PABS variable leading to four-year college enrollment. High school GPA and composite ACT score were selected as the mediators due to their predictive relationship with college enrollment and positive correlation as predictor variables (e.g.,  $r = .56$ ,  $p < .001$ ).

Barron and Kenny (1986) specified several rules that describe mediation. First, the variable of interest (e.g., commitment to college) needs to predict the outcome (e.g.,

four-year college enrollment). Second, the variable of interest should predict the proposed mediators (e.g., high school GPA and ACT score). Third, the mediators should be correlated and also need to predict the outcome (e.g., four-year college enrollment). Fourth, the predictive strength of the variable of interest on the outcome should decrease (e.g., evidence of partial mediation) or become non-significant (e.g., evidence of full mediation) when the mediators are entered in the equation.

Figure 7 shows evidence of partial mediation between commitment to college and four-year enrollment with high school GPA and ACT scores as the mediators. Readers should note that the partial mediation model presented in Figure 7 does not account for the nested nature of these data. This means that I did not treat the variable high school code as a random effect in this model. Importantly, a mediation model that accounts for variation across schools may show different results.



*Figure 7.* Partial mediation model between commitment to college and four-year enrollment with high school GPA and ACT score as mediators. Commitment to college, high school GPA, and ACT score were standardized. The value in parentheses is the path coefficient for commitment to college on four-year college enrollment after accounting for partial mediation effects of high school GPA and ACT score.

The direct effect of commitment to college on four-year enrollment was .43 (95% CI = .34 - .52). The influence of commitment to college on four-year enrollment decreased when considering the partial mediation effect of high school GPA, but not ACT score. As shown in Figure 7, introducing the high school GPA and ACT score mediators to the model decreased the commitment to college coefficient to .34 (95% CI = .30 - .39).

Interestingly, partial mediation occurred through high school GPA, but not through ACT score (as observed through the indirect effect coefficients of each mediator). For instance, the indirect path coefficient of commitment to college on four-year enrollment through high school GPA was .19 (95% CI = .16 - .23), whereas the indirect path coefficient of commitment to college on four-year enrollment through ACT score was .001 (95% CI = -.0214 - .0238). Although the direct path coefficient after accounting for partial mediation was .34 (95% CI = .30 - .39) this cannot be considered evidence of a causal relationship between commitment to college and four-year college enrollment. The results of this dissertation are summarized in part four.

#### **Part Four: Hypotheses**

*Hypothesis 1: Commitment to college, goal striving, study skills, and academic self-confidence will positively predict college enrollment at both two and four-year colleges.*

The effect of psychosocial academic behavioral skills on postsecondary enrollment is different at two and four-year colleges. For two-year colleges, I see little compelling evidence in these data that PABS variables were meaningful predictors of enrollment. I did find a positive relationship between commitment to college and two-year enrollment, but the size of this relationship was smaller (in terms of magnitude) than the influence of commitment to college on four-year enrollment (e.g., OR: 1.32 vs. 1.52, respectively). Thus, I conclude that hypothesis one is generally not supported at the two-year level, with the exception of a positive relationship between commitment to college and two-year college enrollment.

At the four-year level, I found several interesting relationships. Figures 5 and 6 present evidence that the influence of academic self-confidence on four-year college enrollment appeared to be a function of gender and academic performance as measured by the ACT. I found that the positive influence of academic self-confidence on a student's log odds of enrolling in a four-year college was greatest for students who reported being female, and for students who received low average to high average composite ACT scores (e.g., composite ACT scores between 18-23). I conclude that the influence of academic self-confidence on four-year college enrollment should not be interpreted as a main effect due to the disordinal nature of the aforementioned moderation terms.

Commitment to college and social connection had positive effects on four-year enrollment that were retained after controlling for variation across high schools. When all other variables equaled zero, the log odds of enrolling in a four-year college were 1.52 times higher for each one-standard deviation increase in the commitment to college variable (95% CI = 1.36 – 1.69;  $p < .01$ ). Similarly, when all other variables equaled zero, the log odds of enrolling in a four-year college were 1.18 times higher for each one-standard deviation increase in the social connection variable (95% CI = 1.06 – 1.32;  $p < .01$ ). Although these effects retained statistical significance after controlling for variation across high schools, I again encourage readers to consider the reported confidence intervals for these psychosocial behavioral skills. This may be especially true for the social connection variable, where the lower bound of the confidence interval is somewhat close to one.

Although I did not specifically analyze Engage 10-12 at the factor level (e.g., motivation, social engagement, self-regulation) with respect to four-year college enrollment, I postulate that the motivation factor of Engage 10-12, as opposed to the social engagement or self-regulation factors, is the most relevant to high school students' future college enrollment trends. This is because the commitment to college subscale coefficient is larger than the social connection coefficient when four-year enrollment is the outcome. Since I removed several motivation subscales from the Engage 10-12 measure due to concerns about multicollinearity, I wonder if these variables (e.g., goal striving, general determination, academic discipline) would have also been connected to four-year enrollment.

In addition to commitment to college and social connection, academic discipline is another important scale within the Engage 10-12 measure. Although removed from the present analysis, scholars have documented an empirical connection between academic discipline and key education outcomes like grades and persistence (e.g., Allen et al., 2008; Casillas et al., 2015; King & Ndum, 2017). Considering this evidence, researchers and policymakers should continue to acknowledge the benefits academic discipline has on key education outcomes like retention.

Overall, I find mixed support for hypothesis one with respect to four-year college enrollment, where the commitment to college, academic self-confidence, and social connection subscales were all empirically connected to this education outcome. While the magnitude of these relationships were somewhat modest, I believe the unique influence of a high commitment to college subscale on a typical student's likelihood of matriculating to a four-year college should be of interest to students, teachers, and policymakers.

*Hypothesis 2: High school GPA and standardized test scores of academic achievement will mediate the relationship between PABS and two and four-year enrollment.*

Results of the bootstrap mediation model offered some support for hypothesis two. High school GPA partially mediated the relationship between commitment to college and four-year college enrollment. Additionally, I found that ACT score did not have any significant mediation effect on the relationship between commitment to college and four-year college enrollment. These findings complement a growing body of literature concluding that psychosocial attributes are empirically linked to important



educational outcomes like persistence and grades (e.g., Robbins et al., 2004; Richardson et al., 2012). Implications of these findings are discussed in chapter five.

