

STUDENT-INSTITUTION FIT, EXTERNAL COMMITMENTS, AND PERSISTENCE

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Steven Scott Graunke

STUDENT-INSTITUTION FIT, EXTERNAL COMMITMENTS, AND PERSISTENCE

The purpose of the following study is to expand the existing literature of student-institution fit and retention by including factors related to socio-economic status (SES) and nontraditional student status in a model that measured actual student retention at a large, primarily nonresidential urban university. Specifically, this study explores the effect of student-institution fit on fall-to-fall retention when accounting for other factors associated with student success. Research has shown that students with a large number of external commitments are at risk for leaving college before completing their degree (Horn & Carroll, 1996). Likewise, students from low SES backgrounds have also been at risk of not completing their degree due to an inability to pay, inadequate support networks, or an inability to cover the expense of basic needs (Cabrera, Stampen, and Hansen, 1990, Terenzini, Cabrera, and Bernal, 2001, Chaplot, Cooper, Johnston, and Karandjeff, 2015). Bowman and Denson (2014) and Denson and Bownman (2015) introduced two student-institution fit instruments that the authors claim could be used to identify students who might be at risk of leaving their institution. Similarly, Gilbreath, Kim and Nichols (2011) claim that a student-institution fit instrument could be used to identify students who are likely to find fit and thus persist at an institution. However, to date there has not been an exploration of the relationship between student-institution fit and retention net the effect of nontraditional student characteristics or low SES. A total of 351 new beginners and transfers at IUPUI completed a survey which included the Gilbreath et al. (2011) student-institution fit instrument. A confirmatory factor analysis revealed that the model fit data obtained from the IUPUI sample following some modifications. However, Cronbach's alpha levels for two of the three fit subscales were low, providing questionable evidence of the internal consistency of these scales. Three separate path analyses were then conducted to determine the effect of student-

institution fit on fall-to-fall retention net the effect of nontraditional student characteristics and low SES. The results of these analyses showed that Social Environment fit had a significant effect on fall-to-fall retention when the number of nontraditional student characteristics were included in the model. However, the effect was no longer significant once receipt of a Pell grant and unmet financial need were included. These results highlight a need to continue to develop student-institution fit instruments to better assess Academic Environment fit and Physical Environment fit. The results also bring into question the use of student-institution fit instruments as a tool to identify students at risk for departure.

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CHAPTER ONE

INTRODUCTION

Identifying which student characteristics are associated with student retention and degree completion has long been an area of interest for higher education researchers, dating back to at least the 1920's (Summerskill, 1962). Today, federal and state governments as well as numerous non-profit organizations have endorsed a wide variety initiatives designed to encourage institutions to improve retention and graduation rates. For example, the Lumina Foundation's "big goal" is to have 60% of Americans with a high-quality postsecondary credential by the year 2025 (Lumina Foundation, n.d.).

Bold college completion goals cannot be attained, however, if students leave higher education before obtaining their degree. According to the National Student Clearinghouse Research Center (2016) about 61% of students who began college in the fall of 2014 were still enrolled in their original institution in fall 2015, and only 72% were still enrolled at any higher education institution at all. Retention, defined as persistence at the same college from one year to the next, is especially poor among students who do not possess sufficient financial resources (low socio-economic status (SES)) and students with a wide variety of external commitments (nontraditional students). Of low SES adult students who began during the 1995-96 academic year, only 7% of those intending to complete a Bachelor's degree actually did complete their degree within six years (Cook & King, 2004). Likewise, degree completion for students who have received a Pell grant has been included as a metric in the state of Indiana's funding formula for public institutions, demonstrating that at least one state has made increased degree production among low SES students a priority as well (Indiana Commission for Higher Education, 2013).

Tinto (1975, 1993) proposes an interactionist model of student retention in which students' demographic and academic characteristics, combined with their goals and commitment

to degree attainment, interact within the social and academic context of their institution to affect students' subsequent decisions to remain or depart. In the most recent revision of this model, Tinto (1993) theorizes that external commitments, defined broadly as financial concerns and obligations external to the institution, such as work or family commitments, have a direct effect on students' goals and commitments, and therefore an indirect effect on retention. More recently, Bowman and Denson (2014) and Denson and Bowman (2015) provided further elaboration on Tinto's model by introducing the concept of student-institution fit. Drawing from broader person-environment fit theories as well as Bean and Eaton's (2000, 2001) model of the psychological antecedents of retention, Bowman and Denson claim that students attending institutions that are congruent with their ideal institution would be more likely to remain enrolled rather than transfer out. Initial studies propose that student-institution fit has a significant indirect effect on students' intent to persist. However, Bowman and Denson did not consider the impact of factors affecting low SES or nontraditional students when exploring the impact of student-institution fit. It is entirely possible, therefore, that student-institution fit may have less of an impact on retention when external commitments are too extensive.

According to Gilbreath, Kim, and Nichols (2011), student-institution fit instruments could be used in order to find, target, and recruit students who are likely to fit at an institution. Identifying students who are likely to have high levels of fit will increase retention rates, as these students would be more likely to persist and ultimately earn a degree. Similarly, Bowman and Denson (2014) advocate that student-institution fit instruments could be used as part of an early warning system. Students demonstrating low levels of fit could be directed to appropriate interventions, thus decreasing the risk of departure. However, given the dearth of literature exploring the relationship between student-institution fit, low SES, nontraditional student factors,

and retention, it is unclear if any instrument could offer any of these benefits. The proposed research seeks to close this gap in the literature by exploring the construct of student-institution fit as it relates to the retention of low SES students and nontraditional students.

Purpose of Study

The purpose of the following study was to expand on existing literature exploring the relationship between student-institution fit and retention by including factors related to low SES and nontraditional student status in a model that measured actual student retention at a large, primarily nonresidential urban university. As a result, this study tested whether student-institution fit is an appropriate lens for studying the factors that affect the retention of all students in higher education.

Researchers have long noted that both finances as well as external commitments affect the chances that a student will remain enrolled in higher education and complete their degree. Cabrera, Stampen, and Hansen (1990), for example, found that students' ability to pay, defined as a combination of socio-economic status and satisfaction with the cost of attendance, had a significant effect on retention. Specifically, students from higher income quartiles were still more likely to persist, even net the effect of grades and measures of social integration. Students coming from a low SES background may face a number of challenges beyond simply the inability to pay. Terenzini, Cabrera, and Bernal (2001) argued that students from low SES backgrounds may be the first in their family to attend college and therefore lack the support networks necessary in order to navigate college. Chaplot, Cooper, Johnston, and Karandjeff (2015) noted that low SES students may not have adequate food or shelter, thus preventing them from fully engaging in higher education.

Studies have also shown that nontraditional students face many obstacles in remaining

enrolled through graduation. Horn and Carroll (1996) created a measure of nontraditional status based on student behaviors. In one descriptive study using data from two surveys from the National Center for Educational Statistics, Horn and Carroll found that 64% of students with no nontraditional characteristics had completed a degree in 5 years, compared to 52% of minimally nontraditional students, 41% of moderately nontraditional students, and 34% of highly nontraditional students.

Several studies (Bean & Metzner, 1985; Braxton & Hirschy, 2005; Braxton, Hirschy, & McClendon, 2004; Metzner & Bean, 1987) have proposed models highlighting that retention of nontraditional students is less dependent on social integration and more dependent on other factors, such as finances, support from family, work commitments, affiliation needs, intrinsic motivation, and other factors. It is not clear what effect, if any, student-institution fit may have on the persistence decisions of nontraditional students.

An exploration of the effect of student-institution fit on retention for low SES and nontraditional students would be useful. Fit has long been thought to be important in understanding students' experiences in college. Coyne (1975; 1978) theorized that a lack of fit between students' needs and the extent to which the environment provided for those needs could be a source of stress. More recently, admissions professionals have begun to explore the impact of "matching" high ability, low SES students to institutions with an appropriate level of academic rigor (Supiano, 2016). Other higher education professionals, such as Strayhorn (2012), have explored the impact of sense of belonging, particularly minority and low SES students' feelings that they may not have a place at predominantly white institutions.

Three studies in particular highlighted the importance of student-institution fit research. Gilbreath, Kim, and Nichols (2011) developed a 32-item student-institution fit questionnaire that

was used to determine the extent to which students' needs were being met by the academic, social, or physical environment of their institution. This instrument used the needs-supplies fit model, in which students rated the extent of one need and the degree to which the environment of the institution met that need. Fit was then defined as students' perceptions of the degree to which their self-reported needs match the degree to which the environment of the institution is perceived to provide for those needs. The authors found that students' satisfaction with their university increased as the supplies of the university increased towards students' needs. However, as supplies from the university surpassed students' needs, satisfaction increased more slowly. Gilbreath et al. propose that a better fit between students' needs and the degree to which the institution meets those needs could lead to increased retention rates. However, although Schreiner and Nelson (2013) suggested that satisfaction may be related to retention, Gilbreath et al. did not explore the relationship between fit and retention in their study.

Two additional studies conducted by Denson and Bowman explored the relationship between student-institution fit and intent to persist in college. In the first study, conducted at two universities in the United States, the authors found that student-institution fit had a significant indirect effect on students' intent to persist at their institution, moderated by student satisfaction (Bowman & Denson, 2014). In the second study, conducted at two Australian universities, level of student-institution fit also had a significant indirect effect on students' self-reported intent to graduate, this time moderated by level of academic engagement (Denson & Bowman, 2015).

All three studies demonstrate that student-institution fit should be considered in explorations of student retention and that a lack of fit may be a signal that an individual student requires additional intervention. However, none of these studies examined retention directly, but rather studied either other factors associated with retention (satisfaction, in the Gilbreath et al.

study) or students' persistence intentions (in the Denson and Bowman studies). Likewise, none of these studies explored the degree to which student-institution fit instruments may be useful for examining the retention of low SES students or nontraditional students. Gilbreath et al. developed their instrument using students at primarily nonresidential universities, but did not include any factors related to nontraditional students in their model. Likewise, Bowman and Denson (2014) explicitly stated that their instrument may help identify whether low SES students were having difficulty adjusting to the primarily upper and middle class environments of higher education. However, they did not include any factors related to finances in their model of students' intent to persist

Guiding Research Questions

The full set of research questions guiding this study are as follows:

- 1) Does the factor structure of the measure of student-institution fit proposed by Gilbreath, Kim, and Nichols fit data obtained from students at a large commuter institution?
- 2) What is the relationship between student-institution fit and retention, net the effect of background variables and nontraditional student level?
- 3) What is the relationship between student-institution fit and retention, net the effect of background variables and factors associated with low SES?
- 4) What is the relationship between student-institution fit and retention, net the effect of background variables, nontraditional student level, and factors associated with low SES?

The Gilbreath et al. (2011) instrument included three factors derived from 32 paired items; Academic Environment (AE) fit, Social Environment (SE) fit, and Physical Environment (PE) fit. Fit was determined as the difference between the extent to which the student reported that they need assistance from the university and the extent to which the student perceived the university supplied that need. In order to assess the utility of the instrument, the first question

was to determine if the data collected from student responses to a survey fit the model proposed by Gilbreath et al. The results of that analysis point towards slight changes to the three factors (AE fit, SE fit, and PE fit), which were then used to explore the subsequent research questions.

Once appropriate factors were identified, data from the initial survey were combined with demographic and financial aid information in order to determine the relationship between student-institution fit and retention, net the effect of nontraditional factors and variables associated with socio-economic status. The model used in this part of the study was adapted from Braxton and Hirshy's (2005) model of retention in primarily nonresidential institutions as well as the Metzger and Bean (1987) model of factors affecting nontraditional student retention. First, each students' nontraditional score, calculated using the method proposed by Horn and Carroll (1996), was included along with each of the three dimensions of fit to determine the relationship between fit and retention, net the effect of nontraditional student level. The second model replaced the nontraditional level with receipt of a Pell grant, which was used as a proxy for low SES (Chaplot et al., 2015), and unmet financial need, which was used as a proxy for ability to pay. This model assessed the relationship between student-institution fit and retention, net the effect of factors associated with SES. The final model included both nontraditional student factors and factors associated with SES to determine the relationship between student-institution fit and retention, net the effect of all external commitments.

Significance of Study

This study will contribute to the literature on retention and college student success in three primary ways. First, this study will extend existing research on the retention of nontraditional and low SES students by integrating student-institution fit with existing models of retention. Metzner and Bean's (1987) study focused primarily on academic variables and the external environment when considering nontraditional student retention, but did not consider

psychological factors such as fit. Similarly, the Braxton and Hirshy model of retention in commuter colleges (Braxton & Hirschy, 2005; Braxton, Hirschy, & McClendon, 2004) proposes that external factors may influence students' commitment to their institution, but does not consider the degree to which the institution may be meeting students' needs. If the relationship between fit and retention is significant net the effect of external commitments and low SES status, the results of this study would argue for a more comprehensive model of retention than has previously been presented for either nontraditional or low SES students.

Second, the use of Horn and Carroll's (1996) conceptualization of nontraditional students presents a broader definition of than has been used in other retention studies. Horn and Carroll's scale is based on students' behaviors and external commitments rather than simply using age. This definition may be more useful for retention studies. given that students of all ages may face obstacles hindering full engagement in higher education (Chaplot et al., 2015). The Horn and Carrol scale also allows researchers the opportunity to examine the degree to which a student is nontraditional rather than treating nontraditional status as a dichotomous variable.

Finally, Bowman and Denson (2014) propose that student-institution fit instruments may prove to be useful as an early warning assessment to determine which students may be at risk for departure. Many existing early warning systems that are marketed to colleges and universities claim to be able to identify which students are at risk for departure early in their college career based on specific factors that have been associated with students leaving in the past. However, such systems do not provide relevant information about why a student may be at risk. The analyses conducted in this study, using data from a survey administered three weeks after the beginning of students' first semester at a new institution, directly tested the viability of fit as an early indicator for retention at a large, public, primarily non-residential university. Higher

education institutions may consider adding measures of student-institution fit to existing early warning systems should the results of this study demonstrate the utility of fit in identifying students at risk for departure. Adding fit data to existing early warning systems could provide more detailed, actionable information as to why students may be leaving, which will be useful when designing appropriate interventions.

Terminology

Person-environment fit refers to the degree of match between an individual and the environment within an organization (Ostroff & Schulte, 2007). The student-institution fit instrument used in these analyses is a needs-supplies fit instrument developed by Gilbreath et al. Needs-supplies fit is an evolution of Murray's (1936) conceptualization of needs and press. "Needs" refers to personal strains caused by certain internal conditions or external situations, while press is a complex combination of factors in the external environment that may evoke a need. The concept of supplies replaced the idea of press in subsequent higher education research. "Supplies" refers to the extent to which an environment meets someone's self-described needs (Gilbreath et al., 2011). Needs-supplies fit is therefore defined as the extent to which the environment provides something that an individual is lacking (Edwards & Ship, 2007). For the purposes of this dissertation, fit will be defined as the difference between students' self-reported needs and students' perceptions of the degree to which an organization meets those needs (supplies). Student-institution fit would therefore be defined as fit between and student and their current higher education institution, as conceptualized by the Gilbreath et al. student-institution fit instrument.

A distinction should also be made between moderator and mediator variables.

Moderating variables are variables that interact with the independent variable of interest to

produce an effect, while mediating variables refer to variables that intervene between one variable and an intended outcome (Evans & Lepore, 1997). Low SES students and nontraditional students will be defined in greater depth in the literature review.

Overview of Dissertation

The first chapter provides an overview of the relationship between student-institution fit and retention, as well as the need to investigate factors associated with nontraditional students and low SES. Next is an overview of the problem with existing research, followed by a summary of the significance of this study. Chapter 1 concludes with an overview of the dissertation.

Chapter two is a review of the literature. This includes major theories of retention relevant to this study, such as Tinto's (1993) interactionist theory of student departure, Bean and Metzner's (1985; Metzner & Bean, 1987) theory of nontraditional student retention, Bean and Eaton's (2000, 2001) psychological model of retention, and Braxton and Hirschy's (Braxton & Hirschy, 2005; Braxton et al., 2004) theory of retention in primarily nonresidential institutions. The literature review also includes a description of challenges facing nontraditional students as they attempt to remain in college, with a particular focus on Horn and Carrol's (1996) nontraditional student scale and the utility of this scale in retention research. This chapter also includes a discussion of research pertaining to low SES students, including various definitions of low SES students and how studies of low SES students' success were influenced by varying definitions. Then will come a discussion of needs-supplies fit as a psychological construct, Coyne's (1975,1978) application of needs-supplies fit to college student success, the use of fit in prior research on student retention, and the development of instruments by Bowman and Denson (2014; Denson & Bowman, 2015) and Gilbreath et al. (2011) to measure student-institution fit.

This chapter concludes with a comprehensive description of the guiding research questions that will inform subsequent analyses.

Next, chapter three is a description of the methods used to conduct the analyses in this study. A description of the study institution (IUPUI), the sample, and the survey developed based on the original Gilbreath et al. instrument will be included. This chapter will also include a description of methods used to answer each research question. First, confirmatory factor analysis (CFA) were used to determine if the factor structure for student-institution fit proposed by Gilbreath et al. fit data obtained from a survey at IUPUI. Then, three separate path analyses were conducted. The first path analysis explored the relationship between student-institution fit and retention net the effect of nontraditional student characteristics. The second model was used to determine the effect of student-institution fit on retention, net the effect of low SES. Finally, the third path analysis model was used to determine the effect of fit on fall-to-fall retention, net the effect of both nontraditional characteristics and low SES.

Chapter four describes the results of the CFA and three path analyses outlined in chapter three. These results will inform subsequent discussion and conclusions. The dissertation ends with a comprehensive discussion of the results, including implications for practice, implications for future research, limitations, and overall conclusion.

CHAPTER TWO

LITERATURE REVIEW

The following chapter provides an overview of the literature on retention and student-institution fit as it pertains to nontraditional and low socio-economic status (SES) students in higher education. First, I briefly discuss existing retention literature written, with a focus on factors identified in early studies related to the retention of low SES or nontraditional students. Difficulties in defining each population will then be discussed as well as the challenges both nontraditional and low SES students face in completing a college degree. Next, I focus on the concept of student-institution fit, including conceptualizations of fit in psychological, organizational, and higher education literature. The literature review concludes with a discussion of the applicability of student-institution fit to understanding the retention of nontraditional and low SES students using both Denson and Bowman (2015) and Bowman and Denson's (2014) model of student-institution fit and the more comprehensive fit model proposed by Gilbreath, Kim, and Nichols (2011).

Factors Affecting Student Retention

Early Literature

Summerskill (1962) reviewed much of the literature written prior to the 1960's on college student retention. He observed that students who came from rural settings were less likely to persist and that older students may experience financial barriers that prevent them from graduating. Academic achievement in high school and scores on standardized tests were also strongly related to persistence, which has also been demonstrated in subsequent studies (Pike, Hansen, & Childress, 2014; Synco, 2012). However, many of these early studies were based on descriptive data, and Summerskill recommended that individual institutions engage in a more

extensive analysis of student retention.

One of the more comprehensive early studies was conducted by Astin (1975). Astin sent a follow-up survey to a randomly selected group of students who completed the Cooperative Institutional Research Program (CIRP) First-year student survey four years earlier and explored responses to both surveys. The CIRP survey was designed to be administered primarily to incoming first-year students before the start of classes and is used similarly 50 years later (Higher Education Research Institute, 2017). The iteration of the CIRP survey used by Astin for these analyses included items regarding demographic information, parents' income and education, educational and career aspirations, and numerous other constructs, while the 1972 follow-up survey was focused mainly on college attendance, degree completion, and employment information. Astin found that "boredom with courses," "financial difficulties," and "poor grades" were the most common reasons for dropping out cited by men, while "marriage, pregnancy, or other family responsibilities" were the most frequently cited reason for dropping out by women (p. 14). Among Astin's other key findings were that past academic achievement and perceived academic ability were among the most important predictors of college student success, that scholarships and grants were more positively associated with persistence than student loans, and that full-time employment was negatively associated with degree completion. Later studies supported many of these findings. Taniguchi and Kaufman (2005), for example, found that having young children had a significant negative effect on degree completion for both men and women. Similarly, Jones-White, Radcliffe, Lorenz, and Soria (2014) found that students who received more loans were significantly more likely to leave their current institution and to leave higher education altogether. In addition, data from the 2012/14 Beginning Postsecondary Students Longitudinal Study revealed that about 44% of students working 35 hours or more per

week had left their original institution and not enrolled at another. Comparatively, only 28% of student not working, 14% of students working 1-15 hours per week, and 27% of students working 16-34 hours per week had left their original institution and not enrolled (U.S. Department of Education, 2016).