## CHAPTER 5

### DISCUSSION

In December 2015, President Barack Obama signed into law the Every Student Succeeds Act (ESSA) with bipartisan support. This law, which is a reauthorization of the Elementary and Secondary Education Act of 1965 (ESEA), guides education policy throughout the United States. It is a replacement to the controversial 2001 No Child Left Behind Act (NCLB), which required states to independently set achievement standards for students and implement standardized tests in order to receive federal funding from the Department of Education (e.g., Meier, 2004). Under the newest reauthorization of ESEA, states will continue implementing annual standardized tests to measure academic achievement, but state level authorities, as opposed to the federal oversight of NCLB, will inform accountability mechanisms.

One important provision of ESSA pertaining to psychosocial academic behavioral skills is found within Title I, which calls for a broader definition of student success than was previously defined by NCLB. Title I calls for the inclusion of non-cognitive factors in accountability models, specifically stating that “for all public schools in the State, not less than one indicator of school quality or student success that allows for meaningful differentiation in school performance” (as cited in Adelman & Taylor, 2016, p.2). Title I says the non-academic indicator should be “valid, reliable, comparable, and statewide,” and that it may include measures of “student engagement, educator engagement, student access to and completion of advanced coursework, postsecondary readiness, school

climate and safety, and any other indicator the State chooses that meets the requirements of this clause” (Every Student Succeeds Act of 2015, 2006). The law also emphasizes that information detailing a state indicator should be submitted to an educational agency for analysis, and specifies additional non-academic metrics like “absenteeism (including both excused and unexcused absences), incidences of violence, bullying and harassment” as permissible options for state accountability models (Every Student Succeeds Act of 2015, 2006).

The descriptions of the newly mandated Title I indicator are broad, providing states with flexibility about how to measure nonacademic behavioral success. However, within this flexibility lies a challenge, as state legislators and policymakers will need to make complex decisions about how educators will define and measure readiness for college and career. The value of non-cognitive constructs underlying Title I, such as psychosocial academic behavioral skills, are supported by the work of numerous empirical researchers (e.g., Binkley et al., 2012; Mattern et al., 2014; Robbins et al., 2004; Richardson et al., 2012). With the passage of ESSA, educators will progressively become interested in measuring and understanding how these variables relate to key education outcomes like college enrollment. As such, ESSA provides a clear motivating force for educators in the United States to more formally consider how to integrate PABS to education and career development programs.

## **Outline**

There are several sections in this chapter. First, the results of this dissertation are synthesized with previous studies that have examined psychosocial academic behavioral skills. Second, career and workforce development implications pertaining to psychosocial skill development are reviewed, with particular attention dedicated to the value of infusing job training policies with evidence-based career development research. Next, practice implications for teachers, school council members, educational administrators, politicians, and education policymakers are outlined. Fourth, pertinent limitations and potential future directions for empirical research are identified.

## **Research Synthesis**

In this dissertation, the commitment to college Engage 10-12 subscale was empirically linked to subsequent four-year college enrollment. Consider equations seven and eight, which demonstrated that the predicted probability of enrolling in a four-year university for a student with a high commitment to college subscale score was .57, whereas it was .46 for a student with an average commitment to college subscale score (all other variables were held constant). Although the effect of commitment to college on four-year enrollment was partially mediated by high school GPA (as shown in Figure 7), these findings are consistent with the results of Robbins and colleagues (2006), who found that the same Engage 10-12 subscales – commitment to college and social connection – also predicted first-year college student retention (OR: 1.19; 95% CI: 1.11-1.27;  $p < .01$ , OR: 1.13; 95% CI: 1.05-1.21;  $p < .01$ , respectively). In regards to commitment to college, this means that students with sufficient levels of academic

achievement, who are confident in their personal reasons for pursuing a four-year degree, and who are determined to invest the requisite time, effort, and personal resources to attain a college degree are more likely to enroll and persist through a four-year college than students who lack these qualities.

The finding about a connection between commitment to college and four-year enrollment also provides evidence that PABS are linked to outcomes that developmentally precede postsecondary persistence. Previously, in his Student Integration Model, Tinto (1975; 1993) famously posited that student dispositions affect dropout decisions during college. More recently, King and Ndum analyzed data from over 9,000 students in 31 different four-year colleges and determined that students with high academic discipline, commitment to college, and social connection Engage subscale scores were more likely to stay at their institution between the first and second year of college. King and Ndum (2017) found that, “if a student increased his or her academic discipline, commitment to college, or social connection [subscale score] by one standard deviation, the student’s probability of first-to-second year retention increased from .65 to .76” (pg. 14). The results of this dissertation similarly suggest that the commitment to college and social connection Engage subscale scores predicted positive educational outcomes, but at an earlier stage of development (e.g., college enrollment vs. persistence).

In addition, the reported positive relationship between commitment to college and four-year college enrollment reflects the meta-analytic correlation between institutional commitment and postsecondary retention calculated by Robbins and colleagues (2004). In their sample of over 20,500 subjects, Robbins and colleagues (2004) determined that

after correcting for measurement error the estimated correlation between institutional commitment and postsecondary retention was .26. Robbins and colleagues (2004) also concluded that institutional commitment demonstrated a stronger relationship with retention compared to other psychosocial constructs like social involvement (pg. 269). This is similar to the conclusions drawn from Table 15 in this dissertation, where commitment to college yielded a stronger relationship with four-year enrollment than social connection (e.g., odds ratios of 1.51 vs. 1.18, respectively). Thus, previous research and findings from this dissertation suggest that one's sense of commitment has a stronger empirical connection to education outcomes like college matriculation and retention than does social connectedness.

Social connection was also empirically linked to four-year college enrollment. This means that students who viewed themselves as socially connected with peers, teachers, and mentors were more likely to matriculate to a four-year college than peers who lacked a sense of belongingness in their school. Interestingly, in these data social activity did not yield any empirical connection to enrollment at two or four-year colleges. This suggests that a student's subjective sense of belonging and connection to other people in a school environment is more directly related to four-year college enrollment than their overall level of comfort in meeting new people.

As an example, consider that a student who simply feels comfortable meeting new people is not necessarily advantaged over a different student who is less comfortable interacting with peers. Rather, students appear to be better positioned to enroll in a four-year college if they feel a genuine sense of belongingness within their respective social environments. The reported discrepancy between social connection and social activity

connects to the findings of Schneider and colleagues (1996), who previously concluded that “social competence is [not] a monolithic entity, or...just general intelligence applied to social situations” (p. 479).

The finding about a positive relationship between social connection and four-year college enrollment also relates to studies by Allen and colleagues (2008) and Robbins and colleagues (2006). In a sample of over 6,800 students at 23 different colleges, Allen and colleagues (2008) applied a hierarchical multinomial logistic regression path model and concluded that social connectedness had “direct effects on retention” (e.g.,  $\beta = .152$ ,  $p < .01$ ). Similarly, Robbins and colleagues (2006) concluded the odds of first semester retention increased by a factor of 1.2 for each one standard deviation increase in the social connection subscale after controlling for other significant predictors. The magnitude of the standardized coefficients and odds ratios reported in studies like Allen and colleagues (2008) are similar to those in this dissertation. For instance, the social connection subscale was positively related to enrollment at a four-year college with an odds ratio of 1.18 (95% CI: 1.06 – 1.32;  $p < .01$ ).

An additional research implication of this dissertation relates to supplementing the evidentiary base of the Engage measure (e.g., ACT, 2012, Le et al., 2005). Due to the passage of ESSA, educators and policymakers at federal and state levels will progressively need to consider students’ psychosocial characteristics. To help meet this need, researchers must develop high quality assessment tools that measure PABS and which are linked to key education outcomes like college enrollment. Although Engage has strong empirical support pertaining to grades and persistence during college (e.g., Le et al., 2005; Robbins et al. 2006), the data from this dissertation supplement these

findings by connecting PABS with initial college enrollment. Beyond reflecting the results of previously published studies, the findings of this dissertation also reinforce the notion that psychosocial academic behavioral skills are characteristics of individuals who succeed in a globalized economy. Next, I examine how PABS are connected to broader, societal-level trends in workforce development before identifying specific practice implications.

### **Career and Workforce Development Implications**

In their *Handbook of Career and Workforce Development*, editors Scott Solberg and Saba Ali outline implications of implementing evidence-based career development programs at local, state, and national levels (2017). This resource comes at a pivotal time as the United States' economy continues to transition away from manufacturing and toward vocations defined by twenty-first century skills (Binkley et al., 2012). In their chapter defining twenty-first century skills, Binkley and colleagues (2012) persuasively describe how this shift is changing the skills workers need to be competitive:

No longer can students look forward to middle class success in the conduct of manual labor or use of routine skills – work that can be accomplished by machines. Rather, whether a technician or a professional person, success lies in being able to communicate, share, and use information to solve complex problems, in being able to adapt and innovate in response to new demands and changing circumstances, in being able to marshal and expand the power of technology to create new knowledge, and in expanding human capacity and productivity (p. 17)



Indeed, workforce supervisors search for employees who consistently demonstrate psychosocial skills when engaging with customers, providing services, or working collaboratively with co-workers in an office or other professional setting (e.g., Elchert, Latino, Bobek, Way, & Casillas, 2017; Judge & Bono, 2001; Judge et al., 2004). As an example, consider healthcare industries, where nurses, physicians, therapists, and other professionals must consistently apply psychosocial skills when meeting with patients. In the business sector, employees must be able to effectively socialize to a professional environment, show compliance with professional rules and norms, and consistently complete work tasks. Persons working in the service industry, such as in hotels, restaurants, and telecommunication firms, must efficiently execute work obligations, appropriately interact with customers, and manage multiple commitments simultaneously. All of these professional spheres increasingly prioritize psychosocial skills (Lippman, Ryberg, Carney, & Moore, 2015).

Problematically, the shift toward prioritizing psychosocial skills is coupled with the reality that career development researchers have historically been absent in shaping state and national policies that focus on job and workforce training (Ali, Flanagan, Pham, & Howard, 2017). Instead, state and local workforce development agencies have typically designed job training initiatives with the intention of equipping students and workers with discrete, technical skills, as opposed to conceptualizing career development as an integral part of youth development (Ali, 2013; Solberg & Ali, 2017). As noted by Ali and colleagues (2017), several states have designed and implemented evidence-based career development programs (e.g., Arizona Department of Education, 2016, Colorado Department of Education, 2014) that utilize interventions like self-exploration, career

exploration, and career planning (e.g., Solberg, Howard, Gresham, & Carter, 2012; Whiston, Rossier, Barón, 2017). Despite these positive examples, there are numerous additional career activities that are inconsistently integrated to career development programs across the United States (e.g., Brown & Ryan-Krane, 2000; Perry et al., 2014).

To help rectify this issue, Solberg and Ali (2017) recommend that politicians, policymakers, school administrators, and teachers throughout the United States place greater emphasis on integrating evidence-based career development programs within school curricula (e.g., Brown & Ryan-Krane, 2000). In part, this means educators and state-level policymakers should adopt a more holistic conceptualization of college and career readiness that goes beyond traditional indicators of future success like grades and standardized tests of academic achievement (e.g., Robbins et al., 2004; Mattern et al., 2014).

One way for educators to embrace a more holistic conceptualization of college and career readiness is to adopt individualized learning plans (ILPs) geared towards students' academic, personal, and social skill development (Solberg & Ali, 2017; Solberg et al., 2012). In essence, an ILP is a document that aligns a student's courses, postsecondary plans, and career goals, while also recording the student's varied college and career readiness skills (Solberg & Ali, 2017). However, ILPs also define the processes by which students gradually understand how their courses relate to future vocational goals through use of career development activities like self-exploration, career exploration, and career planning and management (Solberg, Wills, and Larson, 2013).