Psychological and Environmental Factors

Multiple researchers have explored psychological and environmental factors that related to persistence. In his literature review, Summerskill (1962) notes that students withdrawing from college frequently cited declining academic motivation and failure to adjust socially as major factors in their decision to withdraw. A later comprehensive meta-analysis, conducted by Robbins, Lauver, Le, Davis, Langley, and Carlstrom (2004) examined the impact of nine broadly defined psychological, contextual, and academic factors found to be related to student retention in either psychological or higher education literature. They found that the impact of three broad constructs, academic goals (defined as the perceived value of a college education and commitment to earning a degree), academic self-efficacy (perceived probability of success in college), and academic-related skills (self-ratings of skills and abilities that help students succeed in college) were highly correlated with retention across the studies included in the analysis. Similarly, Bean and Eaton (2000, 2001) propose a more comprehensive model of student attrition, theorizing that students' self-efficacy beliefs, an internal locus of control, and feelings of personal stress interact with feelings about the social and academic environment to drive students' intentions to remain at their institution or to depart.

Tinto's Theory of Student Departure and Criticisms

The most prominent student retention theory is the model developed by Vincent Tinto (1975, 1993). In this model, the influence of certain pre-college characteristics, including

students' demographic characteristics and academic ability, are filtered through students' external commitments, academic goals, and academic commitments to foster integration into both the social and academic context of the institution. Degree of integration then causes students to reevaluate prior goals and commitments, which facilitates the decision to depart.

Tinto's theory is not without criticism. For example, in a review of studies exploring the impact of early academic integration on subsequent academic integration and retention, Braxton and Lein (2000) found that support for the construct of academic integration was much stronger in multi-institution than in single institution studies. Though these results may be in part due to inconsistent definitions of academic integration across studies (Braxton & Lein, 2000; Tinto, 1997), one conclusion could be that academic integration may have different impacts across different kinds of institutions.

Others have questioned the appropriateness of integration as a mechanism for student retention. Tierney (1999) stated that Tinto's concept of integration implies that students must be able to find a place in a higher education institution that is mostly white and composed mostly of students, faculty, and staff from middle and upper class backgrounds. Students of color and students from low SES backgrounds might find it particularly difficult to become "initiated" into a culture they perceive to be "foreign" (p. 82). Guiffrida (2006) has since elaborated Tinto's theory to recognize that students from diverse backgrounds must remain connected to their home communities. He further recommended that practitioners adopt the term "connection" rather than integration, in order to emphasize the need for students to establish relationships within their university while also maintaining relationships with family and friends in their home community. Guiffridea's proposed theory suggests that, for students from more collectivist orientations, social adjustment would be affected not only by connection to the academic

environment, but also by the maintenance of strong connections with support systems back home. However, no studies could be located that empirically tested this theory.

Other theorists have provided further elaboration. Building on the work of Tinto (1993) and Tierney (1999), as well as Astin (1984, 1996) and existing research on college choice, Stage and Hossler (2000) developed a model that states that students play an active role in the decision to depart from the moment they enter higher education. Specifically, Stage and Hossler note the importance of information gathering at the beginning of the college experience, indicating that students form expectations about an institution from their pre-college exploration. These expectations then influence subsequent persistence decisions. The authors further state that additional emphasis should be placed on the extent to which students actively become involved in activities that promote connection to the academic and social environment, rather than steps faculty and staff take to encourage involvement. Finally, like Guiffrida (2006), Stage and Hossler (2000) affirm the importance of family encouragement as an important factor in persistence. The idea of establishing a connection between the college search process and subsequent persistence is intriguing, as is the additional emphasis on social networks external to the university in persistence decisions. However, the authors admit that their theory was not intended to explain persistence decisions of nontraditional students.

Tinto's theory may be even less applicable when exploring students attending commuter institutions. Pascarella, Duby, and Iverson (1983) attempted to replicate Tinto's model using a sample of students completing the American Council on Education survey at a commuter institution in the Midwest. The authors found that students who were more academically integrated were more likely to persist to the second year. However, the authors also found that students with higher levels of self-reported social integration were actually less likely to persist

at this commuter institution. Pascarella et al. speculated that students with higher reported levels of social integration may have more of a need to form connections with others and may depart for residential institutions in order to seek a social environment that better fulfills this need. In a separate analysis, Pascarella, Duby, Miller, and Rasher (1981) used discriminant analysis to find the best models to discern between commuter students who persisted, stopped out, or departed after one year. They found that first semester GPA was the factor which best discriminated students who persisted from students who withdrew. The authors interpreted this finding to indicate that academic integration was of central importance to commuter students.

Amy Hirschy, John Braxton, and their colleagues developed a modification of Tinto's model, which proposed that the same factors that affect retention in residential universities affect students differently in primarily nonresidential institutions (Braxton & Hirschy, 2005; Braxton, Hirschy, & McClendon, 2004). As with Tinto's theory, the Braxton and Hirschy model for primarily nonresidential institutions suggested that pre-entry characteristics affected students' initial institutional commitment, which affected subsequent institutional commitment and persistence. Unlike Tinto's model, Braxton and Hirschy (2005) did not propose any effect for social integration on persistence. Instead, they claimed that the external environment, defined broadly as factors affecting persistence external to the institution, had a direct relationship on retention, rather than an indirect relationship moderated by social and academic integration. In other words, finances, work obligations, family obligations, and family support all directly affect commuter students' decisions to remain in college, rather than affecting the degree to which they become a part of the academic and social aspects of the institution. Likewise, because students who are commuting spend less time on campus than students living on campus, integration into the culture of campus becomes less important. Instead, psychological factors take precedence.

Psychological factors that may have a positive impact on retention at primarily residential institutions, such as a high need for affiliation with other students, may negatively impact students at primarily nonresidential institutions, since opportunities for deep levels of engagement are few and far between. Because of these alternative models and other criticisms, Synco (2012) and Davidson and Wilson (2014) recommend that institutions consider their individual missions and student populations before applying Tinto's theory directly.

Davidson and Wilson (2014) also criticized Tinto's (1975, 1993) lack of consideration for nontraditional students who may have a variety of other obligations external to the college environment. However, Tinto did include an addition to the 1993 revision of his model to account for a broad array of external commitments. Tinto divided external commitments into two separate categories: obligations toward family and work, and factors related to a students' ability to pay for college. Further discussion is essential, as this modification touches potential difficulties low SES students and nontraditional students may face both in adjusting to the college environment and ultimately remaining until they complete their degree.

Nontraditional Students and Retention

Defining Nontraditional

Among the most prominent criticisms cited by Davidson and Wilson (2014) is the applicability of Tinto's model to nontraditional students. As far back as 1962, Summerskill theorizes that, while older students may be more likely to withdraw, lower rates of retention may be due to other factors rather than chronological age. Specifically, Summerskill notes that first-year students who do not begin at a traditional age may delay enrollment due to "personal or [*sic*] financial or other reasons" that persist after enrollment and contribute to subsequent withdrawal (p. 631).

Nonetheless, subsequent researchers attempted to understand the reasons that nontraditional students did not persist and complete their degree. In order to understand the causes of nontraditional student departure, however, the group first needed to be defined. Astin (1975) initially defined nontraditional students as “those who are married, older, or attending part-time” (p.167). Astin further argued that nontraditional students may be more likely to be successful at institutions where most students do not live on campus than “traditional” students would be, though he recommended that further study. At the same time Astin conducted his initial analysis, Pantages and Creedon (1978) conducted a thorough review of retention literature published between 1950 and 1975. Their conclusions were similar to those of Summerskill, in that age was found to be of little use in retention studies when consideration is made for finances, motivation, and other factors. Ramist (1981), in his review of the literature, found an equal number of studies that found that older students were more likely to depart compared to those that suggested age had no effect on retention.

Subsequent studies of factors affecting nontraditional student enrollment defined nontraditional students in a variety of ways. Bean and Metzner (1985) and Metzner and Bean (1987) argue that many of the developmental milestones described by theorists such as Chickering (1969) were inappropriate for students beginning college in adulthood, since these theories were generated primarily using data obtained from young adults in residential institutions. For their analyses, Bean and Metzner defined nontraditional students as being 25 years or older, attending part-time, or living off campus. Students meeting these characteristics were the focus of a subsequent theory of nontraditional student retention. Researchers since Metzner and Bean have continued to cite the student development literature in discussions of the factors affecting the retention of nontraditional students, arguing that the developmental

milestones already attained by adult students made existing theories of retention invalid (Maroney, 2010).

Other common definitions of nontraditional students reflect enrollment patterns more than age. Adelman (2006) defined traditionally aged students as those beginning college for the first time before the age of 20. Though the reasoning behind this decision is not explicitly stated, Adelman's definition appeared reflect the concerns of Summerskill (1962) in that delayed entry may be more important in studies of retention than chronological age. Other more recent researchers have echoed also Summerskill's early conclusions. In a study of the factors that affected degree attainment for Latino/a students, Arbona and Nora (2007) did not include age in their model but did include a dichotomous variable indicating whether or not the student had waited at least six months following high school graduation before enrolling in college. They found that enrollment immediately following high school had a statistically significant effect on degree completion at both two-year and four-year institutions for Latino/a students. Likewise, after a significant negative effect was noted for "nontraditional age" (older than 24 years of age) on both five year and six year completion rates, Pike, Hansen, and Childress (2014) were quick to indicate that the effect may be due to factors associated with delayed enrollment rather than age itself (p. 10).

Horn and Carroll (1996) proposed one of the most comprehensive definitions of nontraditional students in their descriptive study of the enrolment patterns, retention, and degree completion of nontraditional students. Rather than focus on factors such as age, which could not be addressed with institutional intervention, Horn and Carroll elected instead to focus on the broad categories of "1) enrollment patterns, 2) financial and family status, and 3) high school graduation status," because intervention either before entering college or while enrolled may

change students' educational trajectory (p. 3). "Enrollment patterns" included part-time enrollment in college and delaying enrollment in college a year or more after high school. "Financial and family status" included factors associated with Tinto's (1993) external commitments, such as caring for dependents, being unmarried with a child, full-time employment, or being financially independent. "High school graduation status" was defined simply as whether or not the student had earned a GED as opposed to a high school diploma. Horn and Carroll then tallied the number of characteristics that applied to a given student and defined students along a continuum of minimally nontraditional (at least one characteristic), moderately nontraditional (two or three characteristics), or highly nontraditional (four characteristics or more). The National Center for Educational Statistics (NCES) continues to use these same risk factors when reporting student success. Among students who began during the 2003-2004 academic year, 54.3% of students who did not have any nontraditional student characteristics had received a Bachelor's degree by 2009 (Skomsvold, Radford, & Berkner, 2011). Conversely, only 21.3% of students who had at least one nontraditional student characteristic had received a Bachelor's degree during the same time period. About 54% of students with four or more characteristics had not received any degree and were no longer enrolled at a higher education institution.

These characteristics identified by Horn and Carroll form a solid network of factors associated with retention. In addition, researchers using this framework do not need to rely on proxies such as age to account for relevant external commitments that define the challenges faced by nontraditional students. Finally, as advocated by Horn and Carroll, by shifting the focus to factors that can be addressed through intervention, institutional researchers, policy analysts, and practitioners can more readily identify appropriate measures to help nontraditional students

succeed. For example, an institution at which many students have delayed enrollment may seek to invest more heavily in tutoring or interventions designed to help students regain academic skills and adjust to the academic rigor of college. The Horn and Carroll measure therefore would be the most useful definition of nontraditional students for the purposes of retention research.

Broadly speaking, nontraditional students should be defined as students whose external commitments and lower degrees of engagement with the university make them at risk for departure. For the purposes of this literature review, each author's definition of nontraditional students will be taken into account when critiquing findings. For the purposes of subsequent analyses, we will focus on nontraditional student level, which will be defined as students' nontraditional student score using the Horn and Carroll measure.

Understanding Nontraditional Student Retention

Horn and Carroll's (1996) study is particularly instructive for understanding the difficulties faced by nontraditional students. Their study used data derived from a series of surveys conducted on behalf of NCES, including the 86-87, 89-90, and 92-93 administration of the National Postsecondary Student Aid Study and the 1994 follow-up to the Beginning Postsecondary Students Longitudinal Study (BPS). Gathering data from nationally representative samples provided information on the success of nontraditional students from various backgrounds at a wide variety of institutions in multiple parts of the country. The use of BPS data was especially important, as it enabled the researchers to collect data five years after beginning college and ultimately learn about graduation outcomes. Horn and Carroll labeled students as minimally nontraditional if they had at least one of the characteristics mentioned, moderately nontraditional if they had two or three characteristics, and highly nontraditional if they had four or more characteristics.

Using data from the four survey administrations, Horn and Carroll found that the majority of respondents were at least minimally nontraditional by their definition (between 65% and 69% in each survey). Using the BPS data, students who were defined as nontraditional were significantly less likely to earn a degree five years after beginning in higher education than were students who did not have any nontraditional student characteristics. The percentage of students completing a degree in five years also decreased as the number of nontraditional characteristics increased. More specifically, 33% of highly nontraditional students completed a degree within five years, compared to 41% of moderately nontraditional students, 52% of minimally nontraditional students, and 64% of students with no nontraditional student characteristics. Nontraditional students were also more likely to depart after their first year than students with no nontraditional characteristics. However, after the first year, rates of departure were similar for nontraditional students and students with no nontraditional characteristics.

Horn and Carroll used only descriptive statistics. As a result, their study contributes little to the understanding of the direct impact of being a nontraditional student on retention and graduation, nor does it illustrate how having the characteristics of a nontraditional student affects the odds of retention or graduation, net the effect of other factors. However, their study did raise important questions about the influence of factors external to the collegiate environment on persistence and degree completion. Subsequent researchers also explored the concerns raised in Horn and Carroll's initial analysis. Pike et al. (2014), for example, found that the number of hours students planned to work decreased the odds of graduating within four, five, and six years. Similarly, students who were enrolled full-time were also significantly more likely to graduate within five or six years than students who were enrolled part-time. These results suggest that many of the concerns raised by Horn and Carroll about the external obligations of nontraditional

students remain valid.

Models of Nontraditional Student Persistence

Bean and Metzner (1985) conducted a comprehensive review of the literature surrounding the factors that contributed to the retention of nontraditional students, defined by a combination of age, living off-campus, and enrollment intensity (i.e., enrolled part-time). The model proposed by the authors based on this review places less emphasis on social integration than most studies of persistence. According to the authors, since nontraditional students have fewer opportunities to become active participants in the social context of their institution, social integration would be less important. Instead, external factors, such as financial variables, family commitments, employment, and perceived encouragement were thought to be more closely associated with persistence. Metzner and Bean (1987) subsequently tested the model using a sample of 624 nontraditional students. They found that intent to persist, hours enrolled, and first-year GPA had the strongest direct influence on retention. Finances also had a significant indirect effect on retention, moderated by intent to persist. However, there was little support for the proposal that social factors might be related to retention.

Metzner and Bean's test of the Bean and Metzner model was instructive for several reasons. For one, the population for this study was only part-time students at a primarily commuter institution. Carrying only a part-time course load was one of the factors associated with the definition of nontraditional students argued by Horn and Carroll (1996). In addition, students attending a commuter institution would be more likely to have other factors external to the college environment contributing to their ability to persist, though no specific information about external commitments was collected by the authors. Nonetheless, defining their population by enrollment intensity and using an institution likely to enroll students with a number of

external commitments hints that the authors were considerate of the important factors affecting retention beyond simply defining nontraditional students based on age. Metzner and Bean's study, however, only provides modest support for the overall Bean and Metzner (1985) model. While several variables, including certainty that finances will be available to pay for college, had a significant direct effect on intent to persist, only five variables (intent to persist, college GPA, high school performance, credit hours enrolled, and absenteeism) had a large enough total effect to warrant much consideration from the authors. Though the results of this study suggest the need for additional scrutiny of the Bean and Metzner (1985) model, little additional investigation has been done since Metzner and Bean's 1987 study.

One subsequent study that relied heavily on the Bean and Metzner model explored the relationship between coping strategies and persistence in adult students. Maroney (2010) proposed a "stress and coping model" (p. 27) to describe the persistence of adult students. Though Maroney focused exclusively on adult students, she underscored that adult students possess a large array of external commitments beyond college demands as well as a finite set of psychological resources with which to manage these demands. Maroney suggests that adult student persistence is therefore greatly influenced by students' abilities to draw upon these psychological resources, though Maroney is not entirely specific about the mechanism through which that would occur.

Like Metzner and Bean, Maroney found little support for the proposal that social integration was an important factor in predicting the retention of nontraditional students. Maroney further found that classroom experiences were more important for nontraditional student retention than social experiences. Tinto (1993, 2012) has subsequently modified the original 1975 model to account for the effects of factors outside the college environment. He has

further echoed Maroney, stating that many students, “go to campus, attend class, and quickly leave to attend to other obligations. For them, the experience of college is primarily built upon their success in the classroom” (Tinto, 2012, p. 5-6). Clearly, persistence models developed around traditional student needs may not apply in the same way to nontraditional students.

Low SES Students and Retention

Finances in Retention Research

In the initial iteration of his model, Tinto (1975) excluded the influence of any factors external to the institution, instead describing student departure purely as an interaction between students’ personal characteristics and the environment. Subsequent research by several authors (Cabrera, Nora, and Castañeda, 1992; Cabrera, Stammen, & Hansen, 1990) explored Tinto’s model while also accounting for perceptions of financial need. These authors asserted that economic factors contribute substantially to students’ subsequent departure decisions. Cabrera et al. (1990), for example, explored the direct effect of students’ ability to pay on retention using a slightly modified version of Tinto’s 1975 model. In this study, the authors defined ability to pay for college using two variables, satisfaction with the cost of attendance and socioeconomic status (SES) quartiles, and explored the relationship of each with retention. They found that satisfaction with the cost of attendance was significantly related to persistence and that students from higher income quartiles were more likely to persist when only the financial variables were included in the model. When other factors, such as grades and a measure of social integration were added, the effect of the financial variables was less strong. Satisfaction with the cost of attendance, in fact, was no longer statistically significant. However, the model proposed by the authors did pose that their measure of SES moderated the impact of goals and commitments on retention. Following these studies, Tinto (1993) included financial factors among the external

commitments that could affect retention. However, Tinto also stated that the exact contribution of a student's financial situation on retention was unclear, as he indicated, "Though there is little doubt that personal finances can and do impact upon persistence, there is still some question about how and why they do so" (p.65). Nonetheless, studies exploring the impact of factors related to finances in conjunction with social and academic integration have been few and far between (St. John, Cabrera, Nora, & Asker, 2000).

Defining Low SES Students

Part of the difficulty in studying the factors affecting low SES students' persistence has been in defining the population. In a meta-analysis of the effect of social class on social integration, Rubin (2012) found that most studies used parental income, parental education, or a combination of education, income, and other factors (such as the number of books in the home) to classify students as low SES. Rubin found that the method of classifying students as low SES did not have moderating effect on the relationship between income and social integration. However, a discussion of the pros and cons of various methods researchers have used to define low SES students would be instructive.

Frequently, students from a low SES background have been defined as students whose parents had either not previously attended or had not completed college (first-generation students). Borrego (2007), for example, highlighted a low level of parental education as a "cultural marker" for low SES students (p. 3). Studies demonstrating lower probability of completion for first generation college students are myriad. Ishitani (2003), for example, used event history analysis in order to determine the effect of being a first generation student on degree completion over time. In a single institution study, the author found that students from families in which neither parent attended college were significantly more likely than students

from families in which both parents completed a Bachelor's degree to depart after the first and third year, though no significant differences were found during the second and fourth year. In a similar study using the National Educational Longitudinal Study of 1988 (NELS:88), Ishitani (2006) divided first generation students between those whose parents' highest degree completed was a high school diploma or less, and those who had at least one parent that had attended college. The results suggest that students whose parents completed a high school diploma or less were 8.5 times more likely to depart before their second year than students whose parents had completed a Bachelor's degree, while students whose parents had completed only some college were 4.4 times more likely to depart than students whose parents had fully earned Bachelor's degree. Later, Pike, Hansen, and Childress (2014) also explored the relationship between a number of pre-entry characteristics and four, five, and six-year degree completion. The results of their single institution study suggest that being a first-generation student was significantly and negatively related to completing a degree within five or six years, though there was no significant finding for four-year graduation.