A series of studies have shown that students who participate in ILPs receive high grades, feel motivated to enter postsecondary training programs, and enjoy improved career decision making skills (e.g., Solberg, Wills, Redmond, & Skaff, 2014). More precisely, “ILPs support college readiness by helping students become aware of how their current courses are relevant to self-defined career goals. Parents, teachers, and students report that engaging in ILPs results in students selecting more rigorous courses” (Solberg et al., 2012, p. 11). By applying personally relevant career development programs that reflect evidence-based interventions, perhaps more students can successfully matriculate to postsecondary training, develop relevant twenty-first century skills, and persist through their collegiate careers to personally relevant vocations (e.g., Brown & Ryan-Krane, 2000; Solberg, Howard, Blustein, & Close, 2002; Solberg et al., 2012).

Historically, the profession of counseling psychology has made sustained contributions to the study of college and career readiness and the psychology of working (Blustein, 2013; Brown & Lent, 2008). As a result of these contributions and their specialized set of clinical and analytic skills, counseling psychologists are uniquely positioned to serve as advocates for the integration of evidence based career development activities to local, state, and national job training initiatives. This is reflected in the advancement of a scientist-practitioner-advocate model (SPA) of training discussed by Fassinger and O’Brien (2000) and subsequently supplemented by Mallinckrodt, Miles, and Levey (2014). The SPA model advocates for “research as advocacy” and “influencing public policy” for the betterment of clients’ well-being (Mallinckrodt et al., 2014, p. 305, 309). As more states consider how to apply and assess psychosocial academic behavioral skills in school systems due to ESSA, counseling psychologists

should actively seek out and collaborate with state-level policymakers to incorporate their expertise about college and career readiness to state and local policy.

### **Practice Implications**

The practice implications in this dissertation are drawn from aforementioned results and findings from additional researchers (e.g., ACT, 2007; Allen & Robbins, 2010; Fouad & Byars-Winston, 2005; Luzzo & McWhirter, 2001; Robbins et al., 2004; Tross et al., 2000) who have studied the relationships between PABS and positive education and workforce outcomes (e.g., graduation, securing employment). Applying these recommendations will help students develop important psychosocial skills that are necessary for success throughout college and career.

**Assess academics and PABS.** As rates of college student retention continue to struggle across the country (e.g., Carey, 2004; Kena et al., 2015), researchers have found that fostering psychosocial academic behavioral skills early in development is key to meeting the educational needs of a twenty-first century economy (Allen, Robbins, & Sawyer, 2010). These same attributes extend to positive workforce outcomes like successfully executing work-related tasks and job satisfaction (ACT, 2016; Hanson & Borman, 2006). Considering findings from the empirical literature (e.g., Robbins et al. 2004; Mattern et al., 2014), it is increasingly apparent that assessing students' risk of failure in both academic and psychosocial behavior domains is vital to preparing students for college and career. Although educators could measure PABS using different assessment tools, two examples of brief, standardized instruments for educators and

policymakers to consider include Engage (Le et al., 2005) and Tessera (Wrzus & Roberts, 2016).

Engage is one measure that can be used to assess key psychosocial academic behavioral skills that students need to succeed throughout their educations and careers (ACT, 2012; Le et al., 2005). Because Engage is a low-stakes survey and requires about 30-minutes to complete, schools could efficiently apply this instrument to acquire data about their students' psychosocial academic behavioral skills. Additionally, Engage has been extensively studied (e.g., Let et al., 2005; Peterson et al., 2006) so teachers and school administrators can point to empirical researchers who have investigated this measure. Despite these positive attributes of Engage, school administrators should select a measure of psychosocial academic behaviors that fit the needs of students, educators, and other relevant stakeholders.

School administrators should critically examine the measurement instrument they use to assess PABS variables. Although the language surrounding Title I is broad, school administrators should select “valid, reliable, comparable, and statewide” non-academic indicators (Every Student Succeeds Act of 2015, 2006). States and districts that select non-standardized or subjective indicators to demonstrate psychosocial academic behavioral skills could struggle to demonstrate meaningful findings across schools. And yet, self-report inventories can also be problematic for a variety of reasons (e.g., faking good), so researchers should carefully examine measurement tools with respect to their needs (e.g., Bowman, 2010). If educators collect data that is inconsistent or difficult to interpret and apply, it will be challenging to develop and implement interventions that aid

student psychosocial development, perhaps especially for students most in need of support services.

Additional measures of psychosocial academic behavior skills exist besides Engage. Tessera is a second psychosocial academic behavior skill assessment for educators to consider. Tessera, which is developed by the Professional Examination Service, is a low-stakes self-report instrument that provides information about tenacity/grit, organization/responsibility, teamwork/cooperation, composure/resilience, leadership/communication skills, and curiosity/ingenuity (Professional Examination Service, 2016; Wrzus & Roberts, 2016). More broadly, these psychosocial skills are associated with the big five constructs of personality, which include conscientiousness, agreeableness, emotional stability, openness, and extraversion (McCrae & Costa, 1987). In the Tessera assessment, students respond to self-report items, situational judgment situations, and forced choice questions designed to measure their level of mastery in each psychosocial domain (Professional Examination Service, 2016).

Tessera is a relatively brief measure that students can take entirely online, which eliminates the need for paper-and-pencil administration that can be burdensome, time consuming, and lead to additional test administration expenses. Additionally, institutional data files, personalized reports, and actionable insights are included as part of the Tessera scoring package, which can help teachers, education administrators, and state level education policy makers develop interventions that are relevant to individual students, schools, and districts (Professional Examination Service, 2016).

While ESSA encourages educators to measure academic and non-academic indicators to promote student success, some researchers point to the economic benefits of using holistic measurement techniques to monitor student progress. Consider a study by Belfield and colleagues (2015), who reported that for every \$1 invested in social emotional learning programs – programs that facilitate skills similar to the PABS identified in this dissertation – communities yielded approximately \$11 in return due to higher projected lifetime earnings, reduced crime rates, and overall better mental health and well-being. As discussed by Belfield and colleagues (2015), when people consistently apply psychosocial behaviors they are more effective at school and work, which leads to broad, positive benefits for communities.

Although findings from Belfield and colleagues (2015) are encouraging, readers are cautioned against erroneously applying this return on investment to all school districts and communities that measure PABS. Instead, policymakers should consider the Belfield and colleagues (2015) findings as one piece of evidence supporting the value of investing in and measure psychosocial attributes in school environments. To acquire the best possible data, educators should consider the potential benefits and challenges associated with assessing PABS on an annual basis starting early in students' development.

**Consider frequency of PABS assessments.** Although ESSA mandates that schools engage in annual standardized testing of academic achievement in grades 3-8, the specifics surrounding how and when schools assess psychosocial academic behaviors are less clear. Superintendents and school administrators would be wise to thoughtfully consider how frequently they measure students' psychosocial academic behavioral skills. Because assessments of psychosocial academic behaviors skills like Engage are likely

less stressful and time consuming for students than standardized exams of academic achievement, annual testing of PABS beginning early in development could be appropriate for some schools. For instance, if schools tracked students' psychosocial academic behavior skills on an annual basis starting in early middle school, teachers and school counselors could be better equipped to provide struggling students with interventions tailored to individual needs.

Although assessing PABS once per academic year could be appropriate in some school districts, the frequency of assessing PABS is a district and perhaps school specific decision influenced by many factors, such as ESSA provisions, fiscal limitations, and time constraints. Nevertheless, it is important to start assessing students' psychosocial academic behavior skills early in development. This way, there is sufficient time for students to work with teachers and counselors to apply strengths and address weaknesses in order to maximize their chances of future success (e.g., achieving adequate grades). To diminish the time and cost burdens of administering psychosocial assessments to all students, schools could randomly select a representative cohort to assess over a period of multiple years. However, assessment design and implementation procedures should always be purposeful and carried out in accordance with a pre-determined set of objectives (AERA, APA, NCME, 2014). Whenever possible, districts should consult with an expert in measurement, policy analysis, or program evaluation to design and apply an assessment procedure that meets educators' needs while also reflecting best practices (e.g., AERA, APA, NCME, 2014).

Similar to promoting academic achievement, the process of altering students' psychosocial academic behavioral skills is a time and labor intensive process. It is likely



that many students learn PABS in a non-linear fashion involving periods of improvement and skill regression. Arguably, instances when students' level of academic self-confidence or other behavioral skills appear to go down are important because this helps to instill future mastery experiences (Bandura, 1993, 1997). Mastery experiences represent a significant aspect of self-efficacy and involve instances when students overcome challenges or directly engage in skill development through self-directed behaviors (Bandura, 1993, 1997; Brown & Lent, 2013). Through implementing PABS assessments starting early in education, teachers and school counselors can more fully understand the extent of students' skills and work to provide targeted interventions that encourage psychosocial development.

**Provide targeted interventions.** On average, students who are provided with and make use of interventions tailored to particular needs are more likely to report modest gains in behavioral skills due to these supports (ACT, 2016; Robbins et al., 2009). In a sample of over 1,500 18-year old participants in college, Robbins and colleagues (2009) found that when students use personally relevant academic, social, recreational, or advising support services they reported increases in grades and/or improved chances of completing the first year of college. The authors found that the benefits of service utilization were most pronounced for students who were at the greatest risk of not completing college, as determined by their academic performance (Robbins et al., 2009). These findings support the usefulness of interventions that target individual student needs by instilling relevant psychosocial academic behavioral skills. Solberg and colleagues (2013) have previously described steps that educators and state level policymakers can take to provide students with a clear path to career readiness via ILPs. For instance, it is

oftentimes necessary to establish collaborative partnerships across multiple state-level agencies (e.g., department of education, workforce management) to support the implementation of ILPs that align students' courses, postsecondary plans and future career goals (Solberg et al., 2013).

Although interventions tailored to individual student needs are important, it is undoubtedly a challenge for educators in some schools to develop and implement supportive, individualized programming opportunities. Many schools experience budgetary constraints, forcing educators to carefully consider how to allocate limited available resources to best meet students' needs. There is also a deeply troubling national shortage of school counselors who provide vital counseling services for many students. For instance, consider there are an average of over 450 secondary students per school counselor in the United States, but the recommended ratio is 250:1 (American Counseling Association, 2011). In California, the ratio of students to school counselors during the 2011 academic year was a staggering 814:1 (American Counseling Association, 2011). These poor ratios represent one reason why some schools struggle to develop targeted interventions aimed at teaching students PABS.

While these challenges can be difficult for school districts to address, students' psychosocial academic behaviors remain empirically connected to key outcomes like grades (e.g., Casillas et al. 2015), persistence (e.g., Robbins et al., 2004), and college enrollment (as shown by data from this dissertation). When developing interventions, school districts could partner with local agencies or community colleges to establish programs that facilitate professional interests, foster psychosocial skills, and prepare students to manage challenges throughout their postsecondary training and/or careers.

**Assessment timing, growth modeling, and accountability.** Educators and policymakers should consider when to implement PABS assessments during the school year. If assessments are conducted using a brief, standardized instrument they should be given to students near the start of the school year. This way, teachers and counselors can use aggregate data and information about particular students to develop interventions aimed at instilling PABS behaviors. If schools apply PABS assessments late in the academic year, such as during the spring, teachers and counselors will likely have insufficient time to observe positive behavior changes as a result of subsequent behavioral interventions (for instance, students receiving better grades and/or understanding their behavior strengths).

Scholars in higher education, education policy, and educational measurement have debated the relative merits and shortcomings of growth and proficiency accountability models for many years (e.g, Ho, 2008). The particularities of this dialogue are beyond the scope of this dissertation, but as educators contemplate how to incorporate PABS to accountability models, I recommend prioritizing growth over proficiency. This means policymakers should incorporate growth modeling as opposed to applying standards of acceptable PABS to inform accountability models. Educators should conceptualize acceptable behavior progress relative to a given student's life circumstances, personal needs, strengths, and identified areas of growth, as opposed to setting a uniform cut score for certain desirable behaviors.

Students from varying cultural backgrounds may differentially respond to items measuring a particular PABS construct, which means that uniform cut scores of acceptable PABS growth could lead to inaccurate conclusions about students'

psychosocial readiness for college and career. Additionally, language barriers will likely represent a significant impediment for educators in the United States working with students who speak English as a second or third language. Moreover, students who are highly self-confident, consistently persist through challenging tasks, and effectively collaborate with peers may show little measurable progress across measurement years because their behaviors are already contributing to positive outcomes.