There are several problems with defining first-generation status as an indicator for low SES students. The first is actual income, specifically the fact that students whose parents did not complete college may not necessarily be making less money than parents who have. In 2001, 37% of those defined as working poor had a Bachelor's degree, suggesting that not all those who earn a Bachelor's degree earn a living wage (Cook & King, 2004). In addition, being a first-generation college student may also induce a "culture shock" students are not prepared to experience. In his 2006 study, Ishitani included both parental income and various categories of first generation status in his longitudinal model. The income categories included \$0-\$19,999, \$20,000-\$34,999, and \$35,000-\$49,000, with students whose parents earned \$50,000 or more per

year as the reference group. Ishitani found that both students whose parents had obtained a high school diploma or less and students whose parents had attended but not graduated from college were more likely to depart from college than students whose parents had completed a Bachelor's degree, even when accounting from the effects of parental income. In fact, of the income categories included in the model, only students whose parents made between \$20,000 and \$34,000 per year were significantly more likely to depart than students whose parents made more than \$50,000 per year. The findings were similar in Ishitani's (2003) single institution study. In that study, students from families with an annual income of less than \$25,000 were significantly more likely than students from families with a household income of more than \$45,000 to depart following their first or second year, even with first generation status included in the model.

Ishitani's (2003, 2006) main focus in both studies was more methodological than theoretical, in that he hoped to demonstrate the utility of event history analysis when studying attrition among first generation students. However, although the author does not comment directly on the potential implications of including both first generation status and income in a retention model, the results suggest that additional factors other than income may be contributing to high rates of departure for first generation students. Though parental education may be a marker of low SES student status, evidence conveys that it is insufficient as the sole indicator.

Some studies defined low SES students using parental occupation. Cabrera et al. (1990), for example, combined measures of parental education with family income and father's occupation to create composite socioeconomic status quartiles. Archer (2003) highlighted several problems with this approach for defining low SES, including lack of consensus on appropriate classification of professions and lack of agreement as to best practices for classifying students based on their occupation or the occupation of a parent.

Cabrera, Nora, and Castañeda (1992) used receipt of financial aid as an indicator for low SES, arguing that students often receive financial aid because of demonstrated need. In their model, receipt of financial aid had a significant total effect on persistence. However, the effect was indirect, moderated by College GPA, a measure of social integration, and intent to persist in college. The authors found the effect of financial aid on social integration to be particularly meaningful, as the receipt of financial aid might free students to participate in social activities rather than work in order to pay tuition. However, given the differing effects of various financial aid packages on retention, it is certainly possible that loans may have a different effect of social integration than grants (Jones-White et al., 2014).

A few studies have used students' subjective perceptions of their socio-economic status. Cabrera, Nora, and Castañeda (1992) used a single item asking students about their satisfaction with the level of financial support they had received from their institution as a measure of financial attitude. This measure was found to have a significant effect on students' self-perceptions of academic and intellectual development, but the total effect on persistence was small and moderated by other factors. In addition, given that the measure of satisfaction with financial aid was included in the same instrument that measured perceptions of intellectual development, it is entirely possible that an overall factor, in the form of a halo error, could have accounted for the significant effect (Pike, 1999). Similarly, Pike et al. (2014) found that the degree to which students indicated that they need help with financial aid was not significantly related to degree completion either four, five, or six years, net the effect of other factors.

Other researchers and policy analysts have advocated for broader definitions based on social class or personal experiences. Summarizing the findings of a broad range of studies, Borrego (2007) underlined the importance of cultural aspects of low SES students, specifically

the link with cultural capital. Borrego defined cultural capital in terms of connections and asserts that low SES students who obtain a credential may lack the cultural capital to advance out of poverty. She further states that social class intersects with gender, ethnicity, sexuality, and geography, and that such differences should not be ignored when serving low SES students. Similarly, Archer (2003) argues that researchers should employ "postmodern" strategies (p. 11). In her conceptualization, Archer argues that individuals develop a personal conceptualization of social class as a result of interactions with others in their environment. However, Archer also admits that postmodern theorists are less interested in defining social class than they are in examining the relationship between class and individual structures, such as higher education institutions. Postmodern definitions can therefore be "fuzzy" and may not be best suited for empirical research (Archer, 2003, p.19). Archer instead advocates that social class be defined broadly and studies examined on their own merit.

Causes of Low SES Student Departure

Whatever the definition, many studies have found that low SES students are less likely to complete their degree than middle and upper class students. The ability of students to pay the high cost of attendance is obviously a factor in low SES students' success. Wilt (2006) mentions that financial aid is underutilized by low SES students, and proposes that counseling be integrated with academic preparation and other services for low SES students. Others have proposed that several types of student aid, especially the high debt burden created by student loans, makes the cost of college too much for some students to bear (Jones-White et al., 2014). Still others have proposed that the success of low SES students may be the result of a combination of variables commonly associated with social class. Chaplot, Cooper, Johnston, and Karandjeff (2015) highlight that low SES students may not have adequate food or shelter, may

have difficulty with managing their finances, or may experience other struggles that prevent them from becoming completely engaged in college. Terenzini, Cabrera, & Bernal (2001) also found that low SES students are more likely to be the first in the family to attend college, come from a single parent household, and be less academically prepared for college. Low SES students are therefore less likely to understand and be able to navigate the complex systems within higher education. Borrego (2007) further emphasized that low SES students often select institutions and majors not out of interest or perceived connections with the environment, but on convenience. When attending college becomes inconvenient, a student may depart.

Beyond issues of income and external commitments, however, are the sub-cultural barriers low SES students face. Larew (2003) highlights the admissions preferences given to children of alumni at selective institutions such as Harvard. Such policies not only deny low SES students opportunities to attend selective institutions, but may also create a culture hostile to the low SES students who are admitted. Wilt (2006) proposes a comprehensive program to help students from low SES backgrounds that would integrate counseling while simultaneously addressing academic preparedness. Some student coaching programs, such as those studied by Bettinger and Baker (2014), have provided evidence that intrusive coaching could help a wide variety of students navigate the often confusing systems in higher education. However, Borrego (2007) submits that such institutional structures designed to help low SES students may instead make students feel marginalized. Summer Bridge programs, for example, which are designed to assist low SES students adapt to the upper middle class culture of higher education institutions, may actually reinforce existing feelings of inadequacy, since they were identified as needing an additional intervention. These programs may also fail to present the positives of working-class culture, and instead stress what students must do in order to adjust to their new environment.

Borrego, however, did not offer empirical evidence to support that low SES students feel this way entering college, or that summer bridge programs have such an effect.

Identifying the causes of low SES student departure is particularly important given that the number of students from low SES backgrounds in higher education is increasing. According to the Institute for Higher Education Policy (2010), the proportion of young adults between the ages of 18-26 living in poverty and attending a higher education institution increased five percent between 2000 and 2008. The percentage of adult students in higher education and in poverty appears to be increasing as well. In a study conducted at two public universities, adult students were also significantly more likely to indicate that they had received food stamps, Medicaid, or free/reduced price lunch while growing up (Blinn-Pike, Worthy, Jonkman, & Smith, 2008). If the goals set forth by Lumina are to be attained, the success of low SES students in higher education will need to be prioritized. Better understanding of the factors related to the departure of low SES students is necessary.

Student-Institution Fit

Person-Environment Fit in Psychology

Person-environment (PE) fit theories propose that congruence between an individual and the environment within an organization will lead to generally positive outcomes (Ostroff & Schulte, 2007). PE theories, such as student-institution fit, have been used in vocational counseling and organizational development as well as educational studies. One example of a PE fit theory frequently cited in higher education literature is John Holland's theory of vocational environments. Holland (1997) theorized that individuals with certain specific personality characteristics will succeed in academic or vocational environments in which their characteristics are similar to others in the same environment. Those with dissimilar characteristics will need

either to adapt to their environment or find another environment more suitable to their personality.

Ostroff and Schulte (2007) stated that fit can exist between one individual and other individuals within an environment (person-person fit) or between one individual and specific conditions likely to occur within that environment (person-situation fit). Fit can also be hierarchically organized. For example, in a higher education institution, a student may experience great fit within a class or in an academic department, but may not experience much fit with the environment of the entire institution.

Edwards and Shipp (2007) further highlighted the difference between supplementary and complementary fit. Supplementary fit is defined by a match between a person and either the environment or people within the environment. Holland's theory of vocational environments would be a supplementary fit model, since the model would predict that individuals are more likely to succeed in environments where most people have a similar personality. Complementary fit, however, is measured when the person provides something the environment is lacking (demands abilities fit) or the environment provides something that the person is lacking (needs-supplies fit; Edwards & Ship, 2007). Needs-supplies fit is particularly useful for understanding how a higher education institution may contribute to a wide variety of positive outcomes. This will be discussed more in depth later in the literature review.

The utility of PE fit theories in the study of college students continues to be debated. One of several measurement issues highlighted by Kristoff-Brown and Jansen (2007) is that fit can be bound to a specific measurement instance, otherwise known as the temporal nature of fit. Specifically, the fit between an individual and an institution changes as the individuals' needs change or as the organization itself changes. Kristoff-Brown and Jansen proposed that the

temporal nature of fit can be best understood using the $B = f(P + E + PE)$ model. Specifically, changes in the person (student), the environment (institution), and the interaction between person and environment affect the magnitude of misfit between the individual and organization at any given point in time. How long the misfit lasts (duration) or whether the magnitude of misfit increases or decreases (trajectory) depends on changes in needs, values, and goals of the individual and the organization over time. In the context of higher education, this process of assessing fit may be similar to the process described by Tinto (1993) of students reassessing their educational goals and commitment to an institution after success or failure at academic or social integration. Little research using Kristoff-Brown and Jansen's model has been conducted within the context of higher education. Nonetheless, the temporal nature of fit constitutes a unique measurement challenge when assessing the relationship between student-institution fit and subsequent student outcomes.

Fit in Higher Education Research

Higher education researchers have used person-environment fit theory to examine a wide variety of dimensions in the college student experience. Among the first was Pervin (1967), who believed that many prior studies of the college student experience failed to fully capture the effects of the interaction between college students and their environment. Pervin developed the Transactional Analysis of Personality and Environment (TAPE) instrument, on which students rated themselves, their current institution, administration, faculty, other students, and their ideal institution on 52 separate items. In a series of studies attempting to refine the instrument and establish evidence of validity, Pervin noted significant positive correlations between differences in students' ratings of themselves and their colleges and their levels of self-reported dissatisfaction. Pervin theorized that TAPE data could be used to highlight specific areas in order

to maximize fit. Rand (1968), however, had markedly different results in exploring the relationship between student-institution fit and satisfaction. Noting that several college search publications advocated that students' "know yourself, know the college, and match the two" (p. 35), Rand explored the relationship between student-institution fit and subsequent satisfaction with college choice. Differences between individual student and institutional means on subscales of the Vocational Interest Inventory, the ACT, and a measure of students' preference for academic, vocational, non-conformist, or the social environment of college were used in his analysis. Other than finding that students who scored well above the institutional average on a "non-conformist" scale were more likely to be dissatisfied with their choice of college, however, Rand found few consistent relationships between satisfaction and differences in student and institutional scores. Rand advocated that these measures were insufficient for exploring student-institution fit and that different measures may be needed to assist students in the college choice process.

More recently, researchers have used fit to better understand success of students within majors. Smart, Feldman, and Ethington used Holland's theory of vocational environments to provide evidence that students succeed when their personality is compatible with the vocational environment of their academic major. In one study, Feldman, Smart and Ethington (1999) found that students with Investigative, Artistic, or Enterprising personalities increased in their self-rated skills and interests when they majored in disciplines congruent with their personality type, compared to students who majored in incongruent fields. Later, these same authors proposed that environments have an important effect in socializing students to their chosen discipline. Specifically, students who enter incongruent fields may decrease in their self-rated skills and abilities consistent with their personality, but instead tend to increase in their self-rated skills and

abilities consistent with their new discipline (Feldman, Smart, & Ethington, 2004).

Needs-Supplies Fit in Higher Education

One of the first to explore the concept of needs-supplies fit was Murray. Murray (1936) sought to develop a theory of personality that borrowed from the two theoretical dispositions most prevalent in psychology at his time: Behaviorists, who focused their study on observable actions, and “Introspectionists” (p. 241), who focused on perception and mental processes. Personality, according to Murray, derived from needs, which he defined as personal strains caused when certain external or internal situations are perceived. Needs are often more complex than the simple stimulus defined by behaviorists and are therefore evoked by a complex combination of factors within a certain environment, which Murray referred to as press. Specific combinations of presses evoke certain specific needs, which then provoke specific behaviors, or events. Personality then is derived from specific press-need combinations that reoccur throughout a person’s life, which then lead to specific behavior patterns. By 1951, Murray had redefined needs simply as a psychological disposition that drives a certain set of behaviors and began to classify and organize specific categories of needs. This work became especially useful in subsequent higher education research.

Pace and Stern (1958) were among the first to apply Murray’s concepts of need and press to a higher education environment. Using Murray’s (1951) categorization of needs, the authors adapted an existing personality instrument to describe specific presses that may be found in a college environment (Pace & Stern, 1958). The College Characteristics Index (CCI), as Pace and Stern called their instrument, was to be used as an environmental assessment to determine whether the presses present at an institution matched institutional goals and objectives. The authors also argued that knowledge of the college environment could lead to enhanced

understanding of the relationship between specific institutional characteristics and subsequent student behavior. However, they cautioned that more research would be needed about the interactions between specific students and specific college environments before their instrument could be used in developing admissions policy or informing the work of psychological centers.

Pace (1967) would later expand and refine the CCI into the College and University Environmental Scales (CUES). The CUES instrument consists of five scales, which, taken together, describe the primary sources of press a college environment placed on a student. Pace believed that better information about the environment of a college would lead to higher quality research on the effect of specific types of environments on students' development as well as the contribution of colleges towards individual student success. Stern (1970), however, continued to work with the CCI, eventually developing versions to describe high school environment. Stern was particularly interested in congruence, which he defines as the relationship between personal needs and the press of the environment. He would later develop a classification of college environments based on results from the administration of the CCI at multiple institutions. One noteworthy observation recorded by Stern (1970) was that first-year students' initial perceptions of the environment of their institution have little in common with perceptions of upperclass students and even second semester freshmen. Stern speculated that factors other than the students that are recruited determine the environmental press of an institution. However, most of Stern's recommendations involved using environmental assessments to realign student expectations as a means of quelling student protests that were common in the 1960's. No mention was made of using CCI data to foster student success.

Later, Conyne (1975, 1978) approached lack of fit between students and their institution as a source of stress to be addressed in college counseling centers. Conyne viewed press as the

extent to which institutions addressed specific student needs, similar to how subsequent researchers would view supplies. He advocated that students' needs be examined in relation to how well the institution provides for those needs (Conyne, 1978). Conyne further advocated that counselors work with faculty and administrators to identify and address areas where students' needs are not being met.

By the 1980's, higher education researchers had begun to move away from studying need-press models (Borden, 1987). For one, while fit provided a strong theoretical perspective to explain the causes of student attrition, as of the mid-1980's there had been "few published studies" demonstrating a significant effect of press, or lack of fit with an environmental press, and college student attrition (Borden, 1987, p. 17). Second, need-press models failed to consider the effect of forces outside of the college environment on student outcomes. Borden specifically mentioned job prospects or the influence of parents and friends as forces that might draw a student into a greater connection with their institution or inhibit full participation. Borden argued for the measurement of a more comprehensive concept, engagement, which he referred to as the psychological and sociological forces that cause a student to become more connected to an institution. This framework for engagement also recognizes that other psychological and sociological forces may cause a student to become disengaged from their institution. Researchers with NSSE would later use the same term to describe both the amount of effort students put into specific educational activities (similar to Astin's (1984) concept of involvement) and the degree to which institutions create conditions that facilitate student involvement (National Survey of Student Engagement, 2017). NSSE has been administered by more than 1,600 institutions as of 2016, making the survey one of the most popular assessments used by colleges to learn about student engagement (National Survey of Student Engagement, 2017).

Evaluation of Fit Compared to Similar Constructs

Before considering fit within the context of the present study, it would be informative to explore fit in relation to other similar constructs. Students' sense of belonging in particular has received considerable attention in student development literature recently. Strayhorn (2012) conceptualized sense of belonging as being a need that motivates students to engage in behaviors that satisfy the need. In other words, when a student begins college, that student might seek to make connections with other students or join a student organization in order to satisfy their need to belong. When considering needs-supplies fit, students' sense of belonging refers only to the needs aspect. In other words, a measure of sense of belonging might only consider the degree to which a belonging need is satisfied, without providing consideration for how important that need is or the supplies within the environment that could support that need. Fit therefore provides a more complete picture both of the degree of need a student might have to belong and the extent to which both formal and informal aspects of the university might be meeting that need.

Both sense of belonging and fit are limited, however, in that they can only be measured using self-report instruments designed to measure abstract psychological concepts. Higher education researchers have therefore sought to develop measures based on readily available reports of student behaviors. Astin (1984, 1996) developed his theory of involvement to explain a wide range of student outcomes, including retention. Involvement is defined as "the amount of physical and psychological energy that the student devotes to the academic experience." (Astin, 1984, p. 297) Many institutions also began measuring student engagement following the development of the National Survey of Student Engagement (NSSE). Kuh (2003), who led the NSSE project in its early years, defined engagement both by the extent to which students participated in "educationally sound activities" as well as institutional actions designed "to

induce students to take part in these activities.” (p. 25) Both involvement and engagement have been measured using student self-reports of what they have done while in college. Evidence from NSSE suggests that students who report greater levels of engagement during the first year of college are more likely to persist to the second year and receive higher grades (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008). While measures of student behaviors are important, needs-supplies fit may be able to provide additional context to explain student departure. Such a student would be highly engaged, but their departure would stem from academic needs not met by the environment. Fit therefore could provide additional information to supplement engagement data by reporting on psychological factors independent from student behaviors.

Reviving Need-Supplies Fit

Much later, however, subsequent researchers exploring the effects of student-institution fit would revive the needs-press model advocated by Conyne (1975, 1978). Anthony (2011) revised and updated Stern’s (1970) original need-press instruments to provide a better understanding of current college students’ needs. Other researchers revived Coyne’s construct as needs-supplies fit. Gilbreath, Kim, and Nichols (2011) developed a questionnaire designed to measure perceptions of student-institution fit using a series of focus groups with students, academic advisors, and counselors in campus mental health centers. Their analysis yielded a 16 item instrument that included items pertaining to the social, academic, and physical environment. The social environment encompassed a wide variety of experiences, including social life, academic reputation, and diversity. Academic environment included the intellectual climate of the campus, availability of academic resources, and size of the university. The broadest scale in this instrument described the physical environment, which included items on campus location, aesthetics, and affordability. The Gilbreath et al. instrument asked students to rate the importance

of various aspects of the social, academic, and physical environment and the degree to which their current institution provided for these aspects, thus providing a measure of both student's self-reported needs and perceptions of the extent to which the supplies of the institution fulfilled these needs. The final instrument produced six scales, which included Academic Environment needs and supplies, Social Environment needs and supplies, and Physical Environment needs and supplies. Items and reliability estimates obtained by Gilbreath et al. in their final instrument can be found in Appendix A.

Using polynomial regression analysis, Gilbreath et al. found that satisfaction with the university increased as the perceptions of supplies provided by the university rose towards students' reported needs. In other words, as the degree to which the university met students' needs increased, satisfaction also increased. Satisfaction increased at a lower rate as supplies along the academic and physical environment exceeded students' needs. All coefficients were statistically significant at $p < 0.01$. However, psychological well-being increased at a much greater rate as Physical Environment supplies exceeded needs. Gilbreath et al. proposed that improved satisfaction from better student-institution fit could increase student retention, but they did not explore the relationship between fit, satisfaction, and retention directly.