In my view, many students are capable of showing small to modest increases in PABS scores across several measurement years, assuming appropriate supports and targeted interventions are provided (e.g., Robbins et al., 2009). However, accountability models should acknowledge the non-linear nature of behavior change and should consider adequate growth within the context of students' baseline behaviors. Since certain psychosocial academic behavioral skills (e.g., academic self-confidence) interact with indicators of academic-achievement (e.g., ACT composite score), changes in students' behaviors should be considered with respect to a particular individual's circumstances.

There are multiple limitations to using non-academic indicators in school accountability models that should be acknowledged. Researchers such as Duckworth and Yeager (2015) have explicitly stated that self-report instruments of "personal qualities" are "not yet" ready to be integrated to accountability mechanisms (p. 251). Duckworth and Yeager (2015) additionally describe the influence of potential reference bias, where students perceive the nature of their academic behaviors differently due to divergent expectations or norms in distinct school environments. Another concern raised by Duckworth and Yeager is that students could artificially inflate their behaviors,

particularly in high-stakes situations that influence school funding allotments from state or federal agencies (2015).

These concerns are necessary for educators and policymakers to consider, as are worries that poorly applied assessments of psychosocial behaviors could contribute to weak instructional practices that do little to support student development. Bowman (2010) also outlines the temporal nature of self-report inventories, meaning that students' ability to accurately self-report learning or development is influenced by time. In other words, cross-sectional self-report inventories could yield findings that don't actually reflect longitudinal changes in student development (Bowman, 2010). And yet, Bowman (2010) also acknowledges some benefits associated with self-report inventories of student development, such as advantageous pricing and insightful data relating to students' satisfaction levels. All of these concerns should be considered and acknowledged by policymakers when developing accountability mechanisms informed by PABS.

Beyond these concerns, a large volume of research supports the positive influence of PABS on persistence, better grades, and additional outcomes like satisfaction with school (e.g., Ali & Saunders, 2006; Allen & Robbins, 2010; Duckworth et al., 2007; Duckworth & Seligman, 2005; Kuh et al., 2008; Lipnevich & Roberts, 2012; Mattern et al., 2014; Robbins et al., 2004). Internationally, assessments of twenty-first century skills are currently being developed and implemented. For instance, Binkley and colleagues (2012) outlined principles to inform twenty-first century standards and assessments including areas like emphasizing performance-based outcomes and providing actionable information that inform students and teachers alike. Other researchers associated with the ATCS (Assessment and Teaching of 21<sup>st</sup> Century Skills) project at the University of

Melbourne are currently working to design and pilot new assessment methodologies to measure twenty-first century skills like collaborative problem solving (e.g., Scoular, Care, & Hesse, 2017). This exciting research offers evidence that the delivery of assessment methodologies geared toward measuring psychosocial constructs and twenty-first century skills is gaining momentum.

There are also examples of school districts in the United States applying assessments of psychosocial academic behavioral skills. For instance, California's CORE has successfully integrated self-report instruments measuring non-cognitive factors to accountability models (West, 2016). Data analyzed from the CORE district resulted in small to medium correlations between non-cognitive factors like self-efficacy (.28) and social awareness (.20) with English language arts test scores (West, 2016). However, West noted that his findings were limited because he could not consider the potential influence of high stakes testing or how self-report instruments informed teaching practices (2016).

Another example of a school that assesses and integrates psychosocial academic behavioral skills to classroom activities is the Two Rivers Public Charter School in Washington D.C (Ronan, 2017). Two Rivers Public Charter School serves students in kindergarten through eighth grade and emphasizes project based or experiential learning (Ronan, 2017). School administrators developed a social and emotional curriculum with the goal of instilling kids with social and emotional competencies that can be applied in a variety of settings (Ronan, 2017). After receiving a grant, Two Rivers partnered with the Stanford Center for Learning and Equity to design assessments that could be used to gather student data, refine programming, and provide educators with valuable insights

about their students social-emotional functioning (Ronan, 2017). Along with the California CORE district, actions taken by Two Rivers administrators reflect a trend amongst educators to more directly incorporate and measure non-cognitive factors.

**Discussing assessment results with students.** Brief, standardized instruments like Engage 10-12 oftentimes provide individualized test reports with content about students' recorded behavioral strengths, areas of needed growth, and potential interventions that could instill positive habits (Figure 8). While these personalized reports are helpful some students may struggle to absorb and apply this information in a way that fosters behaviors associated with positive education outcomes (e.g., persistence). Particularly in the context of students' busy day-to-day lives in and out of school, it is reasonable to assume a large number of students will need support or scaffolding mechanisms to integrate assessment results to their daily routines.

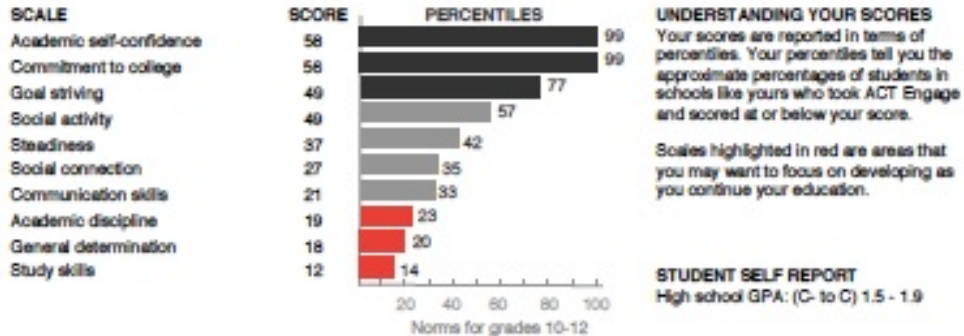
## Sample Student

Tested on MM/DD/YY  
11<sup>th</sup> Grade - ID 926096433

**ACT<sup>®</sup> Engage<sup>™</sup>**  
**Grades 10-12**

**SAMPLE HIGH SCHOOL** Class/section: 006

ACT Engage Grades 10-12 measures personal, behavioral, and academic skills critical to high school and college achievement. Low scores on ACT Engage represent areas that, when improved, may increase your grades and make it easier to focus on being successful as you transition into college. This report is designed to help you identify your strengths and weaknesses in order to ensure that you are successful in your academic career.



### Capitalize on your strengths

#### 99 Academic self-confidence

*The belief in one's ability to perform well in school* — Your score on this scale suggests you feel highly confident in your ability to succeed academically. Confidence in your abilities is critical to your academic success.