Student-Institution Fit in John Bean's Retention Research

Bean and Eaton (2000, 2001) elaborated on Tinto's model when they proposed a model of student retention based on psychological constructs. Specifically, Bean and Eaton proposed that the processes by which academic and social integration occur could be explained using psychological constructs. Self-efficacy, for example, fuels academic and social integration by giving students confidence that they can succeed within their institution. The development of coping strategies would enable students to adapt to the rigors and daily requirements of college,

which would enhance adjustment to the college environment and provide a sense of integration. Finally, students who have a strong internal locus of control would be more likely to attribute success in college to their own individual performance. These students would therefore be more likely to engage in the involvement behaviors Astin (1984, 1996) and Stage and Hossler (2000) tout might enhance social and academic integration. Academic and social integration would lead the student to feel as if there was a fit between them and the institution. This sense of fit, along with a sense of organizational commitment, would foster an intent to persist, which would guide subsequent persistence behaviors. Using an earlier specification of the model, Eaton and Bean (1995) found evidence that behaviors that facilitate coping with the academic and social environment of an institution have an indirect effect on persistence (via intent to persist) even when accounting for prior academic performance and important demographic variables.

Student-institution fit was among the most important constructs presented by Bean and Eaton. According to the model, student-institution fit, along with institutional commitment, mediates the impact of social and academic integration on intent to persist. However, as important as student-institution fit was to their model, Bean and Eaton provide little explanation of this construct, other than to describe it as an attitude developed as the result of increased self-efficacy, lower levels of stress, and personal attributions of success (Bean & Eaton, 2000, 2001). In an earlier iteration of his general model of retention, Bean (1986) described student-institution fit as being reflective of student attitudes about their institution as a whole. Bean (2005) later elaborated more extensively when he theorized that student-institution fit emerges from a sense of shared values with other students concurrently enrolled at the same institution. A perception of student-institution fit therefore could be interpreted as the manifestation of social integration proposed in Tinto's (1993) model. Though integral to the model, this definition was not entirely

consistent with either existing definitions of PE fit in the psychological literature or earlier conceptualizations of fit developed in higher education settings.

Subsequent Research on Student-Institution Fit and Retention

Other researchers expand on the work of Bean in an attempt to integrate student-institution fit into existing models of retention. Mattern, Shaw, and Korbin (2010) conceptualized academic fit as only the absolute difference between a students' SAT score and the mean SAT of their institution. They found that a greater absolute difference between students' SAT and average institutional SAT had a significant positive effect on GPA in the first year, which the authors pose as evidence against the inclusion of student-institution fit in Bean's (2005) model. However, the absolute difference between SAT is far more simplistic than definitions used by Bean or Gilbreath et al. In addition, since the absolute difference treats students who score above and below the institutional average the same, it is difficult to infer how a positive affect might be interpreted.

In 2008, Wintre et al. developed an instrument in order to explore the construct of "student-university match" (SUM). The authors approached SUM primarily as a developmental construct. Like Bean and Eaton (2000), Wintre et al. criticized Tinto for failing to explicitly outline the processes by which a student would become integrated into a university. They proposed that students' success or failure to integrate into an environment could best be described by Eccles, Lord, and Roeser's (1996) conceptualization of PE fit.

Eccles et al. (1996) applied PE fit to the education of adolescents. They suggested that creating match between the developmental abilities of a child with an appropriate learning environment would be an effective intervention to reduce both academic struggles and negative social behaviors. Wintre and her colleagues extended Eccles et al. application of PE fit to college

students with the development of their SUM scale. The Wintre et al. instrument consists of 17 items divided along four dimensions: social, academic, vocational development, and “general characteristics of the university environment” (Wintre et al., 2008, p. 752). These dimensions were not intended to be separate scales but rather to represent a singular fit construct. In that sense, the scale was meant to represent a broad, overall level of fit rather than specific domains of fit. Students completing the SUM were asked to indicate the extent to which each of the items represents a fit between the student and her university environment. The instrument displayed good internal reliability, and confirmatory factor analysis confirmed the presence of a one-factor, unidimensional construct describing overall match between student and university.

The SUM scale developed by Wintre et al. was revised mainly to gather data following the results of a study conducted by Krause (2005, as cited in Bowman and Denson, 2014) of first year students at an Australian university. Krause found that students who departed their original higher education institution after their first year were more likely to lack a connection to peers, to be less involved at the university, and to report a lower sense of belonging. In order to explain these results, Denson and Bowman (2015) developed a student-institution fit instrument. The original SUM scale from Wintre et al. was expanded using constructs derived from existing literature on student retention and PE fit within higher education. The result was a 35 item instrument designed to assess fit along seven distinct dimensions (Denson & Bowman, 2015).

Initial reliability and validity of the instrument were tested using 541 first-year psychology students from two universities in Australia (Denson & Bowman, 2015). Exploratory factor analysis conducted using the sample from one university revealed a six factor structure: diversity, partying, religiosity, political orientation, academic challenge, and wealth/materialism. A second confirmatory factor analysis using the sample from the second university revealed that

the six factor structure provided a good fit to the data (CFI = 0.966, RMSEA = 0.035).

Subsequent analyses using structural equation modeling revealed that student-institution fit had a significant positive direct effect on academic engagement ($\beta=0.20$, $p < 0.05$) as well as a significant indirect effect on intent to remain in college (total indirect effect of student-institution fit on intended retention $\beta = 0.07$, $p < 0.05$). Furthermore, student-institution fit also had a significant negative direct effect on academic disengagement ($\beta=0.25$, $p < 0.01$) as well as a negative indirect effect on intent to transfer (total indirect effect of student-institution fit on intent to transfer $\beta = -0.07$, $p < 0.05$). The results demonstrate that the instrument also appeared to be adequately valid for the purposes of assessing fit along each dimension and identifying students who might intend to depart. However, the authors only explored intent to persist, rather than actual persistence.

A similar study was also undertaken by Bowman and Denson (2014) using students at two universities in the United States (U.S.). In this version, slight wording changes were made in order to make the language more familiar to U.S. students. A dimension on athletics was also added, given the importance of athletics on U.S. campuses, and the physical dimension, which was not supported in the Australian model, was re-added. As with the Australian analysis, internal reliability of each of the seven dimensions was strong, and confirmatory factor analysis suggested that the seven factor model was a good fit to the data. Subsequent analyses also suggested that a second order overall fit factor, comprised of each of the sub factors, proved a good fit for the data as well. As with the Australian model, the U.S. model put forward the presence of a significant positive indirect effect for student-institution fit on intent to persist (unstandardized $B = 0.089$, $p < 0.01$). However, in the U.S. model the effect on intent to persist was moderated by satisfaction rather than academic adjustment. Once again, no attempt was

made to explore the relationship between fit and actual persistence.

Literature Review Summary and Conclusions

Further Exploration of Student-Institution Fit

The results provided by Bowman and Denson (2014) and Denson and Bowman (2015) support the claim that student-institution fit may be an extremely promising concept for understanding student departure. However, these studies do raise several important questions. The first is in regards to the model of the relationship between student-institution fit and retention proposed by Bowman and Denson (2014). The authors state that Bean and Eaton's (2000) conceptualization of a direct relationship between student-institution fit and intent to persist is more consistent with the conceptualization of Wintre et al.'s (2008) original SUM measure. Since Bowman and Denson's measure was based on the SUM, their model of student-institution fit should theoretically be directly linked to intent to persist, as Bean and Eaton would have predicted. However, in both studies, Bowman and Denson (2014) and Denson and Bowman (2015) found that the relationship between student-institution fit and intent to persist was mediated by other factors, which the authors say is more consistent with Tinto's (1993) theory of institutional departure. The model that proved a best fit for their data was more consistent with Tinto's theory than Bean and Eaton's. As a result, further study is necessary to clarify whether there is a direct relationship between student-institution fit and persistence or whether other factors mediate that relationship.

Second, several questions remain about the exact structure of student-institution fit. The Wintre et al. (2008) SUM measure on which Bowman and Denson's studies are based proposed that student-institution fit is a single dimension, while the Gilbreath et al. (2011) study proposes a three factor structure consisting of Academic Environment (AE) fit, Social Environment (SE)

fit, and Physical Environment (PE) fit. Denson and Bowman (2015) found support both for a multifaceted and single dimension model in their Australian study. Additional analysis with data obtained from different institutions would be useful for researchers from a theoretical standpoint.

Third, in both studies, the outcome explored was intent to persist, rather than whether or not the student actually returned to the institution. While the relationship between intent to persist and actual persistence is quite strong, there are often many students who fully intend to persist but do not. Bowman and Denson (2014) proposed using their instrument as an early warning system that could identify students at risk of departing the institution. The authors claim that their instrument demonstrates predictive validity. However, Messick (1995) asserts that if an instrument is to claim construct validity then it must be demonstrated to be valid for the purpose in which it is intended to be used. In order to assert the construct validity of the student-institution fit measure, therefore, future studies should consider the utility of student-institution fit in predicting actual persistence from one year to the next (fall-to-fall persistence) rather than only predicting intent to persist. An empirically validated student-institution fit instrument could be especially useful to institutional research professionals, who could use the information in estimating retention probabilities of an incoming cohort for planning and budgeting purposes or use the information as part of the comprehensive assessment of programs or services (Volkwein, 2008, 2011).

Finally, the Bowman and Denson instrument is a measure of supplementary fit. While supplementary fit has utility for understanding the connection between a student and the institution, needs-supplies fit may provide a better conceptualization for how the institution is creating the conditions necessary for a specific student to succeed. A needs-supplies measure, such as the one created by Gilbreath et al. (2011), could facilitate an exploration that provides

administrators with information to better facilitate student success. Institutions could identify areas where the environment does not meet students' needs and determine required changes to prevent subsequent student departure.

Connecting Student-Institution Fit, Low SES, and Nontraditional Students

Explorations of student-institution fit should also include a wider variety of student populations. As previously mentioned, Bowman and Denson state that the relationship between student-institution fit and retention is best explained using Tinto's (1993) theory of institutional departure. Tinto states that external commitments, such as low SES or the external obligations frequently experienced by nontraditional students, may indirectly influence students' decisions to remain enrolled. Bean and Metzner (1985) further hypothesize that retention for nontraditional students would be affected more by external commitments than social integration, and Metzner and Bean (1987) found that finances had an indirect relationship with retention. Testing the impact of student-institution fit in different institutional settings would also be beneficial to determine if student-institution fit can be used in identification of students for intervention, institutional policy analyses, or retention studies (Volkwein, 2011).

The findings of these theorists are especially important given what is known about the retention of low SES students and nontraditional students. Low SES students face challenges not only paying for college, but also adjusting to an unfamiliar environment and navigating obstacles in their personal life (Borrego, 2007; Chaplot, Cooper, Johnstone, & Karandjeff, 2015). Bowman and Denson (2014) proposed the possibility that students from low SES backgrounds may also experience difficulty fitting in institutions with students from different socio-economic backgrounds, and as a result included a socio-economic fit in their instrument. However, Bowman and Denson did not account for finances in either study exploring the relationship

between student-institution fit and persistence. Further study to investigate the impact of student-institution fit net the effect of SES status is necessary.

Further investigation regarding the impact of student-institution fit net the effect of factors associated with nontraditional students is also important. Horn and Carroll (1996) highlight that students possessing multiple characteristics associated with nontraditional status may be associated with lower retention and graduation rates. Few single institution studies used the nontraditional student measure developed by Horn and Carroll. However, this measure would be a useful method for aggregating numerous important external obligations that may be associated with student-institution fit. Further exploration of the effect of student-institution fit when including factors associated with nontraditional students would be necessary.

Guiding Research Questions

Given the current literature on student-institution fit and persistence, the following questions seem most relevant:

1. Does the factor structure of the measure of student-institution fit proposed by Gilbreath, Kim, and Nichols fit data obtained from students at a large commuter institution?
2. What is the relationship between student-institution fit and retention, net the effect of background variables, and nontraditional student level?
3. What is the relationship between student-institution fit and retention, net the effect of background variables, and factors associated with low SES?
4. What is the relationship between student-institution fit and retention, net the effect of background variables, nontraditional student level, and factors associated with low SES?

CHAPTER THREE

METHODS

This section will describe the methods used to answer the four primary research questions;

1. Does the factor structure of the measure of student-institution fit proposed by Gilbreath, Kim, and Nichols (2011) fit data obtained from students at a large commuter institution?
2. Does student-institution fit predict retention, net the effect of background variables, and nontraditional student level?
3. Does student-institution fit predict retention, net the effect of background variables, and factors associated with low SES?
4. Does student-institution fit predict retention, net the effect of background variables, and all external commitments?

This chapter will have four primary sections: Population, Description of data and data sources, Survey procedures, Methods of analysis, and Limitations.

Population

The study will use data obtained from a survey conducted during the fall 2015 semester at IUPUI. The initial survey was conducted as part of an exploratory study to identify the characteristics of students who felt a lack of fit with the university. Bowman and Denson (2014) advised that universities could use student-institution fit instruments in order to determine the characteristics of prospective students who may experience better fit with the university or identify students in need of intervention. Practitioners at IUPUI hoped to use these data to inform subsequent interventions designed to better meet students' needs.

The random sample for this survey was drawn from students who were starting as new beginners or transfer students at IUPUI during the fall 2015 semester. IUPUI is a public research university with an overall enrollment of over 29,000 students (College Navigator, n.d.). In the fall 2015 semester, there were 3,622 first year students and 1,296 new external transfers (Institutional Research and Decision Support, 2015). From that group, a random sample of 3,000 new Bachelor's degree seeking beginners and new to IUPUI transfers were selected to participate in this survey. Only students who were at least 18 years of age or older were selected.

Data and Data Sources

Student-Institution Fit Instrument

The survey was adapted from the instrument used in Gilbreath, et al.'s (2011) investigation of student-institution fit. The Gilbreath et al. instrument was conceptualized using the needs-supplies perspective first advocated by Coyne (1978) as an appropriate lens to conceptualize student-institution fit. First, the respondents were presented with 16 items and asked to rate "How important are the following to you?" on a seven-point scale (1 = Not at all, 7 = Very Much). Respondents were then presented with the same 16 items and were asked to rate "To what degree does IUPUI do the following?" on a similar seven-point scale (1 = Not at all, 7 = Very Much). For the proposed analyses, fit was calculated as the absolute value of the respondents' needs rating minus the respondents' supplies rating. In this instrument, fit was evaluated along three dimensions: Academic, Social, and Physical Environment fit. The proposed AE fit scale consisted of four items that corresponded broadly with students' perceptions of the formal educational structures within the institution. Items range from abstract aspects of the academic environment, such as academic climate and reputation, to more concrete features such as classrooms and size. Conversely, Social Environment fit scale was concerned

with less overtly academic aspects of the institution, such as social life, athletics, and student support services. Finally, the Physical Environment scale consisted mostly of items related to the material space of the institution, such as location and campus layout. In the Gilbreath et al. study, this factor also included an item regarding “Great affordability.” Because this survey was originally intended to be used for institutional improvement purposes, a series of open-ended items were also added to the end of the survey. Respondents were asked to provide their personal definitions of each of the items in the Gilbreath et al. scale. These responses were especially useful in understanding modification indicies in the analysis for Question 1.

The Gilbreath et al. instrument was deemed to be more appropriate than other fit instruments for a variety of reasons. For one, reliability for each of the needs and supplies scales was mostly strong. Cronbach’s alpha results were above 0.7 for three of the six scales (Social Environment needs, Social Environment supplies, and Academic Environment supply). Cronbach’s alpha for Bowman and Denson’s social scale was also strong (0.85). However, the academic scale was only 0.63, hinting it may not be as strong as the Gilbreath et al. academic scale. In addition, the Gilbreath et al. initial instrument was developed using students at a primarily commuter institution in the Midwest, much like IUPUI. Bowman and Denson’s (2014) instrument prominently featured a religious dimension, which may be inappropriate given that IUPUI is a public institution with no religious affiliation. Likewise, the social dimension in Bowman and Denson’s instrument consisted of two items, “Most students drink frequently” and “Students at this university like to party.” Given the minimized role of social integration in existing studies of the factors affecting persistence at primarily commuter institutions (Braxton, Hirschy, & McClendon, 2004; Pascarella, Duby, & Iverson, 1983), the Gilbreath et al. model is likely to be more appropriate for IUPUI.

Exploratory factor analysis conducted by Gilbreath et al. found that these 16 items aligned with the three proposed factors of fit. A complete list of the items as well as the factors with which each item was aligned in the initial study can be found in Appendix A.

Additional Survey Questions

A series of additional questions were used to collect data otherwise not available in the Indiana University Student Information System (SIS). Data on respondents' use of time was collected via a self-report item that asked respondents to indicate how many hours per week were spent on a series of activities. Specifically, students were asked about the number of hours spent studying, sleeping, commuting to IUPUI, working for pay (both on and off campus), taking care of dependents, taking care of other household responsibilities, engaging in activities related to intercollegiate athletics, engaging in extracurricular activities, and other activities not listed. A feature in the Qualtrics survey system was enabled that limited respondents to only 168 hours per week in order that estimates would be more realistic.

Students were also asked whether they received a high school diploma or GED (1= "Yes," 0 = "No"), whether they were claimed as a dependent on their parents or anyone else's tax return (1= "Yes," 0 = "No;" "I don't know" coded as missing), and whether or not the respondent had any children (1= "Yes," 0 = "No"). Marital status was determined from a single question with eight response options ("Married," "Living with a partner," "Divorced," "Separated," "Widowed," "Never been married," "Don't know," and "Prefer not to answer"). Respondents who indicated they were married were coded as 1, while "Living with a partner," "Divorced," "Separated," "Widowed," and "Never been married" were coded as 0. Both "Don't know" and "Prefer not to answer" were coded as missing.

Two questions were included in order to measure respondents' intent to stay at IUPUI and complete a Bachelor's degree. The first asks the degree to which the respondent believes they will transfer from IUPUI on a five-point scale, and the second asks respondents to indicate their degree intentions. For the analysis, only students who plan to complete a Bachelor's degree or Graduate degree will be included. The full survey is included in Appendix B.

Institutional Data

Data was also obtained from the Indiana University Student Information System (SIS) in order to supplement information provided on the survey. Age was calculated based on the difference in full years between the respondents' birthday and the date of the 2015 fall census for IUPUI (August 31, 2015) to determine which students met necessary eligibility criteria. Number of credit hours enrolled at IUPUI during the fall and spring semesters was also extracted. Students who were enrolled in less than 12 credit hours in both semesters will be considered part-time, while those enrolled in at least 12 credit hours in one semester were considered full-time.

Financial aid records in SIS provided three data points. First, students who received a disbursed Pell grant during the fall 2015 semester were identified. In subsequent analyses, receipt of a Pell grant was coded as a dichotomous variable, with students who received more than \$0 in the form of a Pell grant coded as 1 ("Yes") and students who were disbursed \$0 in the form of a Pell grant coded as 0 ("No"). Unmet financial need, as determined from data submitted on the Free Application for Federal Student Aid (FAFSA) was also obtained. Unmet financial need is based on the institutions cost of attendance, minus the expected family contribution (based on reported income from the student or their family) as well as all federal, state, and institutional aid to be disbursed through the IUPUI Office of Financial aid (Fastweb, 2011).

Students' FAFSA filing status was also obtained, as unmet need based on FAFSA was necessary to include in subsequent analyses. Fall semester GPA was also obtained from the SIS. GPA at IUPUI is calculated on a traditional four-point scale. Fall-to-fall retention was determined by enrollment as of fall 2016 university census (August 28, 2016).

Survey Procedures and Respondents

Survey Procedures

The initial survey was sent to students in the selected sample three weeks following the beginning of classes. This time period was selected, as evidence from Woosley & Miller (2009) suggests that early experiences affecting institutional commitment may have an effect on fall-to-fall retention. Reminder emails were sent one, two, and three weeks following the initial distribution.

Of the students in the original random sample, emails to 14 students bounced back, bringing the adjusted sample size to 2,986. A total of 414 students completed the survey for an overall response rate of 13.9%. Of those 414 responses, 38 did not consent to have their responses used in these analyses and were dropped. An additional 25 did not complete any of the Supplies items, and fit scores could not be calculated. That left 351 respondents who had completed all fit items and had consented to have their data used in these analyses (11.8%). The sample was then split, with 176 responses used for confirmatory factor analysis in Question 1, while the remaining 175 responses were used to analyze the path models in Questions 2, 3, and 4. Tanaka (1987) advocates that a ratio of 5 observations per parameter to be estimated would be appropriate for structural equation models using maximum likelihood (ML) estimation. Given that 32 parameters are to be freely estimated in the confirmatory factor analysis model to answer Question 1, 9 parameters for Question 2, 10 parameters for Question 3, and 11 parameters are to

be freely estimated in the path model to answer Question 4, the total of 175 survey respondents per analysis should be sufficient.

Respondents

A comparison between the full survey population, dropped survey responses and respondents using data points retrieved from SIS can be found in Tables 1 and 2 below. A slightly larger percentage of full-time students responded to the survey compared to the percentage of full-time students in the initial sample (95% of respondents were full-time students compared to 91% of students in the survey sample). A t-test of fit scores revealed only one statistically significant difference in response patterns between full-time and part-time students. Specifically, part-time students were significantly more likely to experience a greater degree of misfit when asked whether IUPUI or their ideal university had a “great student body” ($t=3.87$, $p=0.049$). This item is part of the SE fit scale, which would be predicted to have less impact on the retention decisions of part-time students (Bean & Metzner, 1985; Braxton & Hirschy, 2005). Given the small number of part-time students who responded to this item ($n=15$ part-time students) and the relatively small effect size ($\phi = 0.041$), it is also possible that this result may not be a true effect (Button et al., 2013). No adjustments based on enrollment status were deemed necessary.

Comparisons between demographic characteristics of respondents whose data was used and those that were dropped were also calculated. However, no significant differences were noted in these comparisons. These comparisons are also included in Table 1 below.

Table 1

Differences in academic characteristics between full sample and survey respondents^a

	Full Sample	Dropped responses	Respondents
	Percentages		
Admit Type			
First-Year Baccalaureate	74.8%	79.7%	73.2%
External Transfer	25.2%	20.3%	26.8%
Enrollment status ^{b *}			
Full-time (12 hours or more)	91.3%	91.5%	95.4%
Part-time (less than 12 hours)	8.7%	8.5%	4.6%
Received Pell Grant	40.6%	45.8%	39.3%
Did not file a FAFSA	12.4%	6.8%	10.0%

^a All data obtained from Indiana University Student Information System (SIS) student enrollment and financial aid records.

^b As of August 31, 2015.

*Chi-square test revealed statistically significant difference between respondents and total population at $\alpha \leq 0.05$

Respondents also had a significantly higher mean high school GPA and earned a higher mean GPA in their first fall semester than non-respondents. However, a similar difference was not noted with regard to transfer GPA. For subsequent analyses, pre-entry GPA were mean standardized. First-year students were centered around the mean and standard deviation of the full sample (mean=3.36, standard deviation=0.45), while GPA for transfers was standardized around the full sample mean of 2.93 and standard deviation of 0.62. Pre-entry GPA will therefore be on a consistent scale, and coefficients will reflect the effect of having a GPA above the average for an entry group member in the randomly selected sample. Respondents also had slightly lower levels of unmet financial need than the full sample, though this difference was not statistically significant. However, respondents did have a significantly higher GPA in their first fall semester at IUPUI than all students in the initial sample.

Comparisons between demographic and academic characteristics of respondents whose data was used and those that were dropped were also calculated. However, no significant differences were noted in these comparisons.

Table 2

*Differences in means between full sample, and survey respondents**

	Sample		Dropped responses		Respondents	
	N	Mean	N	Mean	N	Mean
Age ^b	4,845	19.7	59	19.1	351	20.0
High School GPA ^{c*}	4,235	3.36	53	3.52	306	3.45
Transfer GPA ^d	1,109	2.93	10	3.11	83	3.01
Unmet Financial Need ^e	4,215	\$4,715	55	\$3,360	315	\$4,377
Fall semester GPA*	4,748	2.80	59	3.00	350	3.03

^a All data obtained from Indiana University Student Information System (SIS) student enrollment and financial aid records.

^b As of August 31, 2015.

^c Of students for whom high school GPA is available. External transfer students are not required to submit high school GPA for admission to IUPUI.

^d Transfer students only, based on courses from previous institutions that had been reviewed and processed as of March 1, 2017. Additional transfer credits may have been processed since.

^e Of students who had completed the FAFSA. Remaining student need, in U.S. dollars, after expected family contribution and all institutional and federal aid have been considered (Fastweb, 2011).

* Independent samples t-test revealed statistically significant difference between respondents and total population at $\alpha \leq 0.05$

Analyses

Question 1: Does the Factor Structure of the Measure of Student-Institution Fit Proposed by Gilbreath, Kim, and Nichols Fit Data Obtained from Students at a Large Commuter Institution?

The first question will be used to determine whether the factor structure proposed by Gilbreath et al. (2011) fits data obtained during this survey administration. This analysis was conducted because of the relatively low levels of reliability obtained from these scales. Cortina (1993) advised that an acceptable level for alpha be based on the intended use of the scale. Both the Physical Environment needs ($\alpha=0.54$) and Physical Environment supplies ($\alpha=0.62$) scales had particularly low reliability estimates, which would suggest the need for additional evidence of fit. While Gilbreath et al. may have deemed these to be acceptable levels of reliability for

research purposes, a more reliable instrument would be preferred if these scales are to be used for institutional decision making.

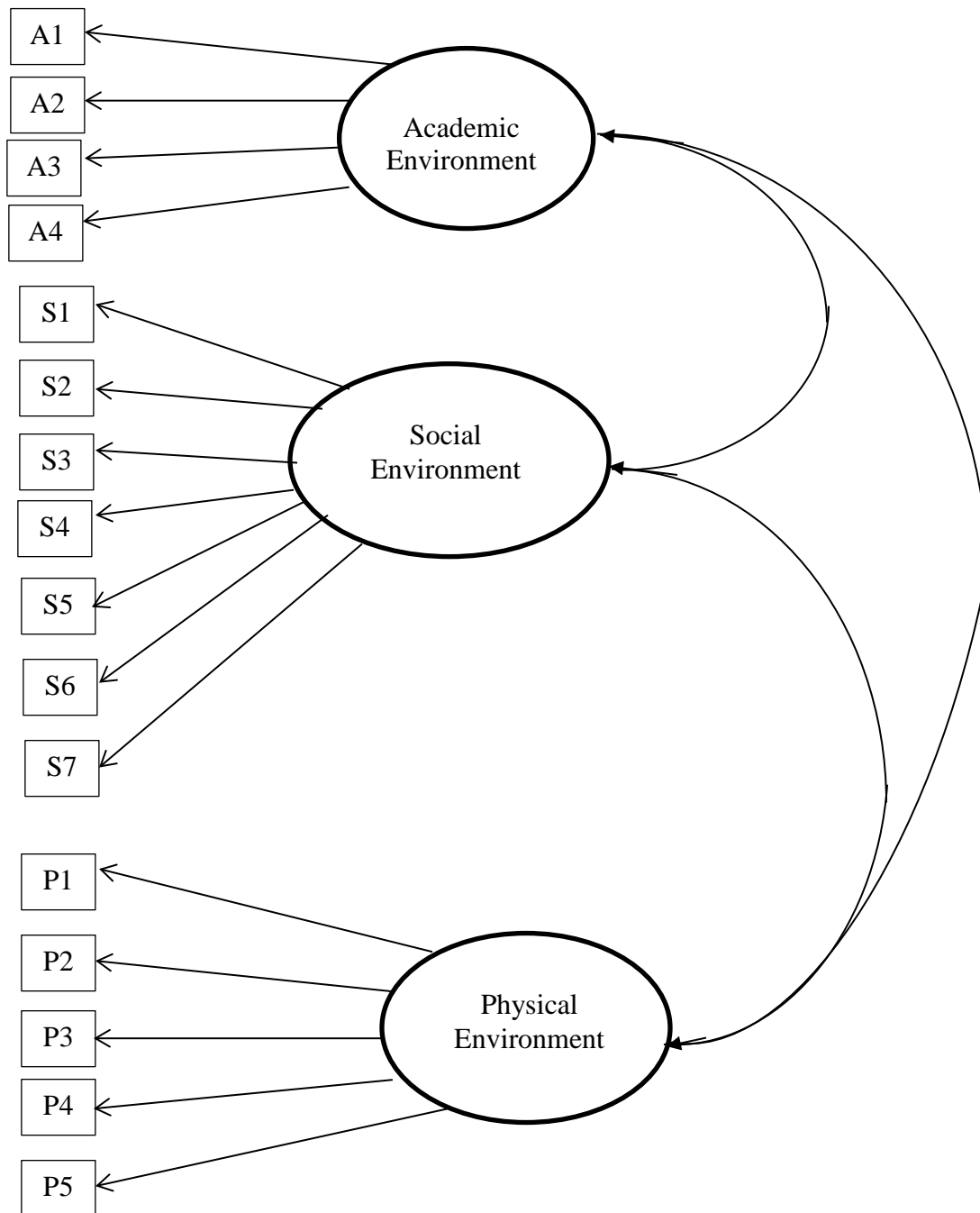
Confirmatory factor analysis (CFA) is the most appropriate method for determining model fit. CFA is a data reduction technique in which the relationships between the underlying latent constructs and the observed variables are specified in advance (Bollen, 1989). This differs from the exploratory factor analysis (EFA) procedure in that EFA models determine the nature of the underlying structure of the data. Gilbreath et al. used principal axis factor analysis, an EFA procedure that uses shared variance along the correlation matrix, to specify a three-factor model for their data. However, the authors do not provide much detail on their exploratory model. For example, the authors did not specify the rotational method used to determine appropriate factor loadings. Examining the underlying three-factor structure proposed by Gilbreath et al. first would be crucial to determine if this structure provides an appropriate fit for the data obtained from the IUPUI sample.

Figure 1 displays the relationships between variables on the student-institution fit instrument as proposed by Gilbreath et al. This model formed the basis for the CFA procedure. The three-factor structure consists of an Academic Environment factor featuring four items, a seven item Social Environment factor, and a five item Physical Environment factor. Appendix A displays correspondence between specific items from the student-institution fit instrument and provides details for each label. One factor loading in each model was set to 1.0 in order that the model be appropriately scaled. The proposed model has 16 observed variables and 32 freely estimated parameters. The model therefore is identified as it meets both the t-rule ($32 \leq (16)(16+1)$) and the three factor rule for identification (Bollen, 1989).

Four fit indices were used to determine if the proposed model is an appropriate fit for the data. The Chi-square test for model fit tests the extent to which the observed sample covariance matrix differs from the restricted covariance matrix (Byrne, 2012). A small value for the chi-square statistic indicates a more perfect match between the two matrices. Therefore, a low value for the chi-square statistic means that the null hypothesis is accepted and that the model fits the data. Although an appropriate statistical test, the chi-square statistic may be easily influenced by sample size and the test may be overly sensitive to misspecification in the model (Bollen, 1989). The sensitivity of the chi-square statistic is not the only issue. Specifically, the American Statistical Association issued a series of principles regarding the use of p-values, such as those produced by the chi-square goodness of fit test (Wasserstein & Lazar, 2016). Among the principles is that conclusions should not be based solely on p-values, and that p-values alone may not be sufficient evidence to reject or accept a null hypothesis. The MPlus statistical package offers additional fit indices to supplement the chi-square test, thus making it an appropriate software to use for these analyses (Byrne, 2012). Other fit indices to be considered include the Comparative Fit Index (CFI), root mean squared residual (SRMR) and root mean square error of approximation (RMSEA). Hu and Bentler (1995) recommend different cutoff criteria for different fit indices based on sample size or estimation method. Per the recommendations of Hu and Bentler (1999), a cutoff value of greater than 0.95 was used for the CFI in combination with a cutoff of less than 0.08 for SRMR and less than 0.06 for RMSEA.

Figure 1

Proposed Model of Student-institution fit for Question 1



Adapted from Gilbreath, Kim, & Nichols, 2011

When results from the CFA did not meet the cutoff criteria, modification indices were used to determine if changes in model specification could lead to a better fitting model. In addition, the definitions provided by respondents through open-ended survey items yielded additional contextual information that was helpful in justifying modifications. No further modifications were made after the model demonstrated an adequate level of fit, in order to reduce the chances of over-specification resulting from nuances in sample data (MacCallum, Rozonowski, & Necowitz, 1992). Cronbach's alpha were also calculated for reconfigured scales in the path analysis model sample, in order to provide further evidence that changes in the structure of the model were not overly influenced by chance from the limited sample size (MacCallum et al., 1992). If modification indices did not produce a better fitting model, an exploratory factor analysis (EFA) would have been conducted in order to determine the appropriate underlying structure of the data obtained from the IUPUI sample. Factors derived from the exploratory factor analysis would then have been used in subsequent analyses, and the path models defined below would have been adjusted accordingly. Fortunately, changes made because of modification indices yielded an appropriately fitting model, so the EFA was not conducted.

Question 2: What is the Relationship between Student-Institution Fit and Retention, Net the Effect of Background Variables and Nontraditional Student Level?

The second part of the analysis incorporated Horn and Carroll's (1996) measure of nontraditional student status to determine if student-institution fit had an effect on retention, net the effect of the degree to which a student is nontraditional. Path analysis was used as it allows for the analysis of a system consisting of multiple structural equations (Bollen, 1989). Path

analysis also allows for the estimation of both direct and indirect effects, which was necessary for estimating the total effect of AE fit on retention.

Previous studies of the factors affecting retention of nontraditional students (Metzger & Bean, 1987) and students at primarily nonresidential institutions (Braxton & Hirschy, 2005) influenced the specification of the final model. Specifically, this model recognizes that factors in the external environment may impact the student's decision to remain in college (Braxton, Hirschy, & McClendon, 2004). This model also included an approximation of the Horn and Carroll indicator of nontraditional student status. Students were given one point if they indicated that they worked 40 hours or more, earned a GED, were not claimed as a dependent, were married, spent at least 5 hours or more caring for dependents, or attend IUPUI part-time (enrolled less than 12 hours in both the fall and spring semester). The total number of points represented an index of the degree to which a student was nontraditional. Each of the fit scales were calculated using unit weights rather than factor weights.

The model proposes that two exogenous variables (Standardized pre-entry GPA and AE fit) have a direct effect on fall GPA. Fall GPA as well as nontraditional student score and the three measures of student-institution fit (AE fit, SE fit, and PE fit) then have a direct effect on fall-to-fall retention.

Because the dependent variable for this analysis is dichotomous (1 = retained to fall 2016, 0 = not retained), the second portion of the path model was estimated using logistic regression. The mediator variable in the equation (fall GPA) is continuous, which will complicate the interpretation of indirect effects. Valeri and VanderWeele (2013) advise that, for outcomes that are not rare (such as retention at the IUPUI campus), generalized linear regression with bimodal distribution be used to estimate the total effects when a mediator is continuous and

the outcome dichotomous. These total effects were estimated only if the total effect would have been statistically significant. For this model, maximum likelihood estimation (ML) was used to estimate model parameters. ML is a popular choice for parameter estimation because it has several advantages in working with large samples. Specifically, as sample size increases, ML becomes less biased, provides better estimates of θ , and provides smaller standard errors. R^2 will be used to determine the proportion of variance accounted for by the linear combination of the independent variables for the first part of the model, while McFadden's R^2 will be used to assess the change in the amount of variance accounted for by the variance in the logistic portion of the model. A full diagram for the model can be found in Figure 2 below, and the corresponding structural equation for Question 2 can be found in equation 1. All parameters were estimated using the MPlus statistical software package.

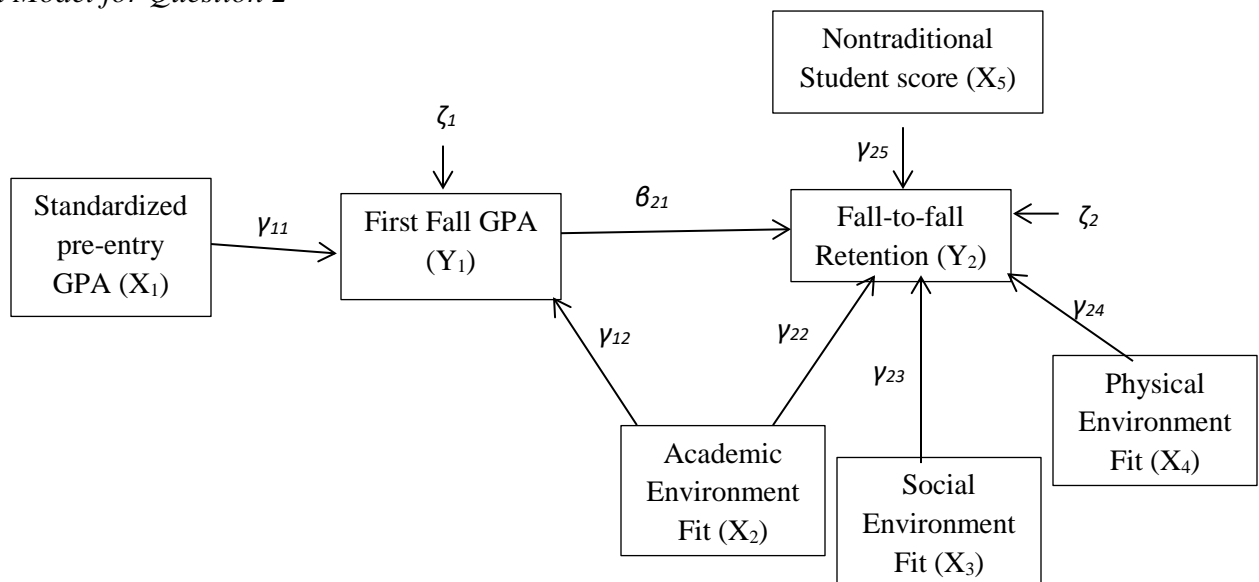
Equation 1: Full system of equations for path model.

$$Y_1 = \gamma_{11}X_1 + \gamma_{12}X_2 + \zeta_1$$

$$\text{Logit}\{(Y_2=1)\} = \beta_{21}Y_1 + \gamma_{22}X_2 + \gamma_{23}X_3 + \gamma_{24}X_4 + \gamma_{25}X_5 + \zeta_2$$

Figure 2

Path Model for Question 2



Question 3: What is the Relationship between Student-Institution Fit and Retention, Net the Effect of Background Variables and Factors Associated with Low SES?

The third part of the analysis incorporated students' income status and ability to pay. Students from low SES backgrounds face numerous obstacles inhibiting their success in college. These obstacles may include finding sufficient funding to pay for college, overcoming challenges that may arise in their personal life, or acclimating to upper and middle class norms often found in higher education institutions (Borrego, 2007; Chaplot, Cooper, Johnstone, & Karandjeff, 2015). Although Bowman and Denson (2014) recognized that students from low SES backgrounds may leave an institution because of a lack of fit, their initial study did not account for income status, ability to pay, or other factors that may complicate the relationship between fit and retention for low SES students. Question 3 in this analysis was designed to close this gap in the literature.

Receipt of a Pell grant in the first fall semester was used as proxy for income status in this analysis. Because Pell grants are disbursed in part based on students' levels of financial need, receipt of a Pell grant should be a useful indicator when true reported income is not available (Federal Student Aid, n.d.). Only students who complete the Free Application for Federal Student Aid (FAFSA) receive a Pell grant, so some low SES students may be missed in this analysis. Unmet financial need was used as a proxy for ability to pay in this model, as unmet need includes all sources of financial aid in addition to family income in the calculation. Larger amounts of unmet need may therefore indicate the extent to which students will need to identify additional sources of income in order to cover their tuition and fees.

The system of equations used for Question 3 will be similar to Question 2, with Pell and unmet need replacing the nontraditional score in the model. Once again, R^2 was used to assess

the portion of variance accounted for in the ordinary least-squared portion of the model, while McFadden's R^2 was used to determine the amount of variance reduced in the logistic portion of the model. As with Question 2, the dependent variable used to answer the question was dichotomous (fall-to-fall retention) so logistic regression was appropriate. Figure 3 contains the complete path diagram for Question 3, and equation 2 yields the structural equation for this analysis.