#### 99 Commitment to college

*One's commitment to staying in college and getting a degree* — Your response suggests that you feel confident in your reasons for continuing your education. You see yourself as determined to invest the necessary time and effort required to attain a high school diploma and college degree.

#### 77 Goal striving

*The strength of one's efforts to achieve objectives and end goals* — Your response indicates that you see yourself as goal driven. You generally set appropriate goals and you feel confident in your ability to achieve these goals. Establishing and accomplishing goals is an important life skill that is essential for success in high school and beyond and will help you to maintain your motivation, energy, and focus.

### Continue to develop your skills

#### 57 Social activity

*One's comfort in meeting and interacting with other people* — Your response suggests you feel relatively comfortable interacting with people you do not know and making new friends. Your social skills may benefit you in courses that emphasize team projects and other collaborative assignments.

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**ACT<sup>®</sup>**



**42 Steadiness**

*One's responses to and management of strong feelings — Your response indicates that you see yourself as capable of effectively controlling your emotions. You feel as though you do not often lose your temper and you manage frustration well. You are fairly effective in keeping emotions from affecting your academic performance and other important activities in your life.*

**35 Social connection**

*One's feelings of connection and involvement with the college community — Your response suggests you see yourself as connected with your school and its student body. Your involvement in school activities will provide a valuable source of stress relief and social interaction that will serve to enhance feelings of connection.*

**33 Communication skills**

*Attentiveness to others' feelings and flexibility in resolving conflicts with others — Your score on this scale suggests that you tend to see yourself as fairly comfortable when communicating with others, handling interpersonal conflicts, and working collaboratively with others. These skills will help you in learning and work environments as you effectively exchange information, cooperate with others, and work as a team member.*

### Make plans for improvement

**23 Academic discipline**

*The amount of effort a student puts into schoolwork and the degree to which a student is hardworking and conscientious — Your response suggests you frequently approach academic related tasks with less enthusiasm and effort than other students. You may frequently rush through your homework without giving much attention to detail, turn in poor or incomplete work, or give up on difficult tasks or problems.*

**20 General determination**

*The extent to which one strives to follow through on commitments and obligations — Your score on this scale suggests that you see yourself as someone who often has difficulty fulfilling your assigned responsibilities or duties. If something more interesting presents itself, you may pursue that interest rather than uphold your prior obligations and/or tend to your commitments. Other people may not be able to depend on you to fulfill your promises.*

**14 Study skills**

*The extent to which students believe they know how to assess an academic problem, organize a solution, and successfully complete academic assignments — Your response indicates that you feel you lack good study skills, problem-solving skills, and learning strategies. Like academic abilities, these skills are important in predicting your success in high school and beyond.*

### Recommended plan of action

Your ACT Engage scores provide information that can help you develop your personal and academic-related skills, which in turn can help you to perform well in high school and facilitate your transition to college. By focusing on building those skills for which you obtained relatively lower scores, you can derive maximum benefit from the learning and growth opportunities available to you.

Figure 8. Sample student Engage 10-12 report.

Students who complete PABS assessments should be provided access to school counseling services to help them understand and apply results. Educators should be mindful that certain students may not want to attend counseling services despite a clear need. These circumstances may require appropriate incentives or mandates to attend counseling services. Importantly, situations where students are mandated to meet with a school counselor are oftentimes context specific and necessitate input and cooperation from multiple parties (e.g., parents, teachers, principal, school counselor or psychologist). When students do meet with school counselors or other educators, it is vital to establish a sense of rapport that respects the student's interests, preferences, background, and personal characteristics. For instance, counselors should understand personal factors like a student's socio-economic status, cultural background, his or her existing support system both in and out of school, and any diverse identities or circumstances that may uniquely influence the student's assessment results (e.g., language differences or English proficiency that may invalidate interpretations of assessment results).

After acknowledging the student's unique background and forming rapport, counselors should proceed to identify and review behavior strengths. It is likely a good idea to ask the student to reflect on their assessment results and to describe the extent to which they agree with the reported findings. Students and counselors should collaborate to identify strategies for applying behavioral strengths to school tasks. For instance, students with high academic self-confidence scores could consider taking on leadership positions in their schools (e.g., school council). Discussing the student's individual strengths could lead to a productive conversation about how he or she will apply their best skills to achieve personal goals.

After identifying and discussing personal strengths, counselors and students should identify behaviors that should be improved. This is a good opportunity to brainstorm simple, concrete strategies the student could apply to promote his or her skills in a certain area. An example is that a student who struggles to develop friendships could work with a counselor to identify strategies to develop relationships with peers. In this situation, one potential strategy involves listing options to participate in different extracurricular opportunities, or setting up regular counseling appointments to practice good social skills. When talking about academic behaviors that are more challenging for a student to apply in his or her daily life, it is very important for teachers and counselors to normalize the process of self-growth and improvement. One way to do this is by acknowledging that all people have personal strengths and areas of growth and that self-development activities like counseling are healthy and normal. Next, limitations of this dissertation are discussed.

### **Limitations**

This study has several important limitations to acknowledge. First, this dissertation is methodologically quantitative and offers no insight regarding students' subjective beliefs about the extent to which PABS are relevant to educational outcomes like college enrollment. The data reported herein do not reveal large quantitative relationships between operationalized PABS constructs and immediate enrollment in a two-year postsecondary institution. However, it is possible that some high school students *believe* their psychosocial attributes relate to subsequent postsecondary matriculation. In turn, these beliefs may influence a student's likelihood of attending a two-year college in ways that fall outside the scope of this study.

A second limitation involves the order of entry for variables in the logistic and hierarchical generalized linear models. In this dissertation, variables were entered using logic and insight from previous literature (e.g., Perna, 2000). However, there are multiple ways to enter variables in regression models (Menard, 1995) and it is possible another researcher would select a different order (e.g., hierarchically, step-wise).

A third limitation relates to the most appropriate index of logistic model fit. To promote model specification, I reported several indices of model fit (e.g., Nagelkerke and Cox and Snell R square values) in order to conceptualize model specifications from varying perspectives. A different researcher could display model fit using alternate model fit statistics. Moreover, to better account for the ordinal nature of the outcome variable (e.g., not enrolled in any college, enrolled in two-year colleges, or enrolled in four-year colleges), a different researcher could have applied multinomial logistic regression, but I did not use this analysis technique. Using multinomial logistic regression could help make more meaningful comparisons across these three enrollment possibilities than the logistic regression models I conducted.

Another limitation with the reported logistic regression models relates to the overall number of variables. It is common practice in quantitative educational research to report the most parsimonious, explanatory model. I attempted to report the cleanest models in this dissertation but intentionally included some variables due to their presence in previous studies (e.g., Perna, 2000, 2006). Consequently, there may be several variables in Tables 13-15 that could be eliminated without greatly reducing the appropriateness of the model itself. These model characteristics are especially important to acknowledge as potential limitations given the size of the coefficients and the reported

mediation and moderation effects. The coefficients reported in this paper could be influenced by the overall sample size. This means that the level one sample is large enough ( $N = 4,160$ ) for some coefficients to appear statistically significant, but have limited practical relevance in reality. For this reason, the findings in this dissertation should be replicated.

An additional limitation is the coding mechanisms used for the reported interaction effect between academic self-confidence and ACT test score on four-year enrollment (Figure 5). Recoding ACT composite score to four distinct levels may have influenced how the data are visualized in Figure 5. For instance, if I had recoded ACT composite scores to fit within one of six levels, as opposed to four levels, the slopes in Figure 5 may have looked different.

Selection bias likely limits the extent to which findings from this dissertation can be generalized to the population of interest. Since different numbers of students completed the Engage measure at each school, there were likely varying reasons these students decided to take the survey. Some students may have been required to take the survey, whereas other students chose to complete the measure of their own volition. These different motivations for completing Engage may have biased the results by influencing students' tendencies to complete the measure honestly.

Another possible source of selection bias is that students taking the Engage measure may have been more or less inclined to attend college than students who did not complete the survey. Thus, it is possible that high school students who did not want to attend college were systematically less likely to complete the survey, which would

introduce selection bias. It is also possible that students who decide to pursue two versus four-year colleges interpret Engage 10-12 questions relating to college commitment and other PABS differently, which could alter the empirical associations reported in this dissertation.

Power at the second level of data (e.g., school level) is another potential limitation. During the data-cleaning portion of my analysis, I removed schools with fewer than five students. Initially, I did this to help satisfy statistical assumptions, but this decision may have also unnecessarily reduced the overall power of the HGLM models.

Finally, I think it is important to acknowledge that I currently have a financial connection to ACT, Inc., the non-profit organization that owns and distributes the Engage 10-12 measure. For approximately four years, I have served as a half-time Research Assistant for ACT, Inc. In this position, I collaborate with experts in assessment, personality, and career development. In my role, I contribute to department initiatives, write internal documents, and represent ACT, Inc. at national research conferences. To promote the integrity of my analysis, I consulted on a per-need basis with the Statistics Outreach Center in the College of Education at the University of Iowa.

## Future Directions

The findings reported in this dissertation raise several potential directions for future research. One direction involves conducting a qualitative inquiry regarding the extent to which students' psychosocial attributes influence postsecondary enrollment. A qualitative investigation would rely on different epistemological assumptions than applied in this dissertation, such as those described by Lincoln and Guba (Lincoln & Guba, 1985). One purpose of a naturalistic inquiry is to provide information about high school students' subjective beliefs about whether non-academic behavioral skills relate to postsecondary enrollment.

Contrary to the research questions I put forward in this dissertation, a qualitative investigation would not seek to generalize results. Instead, a naturalistic inquiry would pursue a deep understanding about the experiences of high school students and their psychosocial academic behavioral skills. This type of an investigation would illuminate the findings reported in this dissertation by providing a more detailed look at how non-academic factors help high school students meet education and career goals.

Another future direction is to investigate whether applying PABS during middle school predicts future four-year college enrollment. While the results in this dissertation already point to the value of acquiring PABS early in development, establishing an empirical relationship between middle school PABS and four-year college matriculation would reinforce the significance of fostering psychosocial skills in young students. Although I offer no a priori hypotheses regarding potential relationships between middle school PABS and four-year college enrollment, research in this area would enhance the

literature by potentially extending the results of this dissertation to earlier stages of development. When conducting this analysis, researchers would be wise to investigate the influence of commitment to college and social connection, as these constructs were the strongest predictors of four-year college enrollment in this dissertation.

A third future direction involves replicating the present findings and conducting a more thorough investigation of potential moderators and mediators. Additionally, the positive influence of commitment to college and social connection on four-year college enrollment needs to be replicated using novel data and different researchers. Although I provide an initial investigation of potential moderator (e.g., ACT score) and mediator effects (e.g., HS GPA) that relate to how PABS connect to college enrollment, future researchers should continue this effort. Examining the type of coursework (e.g., AP or non-AP classes), as opposed to simply examining cumulative high school GPA, could produce interesting findings that address the research questions.

Re-analyzing these data by paying special attention to clustered data is yet another direction for future research. Since students are nested within classrooms, schools, school districts, and states, varying levels of data should be considered. For example, distinct state-level education policies likely influence students' chances of sufficiently acquiring psychosocial academic behavioral skills. By accounting for three data levels (e.g., state, school, student) instead of two (e.g., school, student) researchers could form a more nuanced understanding of how PABS influence college enrollment.



## Conclusion

To attain educational goals like enrolling in, persisting, and graduating from college, many students need to develop and consistently apply psychosocial academic behavioral skills. In this dissertation, I found that two specific PABS – commitment to college and social connection – were empirically linked to increases in students’ odds of enrolling in a four-year college. The effects of these relationships on four-year college enrollment were partially mediated by high school GPA.

These findings supplement a growing body of literature that consistently link PABS to positive education and workforce outcomes throughout the lifespan (see Mattern et al., 2014 for a review). With the passage of ESSA, public schools throughout the United States will increasingly need to demonstrate students’ psychosocial academic behavioral skills. By infusing workforce development policies with evidence-based career development activities (e.g., Solberg & Ali, 2017) and by holistically assessing students’ readiness for college and career, perhaps more students can matriculate to college, earn a postsecondary credential, and secure personally-relevant employment.

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