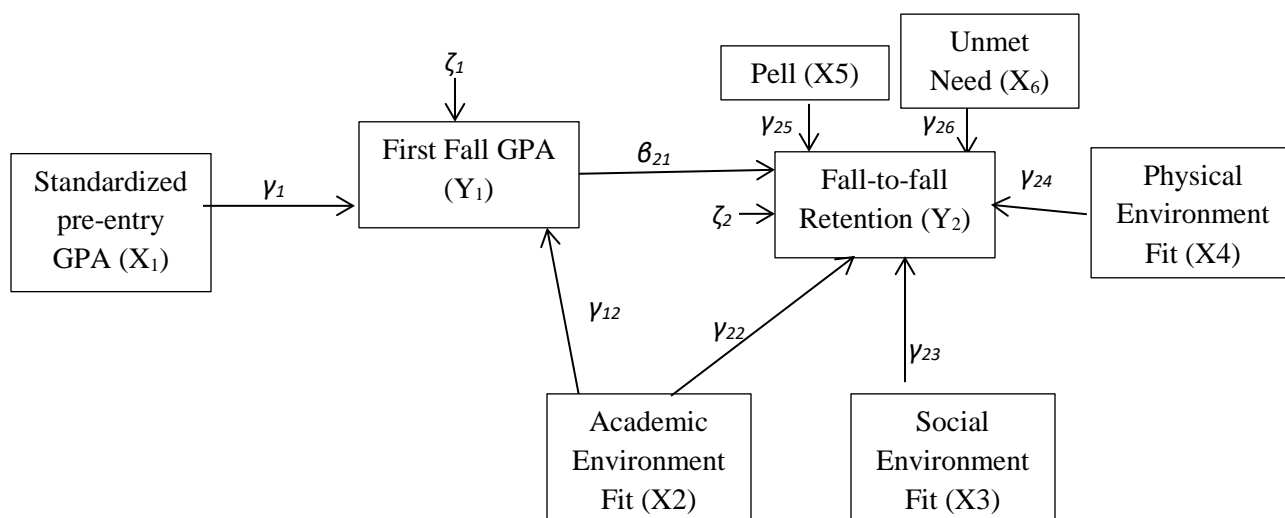
Equation 2: Full system of equations for path model.

$$Y_1 = \gamma_{11}X_1 + \gamma_{12}X_2 + \zeta_1$$

$$\text{Logit}\{(Y_2=1)\} = \beta_{21}Y_1 + \gamma_{22}X_2 + \gamma_{23}X_3 + \gamma_{24}X_4 + \gamma_{25}X_5 + \gamma_{26}X_6 + \zeta_2$$

Figure 3

Path Model for Question 3



Question 4: What is the Relationship between Student-Institution Fit and Retention, Net the Effect of Background Variables, Nontraditional Student Level, and Factors Associated with Low SES?

When the results from the CFA described in Question 1 suggested that the factor structure was appropriate, and the results of Questions 2 or 3 provided evidence that one or more

of the dimensions of student-institution fit may have an effect on retention, the study proceeded to question 4. Data obtained in the original survey was used as part of a path analysis model to determine if any of the three fit scales had a significant effect on retention, net the impact of background variables, external commitments, and factors associated with low SES students.

The model also included both obligations outside of the institution and students' finances, which Tinto (1993) would describe as external commitments. Nontraditional student score, receipt of a Pell grant, and unmet financial need were included in order to determine the effect of student-institution fit, net various aspects of Tinto's external commitments. The full system of equations and path model are described below.

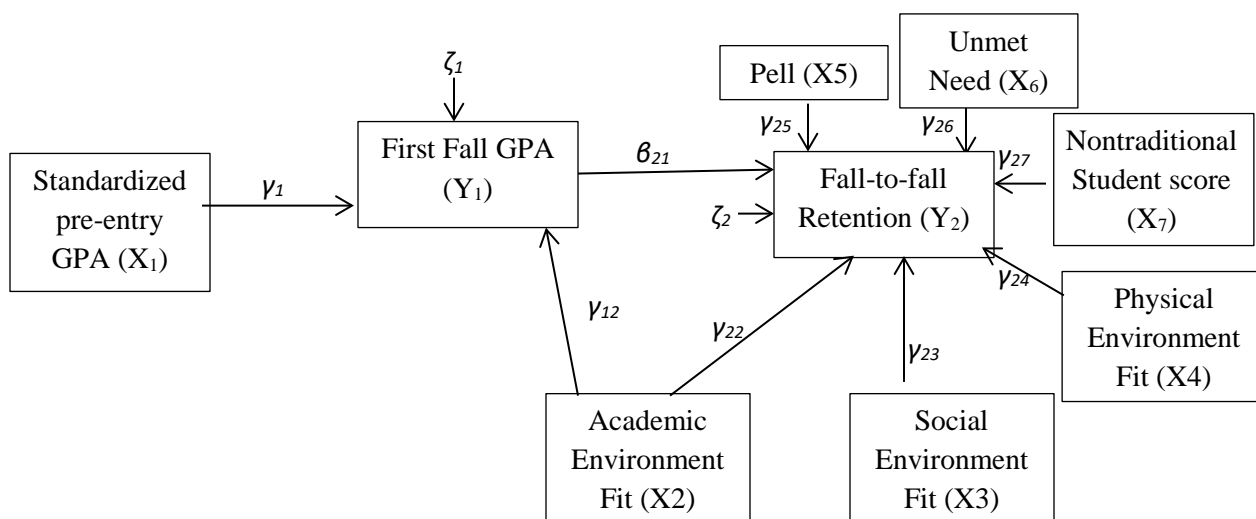
Equation 3: Full system of equations for path model.

$$Y_1 = \gamma_{11}X_1 + \gamma_{12}X_2 + \zeta_1$$

$$\text{Logit}\{(Y_2=1)\} = \beta_{21} Y_1 + \gamma_{22}X_2 + \gamma_{23}X_3 + \gamma_{24}X_4 + \gamma_{25}X_5 + \gamma_{26}X_6 + \gamma_{27}X_7 + \zeta_2$$

Figure 4

Path Model for Question 4



CHAPTER FOUR

RESULTS

The following research questions guided the analyses discussed in this chapter:

1. Does the factor structure of the measure of student-institution fit proposed by Gilbreath, Kim, and Nichols fit data obtained from students at a large commuter institution?
2. What is the relationship between student-institution fit and retention, net the effect of background variables and nontraditional student level?
3. What is the relationship between student-institution fit and retention, net the effect of background variables and factors associated with low SES?
4. What is the relationship between student-institution fit and retention, net the effect of background variables, nontraditional student level, and factors associated with low SES?

To conduct the following analyses, fit scores were calculated based on the absolute value of the difference between needs and supplies. Means therefore represent the difference between respondents' ideal university and their perceptions of IUPUI. A total of 351 respondents consented to participate and completed all of the need and supply combinations. These responses were used in the subsequent analysis. A nontraditional student scale score was also calculated for each student based on students' responses to survey items and data extracted from the IU SIS. Students were given one point if they indicated that they earned a GED, were married, had a child, were not claimed as a dependent on parents' taxes, were attending part-time, or indicated on the survey that they were working more than 40 hours per week. The full sample of 351 survey respondents was split into two samples of 175 and 176 respondents each.

Table 3 displays the means, standard deviations, standard error, skewness, and kurtosis of the fit scores and nontraditional student scores for the full sample and both split samples. Finney

and DiStefano (2006) suggest that when maximum likelihood estimation is used, univariate skewness may effect chi-square statistic results and standard error estimates when values exceed 2. Skewness exceeded 2 for one of the fit variables used in these analyses, “a highly regarded academic reputation” fit in the path model sample. The skewness for “state-of-the-art classrooms, labs, library” fit was just under 2 for the structural equation modeling sample. High skewness ratings such as these may cause chi-square test results to be inflated, which could lead to the dismissal of a model that was correctly specified (Finney and DiStefano, 2006). This was an important consideration when interpreting chi-square results for the CFA.

Skewness did exceed the specified level for the nontraditional student scale. According to Finney and DiStefano, while non-normal data may not effect parameter estimates, standard error estimates could be effected which would lead to an increase in the chances of a Type I error, or false rejection of the null hypothesis. Caution was therefore taken when interpreting the results of the path models.

Table 3

Means and Standard Deviations for Fit Score from Full Sample and Split Samples

Fit items	Full sample						CFA sample						Path model sample					
	N	Mean	Std	Std	Skew	Kurtosis	N	Mean	Std	Std	Skew	Kurtosis	N	Mean	Std	Std	Skew	Kurtosis
			Dev	Error					Dev	Error					Dev	Error		
Enjoyable social life fit	339	1.02	1.21	0.07	1.42	1.95	169	1.14	1.27	0.10	1.32	1.82	170	0.91	1.14	0.09	1.54	2.11
Sports and recreational opportunities fit	341	1.23	1.28	0.07	1.20	1.13	168	1.28	1.28	0.10	1.25	1.54	173	1.17	1.29	0.10	1.18	0.80
Great student body fit	345	0.80	0.95	0.05	1.24	1.48	172	0.79	0.95	0.07	1.22	1.70	173	0.80	0.95	0.07	1.27	1.34
A highly regarded athletic reputation fit	339	1.43	1.50	0.08	1.11	0.63	169	1.45	1.53	0.12	1.23	0.99	170	1.41	1.48	0.11	1.00	0.26
Great support services fit	343	0.84	1.03	0.06	1.40	2.50	171	0.91	1.09	0.08	1.58	3.60	172	0.78	0.96	0.07	1.10	0.37
Great non-academic facilities fit	343	1.22	1.28	0.07	1.29	1.65	171	1.26	1.33	0.10	1.43	2.15	172	1.17	1.23	0.09	1.11	0.91
A diverse student body fit	343	1.21	1.38	0.07	1.28	1.31	171	1.19	1.39	0.11	1.40	1.78	172	1.23	1.38	0.11	1.17	0.91
A scholarly/intellectual campus climate fit	341	0.81	1.01	0.05	1.63	3.04	170	0.84	1.05	0.08	1.62	2.99	171	0.77	0.97	0.07	1.64	3.14
State-of-the-art classrooms, labs, library fit	343	0.83	1.01	0.05	1.77	4.49	171	0.84	1.09	0.08	1.96	5.22	172	0.81	0.93	0.07	1.44	2.79
A highly regarded academic reputation fit	344	0.89	1.02	0.06	1.81	5.03	171	0.95	1.03	0.08	1.31	2.29	173	0.83	1.01	0.08	2.35	8.41
Great school size fit	342	1.04	1.11	0.06	1.38	2.56	170	0.99	1.05	0.08	1.24	2.26	172	1.10	1.17	0.09	1.46	2.65
Great geographic location fit	344	0.76	1.00	0.05	1.80	4.62	172	0.81	1.06	0.08	1.72	3.77	172	0.72	0.95	0.07	1.90	5.88
A safe environment fit	344	0.92	1.07	0.06	1.20	1.26	173	0.95	1.06	0.08	1.03	0.66	171	0.89	1.08	0.08	1.38	1.94
A pleasing physical environment fit	343	0.94	1.10	0.06	1.47	2.60	171	0.94	1.04	0.08	1.15	0.91	172	0.94	1.15	0.09	1.71	3.76
Convenient campus lay-out fit	341	0.79	0.92	0.05	1.24	1.60	171	0.81	0.91	0.07	1.10	0.97	170	0.77	0.94	0.07	1.38	2.26
Great affordability fit	344	1.01	1.27	0.07	1.58	2.56	173	0.99	1.19	0.09	1.46	2.31	1.71	1.03	1.36	0.10	1.65	2.61
Nontraditional Student Scale	324	0.34	0.82	0.05	2.86	8.55	158	0.41	0.92	0.07	2.67	7.25	166	0.28	0.70	0.05	2.96	9.14

Question 1: Does the Factor Structure of the Measure of Student-Institution Fit Proposed by Gilbreath, Kim, and Nichols Fit Data Obtained from Students at a Large Commuter Institution?

A total of 175 responses were used to conduct a confirmatory factor analysis in order to assess if the factor structure described by Gilbreath et al. matches the survey data obtained from the IUPUI sample. Using Tanaka's (1987) proposed ratio of 5 observations per parameter to be estimated, this sample size would be appropriate. Figure 1 displays the model assessed in the first analysis. Fit statistics for the model assessed can be found in Table 4. The Chi-square test was statistically significant ($\chi^2=212.70$, $df=101$, $p \leq 0.01$), suggesting that the data do not fit the specified model. This result may have been obtained due to the skewed results from the "state-of-the-art classrooms, labs, and library" item (Finney & DiStefano, 2006). The RMSEA estimate of 0.079, as well as the lower bound of the 90% confidence interval (0.065 – 0.094) also hints at a low level of model fit. The CFI value obtained from this analysis was also far below the proposed cut point for model fit. SRMR result (0.070), however, was below the advised cut point of 0.08.

Table 4

Fit Statistics for Gilbreath et al. Specified Model Using IUPUI Results

	Value
Chi-Square test of model fit	212.70 Df=101
RMSEA	0.079 90% CI: 0.065 – 0.094
SRMR	0.070
CFI	0.814

The comprehensive results do not provide sufficient evidence that the factor structure proposed by Gilbreath et al. is an appropriate fit for the data obtained from IUPUI students. Modification indices suggest four changes that would be consistent with theoretical assumptions.

The largest assumption would be to move Great Support Services fit from the Gilbreath et al. suggested loading with SE fit to AE fit. The item provides examples such as “academic counseling” and “placement center,” so it is possible that students may perceive this item as referring to academic support services. Furthermore, several respondents defined Great Support Services by referring to tutoring services provided by IUPUI, such as the Math Assistance Center and Biology Resource Center. These comments provided additional justification for moving Great Support Services to the AE fit scale.

Two additional modification indices suggest that correlated error terms between items within two scales would produce noteworthy reduction in the chi-square statistic. These would include specifying a cross-loading between “great support services” and “a scholarly/intellectual campus climate” (both within AE fit) and a cross-loading between “sport and recreational opportunities” and “a diverse student body” (both within SE fit). The largest reduction from correlated error terms would arise from an assumed cross loading between “state-of-the-art classrooms, labs, library” (AE fit) and “great geographic location” (PE fit). This modification seems appropriate given that “great geographic location” had a moderate factor loading with AE fit in the original Gilbreath et al. study (0.25), while “state-of-the-art classrooms, labs, library” had a similarly moderate factor loading with the PE fit scale (0.26).

Fit statistics for the revised model can be found in Table 5. The Chi-square test was statistically significant ($\chi^2=156.56$, $df=98$, $p \leq 0.01$), suggesting lack of model fit. Again, the chi-square result may have been somewhat inflated due to the high skewness of the “state-of-the-art classrooms, labs, and library” item. The obtained CFI rating of 0.903 would suggest that the level of fit was still not appropriate according to Hu and Bentler (1995, 1999). However, RMSEA (0.058) was below the predetermined cut point of 0.06 and SRMR (0.064) was below

the predetermined cut point of 0.08. These measures seem to recommend that model fit was appropriate. Analysis conducted by Hu and Bentler (1999) suggests that a combination of RMSEA below 0.06 and SRMR below 0.08 yielded the lowest combination of Type I and Type II error rates when N was less than or equal to 250 cases. Using these criteria, the respecified model was determined to be adequate for subsequent analyses. Table 5 below provides all fit statistics used in this analysis.

Table 5

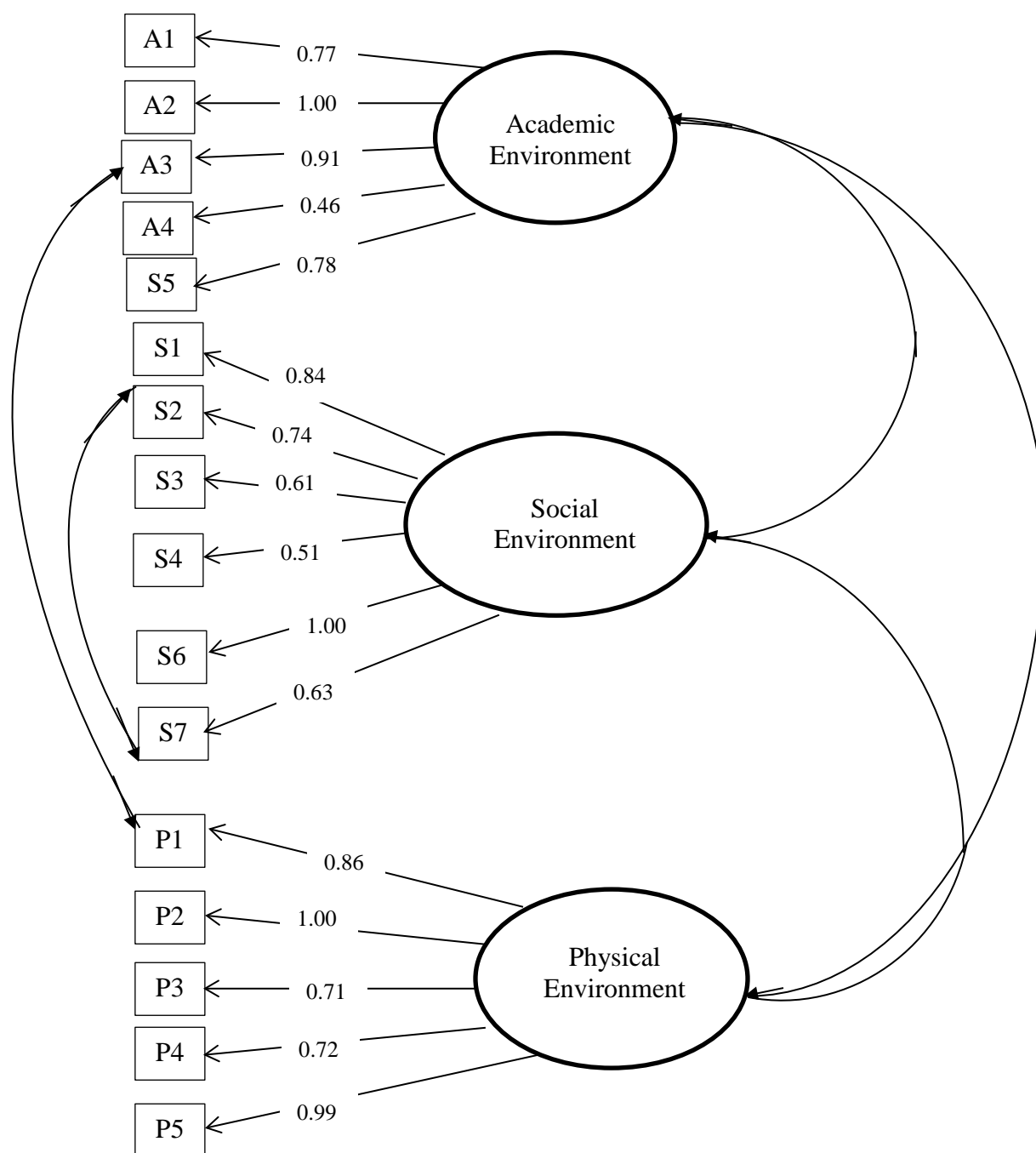
Fit Statistics for Revised Model Using IUPUI Results

	Value
Chi-Square test of model fit	156.56
	Df=98
RMSEA	0.058
	90% CI: 0.041 – 0.075
SRMR	0.064
CFI	0.903

The results described in Table 5 suggest mixed evidence of model fit. However, the overall weight of the evidence does suggest that the proposed model does explain the relationship between the observed and latent variables. Because of the correlated errors between “state-of-the-art classrooms, labs, library” and “great geographic location,” the interfactor correlation between AE fit and PE fit would likely be somewhat inflated (Asparouhov & Muthen, 2009). The final factor structure model to be used in all subsequent analyses, including coefficients, can be seen in Figure 5 below.

Figure 5

Final Model of Student-Institution Fit for Question 1 with Coefficients



Original model adapted from Gilbreath, Kim, & Nichols, 2011

Table 6 below displays Interfactor correlations for both split samples. The correlation between AE fit and PE fit was the largest correlation using both the sample for the CFA and the path model sample, as was expected given the shared variance between “great geographic location” on the PE fit factor and “state-of-the-art classrooms, labs, library” on the Academic Environment factor. In both samples, all correlations between factors were statistically significant and positive at the $\alpha < 0.05$ level. These results suggest that factors may not be independent, or that a second order factor may be present. Because Gilbreath et al. did not propose a second order overall fit, this study will not assume an overall fit factor for this model. However, future researchers attempting to replicate these results may seek to determine if a second-order fit factor is appropriate.

Table 6
Interfactor Correlations Using CFA and Path Model Samples

	Scale	Academic Environment fit	Social Environment fit	Physical Environment fit
CFA sample	Academic Environment fit	--		
	Social Environment fit	0.57*	--	
	Physical Environment fit	0.58*	0.56*	--
Path Model Sample	Academic Environment fit	--		
	Social Environment fit	0.46*	--	
	Physical Environment fit	0.59*	0.50*	--

* Statistically significant correlation at $\alpha \leq 0.05$.

Cronbach’s alpha calculations for each scale can be found in Table 7 below. The only fit factor which demonstrated acceptable reliability using both the CFA sample and the path model sample was SE fit ($\alpha = 0.71$ in CFA sample, $\alpha = 0.72$ in path model sample). AE fit demonstrated adequate fit after dropping “great school size” when using the CFA sample.

However, these results were not replicated using the sample designated for the path model, either with or without “great school size” included. PE fit did not demonstrate adequate levels of reliability with either sample. The lower degree in internal consistency in the AE fit scale hints at a reduced amount of shared variance between the individual items. As a result, there is likely to be attenuation in the size of the effect between AE fit and each of the dependent variables being measured (Trafimow, 2015).

Table 7

Cronbach’s Alpha for Factors in CFA and Path Model samples

Scale	CFA sample	Path model sample
Academic Environment fit – With school size fit	0.70	0.60
Social Environment fit	0.71	0.72
Physical Environment fit	0.62	0.65

Question 2: What is the Relationship between Student-Institution Fit and Retention, Net the Effect of Background Variables and Nontraditional Student Level?

Correlations between variables used in the path analysis to answer Questions 2, 3, and 4 can be found in Table 8 below. As expected, the correlation between AE fit and PE fit was strong, perhaps due to the shared variance between items on those scales. Correlations between all three fit scales were positive and statistically significant at the $\alpha \leq 0.01$ level, suggesting the possible presence of an overall fit factor. However, because the original Gilbreath et al. model did not include an overall fit factor, an overall factor was not used in these analyses.

Nontraditional level was not significantly correlated with first year retention or any of the other variables. Receipt of a Pell grant was significantly and negatively associated with standardized GPA ($r=-0.18$, $\alpha \leq 0.05$), but significantly and positively associated with nontraditional student

level ($r=0.20$, $\alpha \leq 0.05$). This signifies that students with more nontraditional student characteristics were significantly more likely to have received a Pell grant. Unmet need was significantly and negatively associated with fall-to-fall retention ($r= -0.17$, $\alpha \leq 0.05$) and first semester GPA ($r= -0.30$, $\alpha \leq 0.01$). This conveys that higher levels of unmet need were associated with a lower probability of retention and lower first-term GPA.

Results of the path analysis including the nontraditional level are included in Table 9. R^2 for the ordinary least square portion of the model was 0.23, which means that 23% of the variance in first semester GPA was accounted for using the linear combination of only the GPA students earned prior to entry (ZGPA) and AE fit. The unstandardized coefficient describing the relationship between ZGPA and first fall GPA was 0.42, suggesting that a one standard deviation change in pre-entry GPA would yield a 0.42 change in GPA during the first fall semester. This result was statistically significant at $\alpha \leq 0.05$ level. The unstandardized coefficient describing the relationship between AE fit and first fall GPA was not statistically significant ($B=0.06$, standard error=0.09).

Table 8

Correlations for Items in Path Analyses

Measure	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
First year retention (1)	--								
First Semester GPA (2)	0.38**	--							
Z-score of entry GPA ¹ (3)	0.21*	0.48**	--						
Nontraditional Level (4)	0.07	-0.05	-0.05	--					
Received a Pell Grant (5)	-0.06	-0.16	-0.18*	0.20*	--				
Unmet need ² (6)	-0.17*	-0.30**	-0.16	0.12	0.20*	--			
Academic Environment fit (7)	-0.08	0.05	0.01	0.01	-0.01	0.02	--		
Social Environment fit (8)	-0.16	0.16	0.14	<0.01	-0.09	0.03	0.46**	--	
Physical Environment fit (9)	-0.01	0.13	0.05	-0.02	-0.14	0.12	0.63**	0.49**	--

¹ Z-score of high school GPA (for first-time beginners) and transfer GPA (for transfer students) using means and standard deviations for the entire sample. See Table 2 for high school GPA and transfer GPA means and standard deviations.

² Unmet need divided by \$1,000 to aid in interpretation.

* $p \leq 0.05$

** $p \leq 0.01$

McFadden's R^2 was used to assess the goodness of fit for the logistic regression portion of the path model. This measure provides an explanation of the reduction in poorness of fit rather than the amount of variance accounted for by the linear combination of the independent variables (McFadden, 1974). McFadden's R^2 for the logistic regression portion of the model was 0.22. First fall GPA had a significant effect on fall-to-fall retention, net the effect of nontraditional characteristics and all three fit scales. A one grade letter change in GPA during the first fall semester would be associated with a 4.05 times change in the odds. In other words, a student with a 4.0 GPA would be expected to have 4.05 times the odds of being retained the following fall compared to a student who had earned a 3.0 GPA. Of the fit variables, only SE fit was found to have a significant effect on fall-to-fall retention net the effect of the other independent variables. The odds ratio is 0.39, which means that a one unit increase in the degree of misfit between students' self-reported social needs and their perception of the degree to which IUPUI meets those needs would lead to a decrease in the odds of being retained the following fall. Contrary to the initial prediction, the effect of the number of nontraditional student characteristics was not statistically significant net the effect of the other independent variables ($B=1.20$, standard error=2.21, odds ratio=3.30). The relatively large standard error hints that variability in nontraditional student characteristics would decrease the likelihood in identifying a significant relationship. At the same time, the relatively large skewness for the nontraditional scale in the path model sample (see Table 3) would suggest that Type I error would be more likely to occur with this item. The data therefore suggest that there is no direct effect of the nontraditional student score on retention net the combination of the independent variables.

Table 9

Results of Path Analysis Using Nontraditional Student Characteristics

	B	β	Standard Error	Odds Ratio
Direct effect on first fall GPA				
ZGPA ^{1*}	0.42	0.48	0.08	
Academic Environment fit	0.06	0.04	0.09	
Direct effect on fall-to-fall retention				
First fall GPA*	1.40	0.48	0.47	4.05
Nontraditional student characteristics	1.20	0.51	2.21	3.30
Academic Environment fit	-0.42	-0.18	0.54	0.66
Social Environment fit*	-0.94	-0.40	0.42	0.39
Physical Environment fit	0.64	0.27	0.61	1.89

R² for first semester GPA = 0.26; McFadden's R² for fall-to-fall retention = 0.22

¹ Z-score of high school GPA (for first-time beginners) and transfer GPA (for transfer students) using means and standard deviations for the entire sample. See Table 2 for high school GPA and transfer GPA means and standard deviations.

* Effect was statistically significant at $\alpha \leq 0.05$

Question 3: What is the Relationship between Student-Institution Fit and Retention, Net the Effect of Background Variables and Factors Associated with Low SES?

R² for the OLS portion of the model was 0.26, suggesting that the linear combination of entry GPA and AE fit accounted for about 26% of the variance in the model. Once again, ZGPA was the only variable that had a statistically significant relationship with first fall GPA. The unstandardized coefficient was 0.48, which means that a one standard deviation change in pre-entry GPA would yield a 0.48 change in GPA in the first fall semester.

McFadden's R² for the logistic regression portion of the path model was 0.22. The only variable found to have a statistically significant relationship with fall-to-fall retention was GPA in the first fall semester. Results of this analysis suggest that a one-unit increase in GPA (i.e. from a "B" to an "A") would yield 3.61 times greater odds of being retained the following fall. Unlike the analysis using nontraditional characteristics, none of the fit scales were significantly associated with fall-to-fall retention net the effect of the other independent variables. SE fit (B=-0.72, standard error =0.41, odds ratio=0.49), which had a significant and negative relationship with retention net the effect of nontraditional characteristics, did not have a significant effect when receipt of a Pell grant and level of unmet need were

included in the model. That said, neither unmet need ($B=-0.04$, standard error=0.05, odds ratio=0.96) nor receipt of a Pell grant ($B=-0.20$, standard error=0.66, odds ratio=0.82) had a statistically significant effect on fall-to-fall retention in this analysis.

Table 10

Results of Path Analysis using Low SES Variables

	B	β	Standard Error	Odds Ratio
Direct effect on first fall GPA				
ZGPA ^{1*}	0.48	0.52	0.08	
Academic Environment fit	0.03	0.02	0.09	
Direct effect on fall-to-fall retention				
First fall GPA*	1.28	0.49	0.40	3.61
Received Pell grant	-0.20	-0.09	0.66	0.82
Unmet financial need ²	-0.04	-0.11	0.05	0.96
Academic Environment fit	-0.20	-0.06	0.56	0.82
Social Environment fit	-0.72	-0.27	0.40	0.49
Physical Environment fit	0.33	0.11	0.60	1.39

R^2 for first semester GPA = 0.26; McFadden's R^2 for fall-to-fall retention = 0.22

¹ Z-score of high school GPA and transfer GPA

² Unmet need divided by \$1,000 to aid in interpretation

* Effect was statistically significant at $\alpha \leq 0.05$

Question 4: What is the Relationship between Student-Institution Fit and Retention, Net the Effect of Background Variables, Nontraditional Student Level, and Factors Associated with Low SES?

To answer Question 4, all variables used to represent nontraditional student level and low SES were included. Results of the path analysis for Question 4 can be found in Table 13 below. The R^2 for the first portion of the path model 0.26. As in previous iterations, ZGPA had a statistically significant effect on GPA in the first fall semester ($B=0.45$, standard error=0.08), while AE fit did not have an effect.

McFadden's R^2 for the fall-to-fall retention portion of the model was 0.23. Once again, first fall GPA was the only variable with a statistically significant effect on fall-to-fall retention net the effect of the other independent variables ($B=1.29$, standard error=0.51, odds ratio=3.64). As with Question 3, SE fit ($B=-0.77$, standard error =0.45, odds ratio=0.46) did not have a significant effect when receipt of a Pell grant, level of unmet need, and nontraditional student characteristics were all included in the model.

Nontraditional student scale once again did not have a statistically significant effect ($B=1.11$, standard error=2.32), though the relatively large odds ratio (3.03) once again suggests that an effect may have been observed had more survey respondents indicated that they possessed nontraditional student characteristics. However, the increase likelihood of a false positive due to the skewness of the nontraditional scale again suggests that no effect is present. Neither receipt of a Pell grant ($B=-0.27$, standard error=0.66, odds ratio=0.76) nor unmet financial need ($B=-0.04$, standard error=0.06, odds ratio = 0.96) were statistically significant net the effect of the other independent variables.

Table 11

Results of Path Analysis using Nontraditional Student Characteristics and Finance Variables

	B	β	Standard Error	Odds Ratio
Direct effect on first fall GPA				
ZGPA ^{1*}	0.45	0.50	0.08	
Academic Environment fit	0.05	0.04	0.09	
Direct effect on fall-to-fall retention				
First fall GPA*	1.29	0.46	0.51	3.64
Nontraditional student characteristics	1.11	0.49	2.32	3.03
Received Pell grant	-0.27	-0.12	0.66	0.76
Unmet financial need ²	-0.04	-0.02	0.06	0.96
Academic Environment fit	-0.32	-0.14	0.61	0.73
Social Environment fit	-0.77	-0.34	0.45	0.46
Physical Environment fit	0.55	0.24	0.74	1.74

R^2 for first semester GPA = 0.26; McFadden's R^2 for fall-to-fall retention = 0.23

¹ Z-score of high school GPA and transfer GPA

² Unmet need divided by \$1,000 to aid in interpretation

* Effect was statistically significant at $\alpha \leq 0.05$

CHAPTER 5

DISCUSSION

Factor Structure of the Gilbreath, Kim, and Nichols Model of Student-Institution Fit

Results from these analyses provide evidence that modifications to the original model proposed by Gilbreath et al. (2011) are necessary. The most noteworthy change would be the move of “great support services” from the SE fit to AE fit. This finding is not consistent with the original principal axis factor analysis results obtained in Gilbreath et al.’s study, on which “great support services” clearly loaded alongside other items pertaining to non-academic aspects of the institution. However, unlike other items on this scale, “great support services” refers directly to services provided by the university that may be related to the academic experience, while the remaining items are explicitly non-academic in nature. Other measures of fit, such as Bowman and Denson’s (2014) student-institution fit model and Anthony’s (2011) factors of Academic Environment press generally do not explore the role of support services.

Nonetheless, some theorists have speculated that academic support services play some role in facilitating student retention and other positive outcomes. Tinto (2012) mentions that support services can help not only by enhancing students’ academic skills but also by enhancing connections to their institutions’ academic and social context. Likewise, Strayhorn (2012) advocated for the importance of mattering, which is defined as a sense that an individual is appreciated by someone at their institution. This feeling of mattering could come from a variety of different sources, including faculty or academic support staff. Neither Tinto nor Strayhorn were explicitly speaking of student-institution fit, though the types of support each mentioned would typically come from an academic rather than explicitly social context. The results from

the present study do seem to indicate that the support services provided at IUPUI as best conceptualized as academic rather than explicitly social.

Though the model obtained through analysis of Question 1 did present an adequate match for the data obtained, it is noteworthy that only the SE fit scale demonstrated adequate reliability using both the sample for the CFA analysis and the sample for the path models. The findings of low reliability for the PE fit factor are ultimately not surprising. In the original Gilbreath et al. (2011) study, neither Physical Environment need nor Physical Environment supply reached an acceptable level of reliability ($\alpha = 0.54$ for Physical Environment need and 0.59 for Physical Environment supply). The authors only continued to use this scale in subsequent analyses because high scores obtained from students completing the Physical Environment need scale suggested that students placed a great deal of importance on the physical environment. Similarly, Denson and Bowman (2015) found the reliability of their PE fit scale to be inadequate for future analysis and removed it from their final instrument in the Australian study. When using an American sample, Bowman and Denson (2014) obtained a Cronbach's alpha estimate of 0.65 for their PE fit scale. This estimate is lower than might be deemed acceptable in most research, but it was deemed acceptable by the authors since the items used in the fit scale included measurement error from two survey items rather than one. The weight of the evidence suggests that an adequate scale measuring higher education students' perceptions of PE fit has not yet been developed.

The results for AE fit are more inconclusive. Despite a properly fitting model and an appropriate level of internal reliability obtained from the CFA sample, the relatively low alpha obtained from the path model sample suggests that the academic model fit scale had poor internal consistency. Low levels of shared variance between items on the AE fit scale may have

attenuated the effect on both first semester GPA and of student retention (Trafimow, 2015). Further study is clearly necessary to determine if this measure of AE fit is appropriate or if another measure would be more useful.

It is worth noting that the high interfactor correlations between the three factors point toward the presence of an overall fit factor. The possibility of an overall factor was not explored in this analysis, as Gilbreath et al. (2011) did not propose the presence of overall fit factor in their original study. Denson and Bowman (2015) proposed a multidimensional fit structure but did find adequate support for an overall fit scale. However, the SUM measure developed by Wintre et al. (2008) proposed that a single overall measure of fit would be appropriate. More research into the structure of fit, including the possibility of an overall fit factor within the Gilbreath et al. model, may be appropriate.

Another possibility is that current measures of student-institution fit may give insufficient consideration of the importance of needs. The Gilbreath et.al instrument measure used in this study considered the match between the extent to which students' needs match the perceived supplies provided by the institution. However, there was no opportunity to consider whether or not meeting this need would be helpful in retaining the student. Furthermore, the scale weighted unimportant needs at the same level as important needs. For example, a student may have rated their need for "a great student body" as a "4" and rated the subsequent supplies as a "4" as well. That same student may have then rated "great support services" as a 7 and rated the subsequent supplies as a "7" as well. The fit for both items would have been calculated the same, when in actuality "great support services" are much more important to this student. Fit measures may prove more useful if only the most important needs are not being met, rather than treating all needs as equal.

Finally, the results from the first research analyses may suggest that fit as proposed by Gilbreath et al. may be underdeveloped. Messick (1995) outlined six aspects that should be considered when assessing the validity of any construct. These would include the content, substantive, structural, generalizability, external, and consequential aspects of construct validity. The results of these analyses suggest low reliability for the PE fit scale, which call into question the substantive aspects of fit. Likewise, the possibility of an overarching fit factor call into question the structure of fit proposed by Gilbreath et al. Difficulty in measuring abstract constructs may be one reason higher education researchers began turning to measures of engagement, such as NSSE, which are designed to be self-reports of more easily measurable student behaviors. Further evidence of validity should be obtained before fit measures are used more extensively in higher education research.

The Relationship between Fit and Retention Net the Effect of Nontraditional Student Level

Contrary to expectations, the nontraditional student measure developed by Horn and Carroll (1996) did not have a significant effect on fall-to-fall retention in either the first path model, which included GPA and the three fit scales, or in the third path model in which Pell status and unmet financial need were added. The nontraditional student scale was highly skewed, which would actually suggest an increased chance that a statistically significant effect could be found.

One possible reason that no significant effect was found could be because first-semester GPA is suppressing the effect of other variables in the model. However, this finding could also be accounted for by the relatively low numbers of students with any nontraditional student characteristics in this study, as only 62 participants in this study had any nontraditional student characteristics. Nonetheless, using data from the same institution at which this study was

conducted, Lin, Fewell, and Graunke (2017) found that the interaction between being over 25 years of age and students' score on a modified version of the Horn and Carroll scale had a statistically significant effect on retention net the effect of ethnicity, pre-entry GPA, first generation status, unmet need, and receipt of a Pell grant. The modified scale in this study included data from 4,080 students, of whom 687 had at least one nontraditional characteristic. Furthermore, descriptive data reported from NCES continues to show large differences in degree completion and persistence from students who complete the Beginning Postsecondary Students Longitudinal Study (Skomsvold et al., 2011). Though the results of this study do not suggest that nontraditional student score obtained using the Horn and Carroll scale would have an effect on student retention, a sample that included data from students with more nontraditional student characteristics may have yielded different results.

Another possibility could be that the model defining the relationship between student-institution fit and retention could be different for nontraditional students. Kasworm and Pike (1994) used multiple-group analyses to determine that a model designed to explain factors affecting GPA for students who were under 25 years of age was not an appropriate fit using data from students who were 25 years of age or older. The small number of students with any nontraditional characteristics makes similar analysis difficult with the data collected for the present study. However, subsequent research using a larger nontraditional sample could use a multiple-group analysis approach.

Results from analysis of Question 2 suggest a significant negative relationship between misfit with the social environment and retention net the effect on nontraditional student characteristics. In other words, students who reported higher degree of misfit with IUPUI were less likely to be retained even net the effect first-term GPA and nontraditional characteristics.

This finding would not be anticipated given the existing literature. Bean and Metzner (1985) did not include any elements of the social environment in their model of nontraditional student attrition. Nontraditional students were hypothesized to have fewer interactions with faculty and other students and would therefore have fewer opportunities to become socialized, thus yielding less influence from the social environment. Braxton et al. (2004) explicitly excluded the social environment from their model of student retention at commuter institutions, stating that the evidence supporting the inclusion of Tinto's concept of social integration would be modest at best. However, Braxton et al. do state that students with a high need for affiliation may depart a commuter institution, as the lack of a social environment could cause a student with a high need for affiliation to depart and find an institution where that need could be better met. The relationship between need for affiliation and person-environment fit has not been well studied in the higher education literature. However, it is not difficult to speculate that a student with a high need for affiliation might also find that a commuter institution does not have the supply to meet their need for an "enjoyable social life" or a "great student body," both of which are items on the SE fit scale. Data regarding a students' need for affiliation was not collected as part of this study. However, the relationship between need for affiliation and SE fit should be studied in more depth. It is possible that the effect of a students' need for affiliation on retention may be moderated by perceived fit with the social environment.

The Relationship between Fit and Retention Net the Effect of Low SES

Neither receipt of a Pell grant nor level of unmet financial need had a significant effect on retention net the effect of GPA and the three student-institution fit scales. This finding is different than Cabrera et al. (1990), who found that students' self-reported ability to pay did have an effect on persistence net the effect psychological variables and institutional characteristics.

Again, first-semester GPA may be suppressing the effect of other variables in the model.

However, numerous retention theories, including Bean and Metzner (1985), Tinto (1993), and Braxton et al. (2004) have all postulated that students' finances may all have an effect on retention, though that effect may be indirect or moderated by other variables.

Equally noteworthy was the fact that the effect of SE fit on retention was no longer statistically significant once variables associated with finances were included in the model. The regression coefficient for the effect of SE fit on retention as well as the standard errors described in Table 12.

Table 12

Regression Coefficients, Standard Errors and Odds Ratios for Social Environment Fit
Across Three Path Analyses ¹

	B	β	Standard Error	Odds Ratio
First path analysis: Social Environment fit ²	-0.94	-0.40	0.42	0.39
Second path analysis: Social Environment fit ³	-0.72	-0.27	0.40	0.49
Third path analysis: Social Environment fit ⁴	-0.77	-0.34	0.45	0.46

¹ All path models included z-score of pre-entry GPA, first fall GPA, Academic Environment fit, Social Environment fit, and Physical Environment fit.

² In addition to variables noted in footnote 1, first path model included nontraditional student characteristics. Effect in this model was statistically significant at $\alpha \leq 0.05$. See Table 9 for more details.

³ In addition to those mentioned in footnote 1, second path model includes receipt of a Pell grant, and unmet financial need. See Table 10 for more details.

⁴ In addition to those mentioned in footnote 1, third path model includes nontraditional student characteristics, receipt of a Pell grant, and unmet financial need. See Table 11 for more details.

Such a change would be expected when additional independent variables are added to a model and the new variables are correlated with either the original independent variables or the outcome. In this case, level of unmet need had a statistically significant and negative correlation with retention. (For retention and unmet need $p = -0.17$, which was statistically significant at $\alpha < 0.05$.) SE fit was not significantly correlated with unmet financial need ($p = 0.03$), or with receipt of a Pell grant ($p = -0.09$).

In citing examples of how institutions might use student-institution fit instruments, Bowman and Denson (2014) suggest that student-institution fit could possibly be a mediator in the relationship between demographic variables and desirable outcomes for students from low SES backgrounds. Similarly, Rubin's (2012) meta-analysis found a relationship between socioeconomic status and a variety of measures of social integration, though fit was not included in the analysis. The results of the present study find that such an effect may not be observed at IUPUI. Tinto (1993) was explicit in mentioning that the relationship between student finances and retention was not well understood. The results of this study do not point toward a relationship between low SES status and student-institution fit, and the nature of that relationship remains unclear.

It should be noted that the institution at which these analyses took place, IUPUI, does have robust support systems for low SES students, including advising and mentoring through the 21st Century Scholars support program, Nina Scholars program, and the Student Support Services program that provides services for TRIO students (University College, n.d.). These programs have been shown to be effective in facilitating student success at IUPUI. For example, among 21st Century Scholars grant recipients who started at IUPUI in either 2013 or 2014, students who participated in either the peer mentoring or Summer Bridge programs associated with the IUPUI 21st Century Scholars program were more likely to be retained than non-participants. This was true even net the effect of high school GPA, standardized test score, and unmet financial need (Institutional Research and Decision Support, n.d.). Perhaps these programs also help low SES students' meet social needs as well. Further exploration into the social impacts of support service programs at IUPUI would be helpful in understanding these effects.

These results could also be the result of incomplete measures of low SES. Receipt of a Pell grant is an indicator of income more than social class. Likewise, unmet financial need takes into account programs such as Pell. As a result, the students with the highest levels of unmet need may be students from families with income levels just above the level to qualify for certain financial aid programs. Neither of these indicators provide a good indicator of the cultural effects of low SES, which Borrego (2007) highlighted as meaningful. Including more comprehensive measures of low SES along with indicators of fit could perhaps yield different results.

Additional Findings

As in Metzner and Bean's (1987) original examination of the Bean and Metzner (1985) model, GPA in the first semester proved to have the strongest effect on student persistence. In the path analysis models designed to assess Questions 2, 3, and 4, GPA in the first semester was assumed to be effected by standardized GPA and fit with the academic environment. However, in all three models, the effect of AE fit on first semester GPA was not significant net the effect of standardized GPA. One possible explanation could be that standardized GPA is suppressing the effect of AE fit in the model. Another possible explanation could be related to the internal reliability of the AE fit scale. Cronbach's alpha for the AE fit scale in the path analysis sample was relatively low ($\alpha=0.60$), indicating a small amount of shared variance between items in the scale. Coefficients in correlational research can often be attenuated when reliability estimates are relatively low (Trafimow, 2015). As a result, it is possible that the low reliability of the AE fit scale may have attenuated the relationship between AE fit and first semester GPA. Further exploration into the reliability of the AE fit scale is likely necessary, given the inconsistent reliability estimates obtained between the two divided samples in this study.

Implications

Implications for Research

The study has several implications for researchers, the first being the need to continue to develop instruments to assess student-institution fit. While the data obtained from a sample of students at IUPUI did prove to be an adequate fit for an adjusted student-institution fit model, the low reliability estimates from Cronbach's alpha suggest that the AE fit and PE fit scales may have limited utility at this institution. Given the low reliability estimates, new AE fit and PE fit scales should be developed. Aspects from Bowman and Denson's (2014) socioeconomic or political fit scales could perhaps be used in conjunction with aspects of the Gilbreath et al. scale to form a student-institution fit scale with greater shared variance yielding higher reliability estimates. The development of a more reliable fit scale could benefit researchers looking to study the impacts of student-institution fit as well as staff and administrators within higher education institutions who might use student-institution fit to identify students who are struggling to find adequate fit.

The question of whether a single, overall fit factor exists is useful to answer as well. Interfactor correlations obtained from data in this study do suggest that the three fit scales may not be independent or that a second order factor may explain the data obtained from the IUPUI sample. The SUM scale conceptualized by Wintre et al. (2008) conceptualized fit as a single construct consisting of four separate dimensions that do not represent distinct scale. Similarly, Denson and Bowman (2015) tested both a multiple factor model and a model with a second order student-institution fit factor, and they found both models to be an adequate fit for data obtained from an Australian University. Part of the continuing research to identify an adequate student-

institution model fit should also include an exploration for the presence of a second-order factor describing an overall level of fit, which may prove useful in further student-institution fit studies.

Further investigation could also explore the relationship between affiliation needs and SE fit as it pertains to retention in commuter institutions. Data on students' affiliation needs were not collected in this study, though Braxton et al. (2004) hypothesize that students with a high need for affiliation attending commuter institutions may depart to seek an environment where they might find a greater connection with other students. The present study was conducted at an institution where only 9.3% of undergraduate students were living in college owned, operated, or affiliated housing, so a designation as a commuter institution would be appropriate (University Institutional Research and Reporting, 2015). The finding of a relationship between SE fit and retention in the analysis of Question 2 is therefore surprising. Additional research using the Braxton et al. (2004) model of retention for commuter students should consider the possibility of a moderating effect of SE fit.

Another of the gaps in previous research on student-institution fit was the lack of studies exploring the direct relationship between fit and retention. Specifically, both Bowman and Denson (2014) and Denson and Bowman (2015) found that student-institution fit may have an indirect relationship on students' intention to persist despite the fact that Bean and Eaton (2000, 2001) propose that student-institution fit would have a direct relationship. Furthermore, existing studies of student-institution fit have only explored students' self-reported intentions to persist rather than actual behavior. The results from these analyses suggest the presence of a direct relationship between only SE fit and persistence, and only when receipt of a Pell grant and unmet financial need were not included in the model. These results do find support for the conclusions of Bowman and Denson and Denson and Bowman over the original Bean and Eaton model.

Future researchers who wish to include student-institution fit in a model of retention should consider an indirect effect of student-institution fit, perhaps mediated by satisfaction or college adjustment as proposed by Bowman and Denson. The relationship between student-institution fit and factors associated with low SES should also be considered in future studies.

Finally, future researchers may also explore the relationship between nontraditional status and retention. Kasworm and Pike (1994) used a sample of students 25 years of age or older to test three different path models originally developed to explain factors effecting the grades of students 24 years of age or younger. Using a combination of chi-square and TLI, they found that none of the three models tested were an appropriate fit for the data collected. The Kasworm and Pike study conceptualized nontraditional status in terms of age and advocated that different models be developed for older and younger students to understand grades. However, given the possibility that younger students may also display several nontraditional characteristics, it may be more appropriate to consider that nontraditional status moderates the effect of student-institution fit on retention. Because Evans and Lepore (1997) advised that the number of cases be relatively equal across levels of the moderator, the relatively small number of students reporting any nontraditional characteristics in the path model sample would have made it difficult to assess for moderating effects in this study. Researchers who are able to obtain a larger sample of students with nontraditional characteristics might explore whether or not nontraditional status has a moderating effect.

Implications for Practice

The results of this study have implications for higher education professionals working in multiple capacities throughout campus, especially for institutional researchers. Volkwein (2008, 2011) described the “golden triangle” as model for understanding the role of institutional

research, with three legs describing institutional reporting and policy analysis; planning and budgeting; and assessment, effectiveness, and accreditation. The results of the present study have implications for all three legs of this golden triangle.

One useful result of this study concerns the use of Horn and Carroll's (1996) nontraditional student scale in retention research. Though NCES has used this measure for years in the analysis of policies for nontraditional students and reporting of educational attainment outcomes, there is little indication that institutions have broadly adopted this measure to develop or assess their own policies surrounding nontraditional students. Frequently, institutions instead focus on measures such as age rather than taking a more comprehensive view of the factors that may define a nontraditional student (Lin et al., 2017). While the current study did not yield support for a direct effect of nontraditional level on student persistence, additional studies, such as Lin et al., tout that the scale may be useful in retention research when combined with age and other indicators.

Unfortunately, not every institution may have the data available to replicate these analyses. The present study used a survey to collect data on the number of hours worked via self-report, which could be problematic given declining response rates. Additional data points included in the nontraditional student scale, such as marital status or number of dependents, could be obtained from information students provide as part of the FAFSA. However, following guidance from the National Association of Student Financial Aid Administrators and Cooley Higher Education (2017), many institutions have strictly limited the use of FAFSA data in policy analysis and retention studies, to the detriment of students who might benefit from findings. Researchers looking to use the Horn and Carroll scale in the assessment of policies related to nontraditional students should work closely with financial aid professionals to make sure that

data is used in ways that are consistent with both federal guidelines as well as internal university policies. Once relevant data sharing agreements have been made, institutional researchers should work to find better methods of collecting data on off-campus employment and other variables associated with the Horn and Carroll scale.

Bowman and Denson (2014) also mentioned that institutional research professionals could use a student-institution fit instrument as an early indicator that students may be at risk of departure. Existing early warning systems are limited in that they only suggest which variables are related to retention, not why these variables might be important. If fit had been found to be related to retention when measured after the first three weeks, the results could have been used to develop more effective interventions than can be developed using data from existing early warning instruments. Results from the current study make that claim much more questionable. For one, the dynamic nature of fit complicates the timing of the administration of any student-institution fit instrument (Kristoff-Brown & Jansen, 2007). This study followed guidance from Woosley and Miller (2009) to administer the fit instrument early in their first semester. However, the present study did not find evidence that a student-institution fit instrument could identify students with low levels of fit who are at risk of departure, net the effect of first semester GPA and factors associated with nontraditional student status. Contrary to the suggestions of Bowman and Denson (2014) and Denson and Bowman (2015), the results of these analyses clearly call into question the use of student-institution fit as a method for identifying students at-risk of departure. Practitioners should find other methods for identifying at risk students.

Finally, the results of the present study suggest a need for further analysis into the effects of programs for low SES students. Institutional researchers frequently engage in program review activities as part of the assessment function of institutional research (Volkwein, 2008). Results

from Pearson correlations calculated as part of this study suggest that the relationship between receipt of a Pell grant and SE fit, while not statistically significant, was nonetheless large enough that the effect of SE fit on retention was no longer statistically significant. There are several possible explanations for this finding. For example, if students from low SES backgrounds have lower levels of need from the social environment, the supplies necessary to meet that need would be low (Kristoff-Brown & Jansen, 2007). However, it is also possible that programming provided to low SES students provides sufficient supplies to meet both academic and social needs. Comprehensive evaluation of programs for low SES students could reveal both academic and social benefits, as well as costs and effectiveness of these programs (Fitzpatrick, Sanders, & Worthen, 2011). A better understanding of programs for low SES students could provide additional knowledge about the relationship between student-institution fit and low SES.

Limitations

This study had several important limitations that may have affected the results. The first is that student-institution fit in this study was only measured at one point in time, early in the first semester after arrival at the institution. As Kristoff-Brown and Jansen (2007) note, a person's relationship to an organization, such as students' relationship to their institution, changes as needs and surrounding environments continue to evolve. In the proposed study, fit is only measured in one instance, in the first half of the first fall semester, shortly after classes have begun. Students' needs could certainly change after the administration of the survey. For example, taking a new job or incurring more family responsibilities may require more flexibility in course scheduling or greater availability of support services. In addition, changes in university policies may have affected students' subsequent enrollment decisions. For example, after the administration of this survey, a decision was made by IUPUI administration to implement

“banded tuition,” a policy in which students would pay the same tuition rate for between 12 and 18 credit hours per semester (Office of the Bursar, 2016). While this policy encouraged enrollment in more credit hours for some students, it may have also caused some students who do not have the time or resources to enroll in more credit hours to find an institution more suitable to their needs.

That said, the time period in which student-institution fit was measured is a critical period. Woosley and Miller (2009) found that both academic integration and institutional commitment measured in the first three weeks of students’ first fall semester had a significant effect on retention to the following fall semester, net the effect of standardized test score and other pre-entry characteristics. These findings were similar to Graunke, Woosley, and Helms (2005), who found that commitment to a specific institution, commitment to completing a Bachelor’s degree, and commitment to a specific major had a statistically significant effect on degree completion within six years, even when measured shortly after the first three weeks of their first semester. In fact, a higher level of commitment to the major at three weeks was actually negatively associated with six-year degree completion, net the effect of institutional commitment and commitment to a Bachelor’s degree. These studies suggest that, although a students’ relationship to their institution may be fluid, information collected during the first few weeks could be valuable for identifying students at risk for departure. Second, Offenstein, Moore, and Shulock (2010) argue that information on students’ progress toward a degree must be timely in order for institutional leaders to take appropriate action. If student-institution fit data could be used as an indicator for potential intervention, as Bowman and Denson (2014) advocate, then collecting information early during the first semester could enable student affairs and academic staff to find and intervene with students who may be struggling to connect early on.

However, the current study did not find evidence that the student-institution fit instrument used in these analyses, as currently constructed, would be useful as an early warning indicator. Perhaps then fit would be most effective as an indicator of retention right at the moment that a student decides to depart their institution. Since this moment is difficult to identify, fit may have limited utility when used as part of an early warning system.

A second limitation concerns the nature of needs-supplies fit. Gilbreath et al. used a quadratic regression equation to study the effect of student-institution fit on satisfaction and psychological well-being as students' ratings of supplies approach ratings of their needs. Their findings suggest that both satisfaction and psychological well-being increased as ratings for supplies met ratings for needs, but increased at a decreasing rate when ratings for supplies exceeded ratings for needs. These results suggest that the impact of student-institution fit on retention may differ if supplies exceed needs or if needs exceed supplies. However, in their studies, Bowman and Denson (2014) and Denson and Bowman (2015) only explored the magnitude of fit. This study only assessed magnitude of need, though as noted previously the relationship between needs and supplies may be important to consider, especially regarding the most important needs. Future researchers are encouraged to use the Gilbreath et al. instrument to see if the impact of student-institution fit differs when needs exceed supplies or supplies exceed needs.

Third, as with any survey effort, data may have been influenced by survey nonresponse. Of additional concern for this survey may be characteristics associated with nonresponse. In one study at a university in the Midwest, Rogelberg et al. (2003) found that active nonrespondents, those who intentionally decided not to participate in the survey, were more likely to be dissatisfied with their institution compared to participants. This is problematic given past studies

which have demonstrated a link between satisfaction and subsequent retention (Schreiner & Nelson, 2013). Similarly, passive nonrespondents, who indicate that they did not intend to forgo the survey but ultimately did not respond, were more likely to live off-campus compared to students who did respond. Some studies, including Metzger and Bean (1987) have used living off-campus as a variable to determine nontraditional student status. If true of this response set, both active and passive nonresponse could have introduced response bias into these analyses. Satisfaction and campus housing were not assessed to answer these research questions, so it is not known if there were significant differences between respondents and non respondents on these characteristics. That said, subsequent research by Rogelberg, Spitzmüller, Little, and Reeve (2006) demonstrated that satisfaction accounted for only about 6% of the variance in survey response behavior, an amount the authors considered negligible. As a result, even if differences existed between passive nonrespondents and respondents in place of residence, it would appear to be unlikely to affect the results of these analyses. Future researchers may explore the impact of survey nonresponse on retention research, especially as questionnaires become an increasingly popular data collection strategy.

Comparisons between respondents and the full sample were found in Tables 1 and 2 in Chapter 3. While there were differences between respondents and the full sample in terms of percentage of part-time students, high school GPA, and first-term GPA, these differences were not found to be great enough to warrant the need for adjustments.

A fourth limitation could stem from the method for calculating pre-entry GPA for transfer students. A study of IUPUI transfer students revealed that students who transfer to IUPUI from community colleges have a higher mean transfer GPA than students who transfer from four-year institutions (Graunke, Hansen, Rauch, & Wright, 2015). It may then have been

appropriate to develop separate standardized scores for students transferring from four-year institutions and from community colleges. Doing so may have produced more accurate estimates of the effect of pre-entry GPA on retention.

Fifth, other considerations of fit may have been appropriate. For example, Borden (1987) argued for the importance of normative congruence in conceptualizing students' connection to their institution. Normative congruence, first conceptualized by Spady (1971), refers to the similarity between students' individual perceptions and the dominant perceptions of other students at the same institution. In practice, this could be found by assessing the difference between a student's score on a particular measure and the population average. This differs from needs-supply fit in that normative congruence provides a measure of actual reported norms rather than students' perception of what the environment supplies. While students' congruence with the norms of other students attending their institution may have an effect on student retention and success, there is little literature advising how such a model might be conceptualized. Future research may explore the relationship between normative congruence and retention.

The present study also did not include the consideration of race as it is related to fit. Guiffrida (2006) proposed that the term "connection" should be used when assessing the relationship between students of color and predominantly white institutions, as many students of color seek to maintain connections to their home communities while simultaneously forming connections to their institution. Furthermore, Strayhorn (2017) stressed the importance of considering intersectionality in higher education research. Intersectionality in this instance would recognize that privilege or oppression associated with a variety of different social identities may interact to cause certain outcomes. In the case of this study, race may interact with nontraditional student status or low SES to inhibit students' level of fit within an institution. Future researchers

exploring the relationship between student-institution fit and retention should seek to include race in their models in order to better understand this important relationship.

It should be noted, however, that neither normative congruence nor variables associated with race could be included given the low number of usable responses in this study. Using a decision rule of 5 responses per freely estimated parameter, the 175 responses collected from the present survey were sufficient for the models used in these analyses but would not be appropriate for more comprehensive models. Declining survey response rates have caused institutions to explore alternative methods for deploying surveys, including greater emphasis on survey panels (Sarraf, Hurtado, Houlemarde, & Wang, 2016). If researchers continue to develop better instruments to assess levels of student-institution fit or explore the relationship between student-institution fit and retention, they will need to develop data collection strategies that yield more usable responses from students for analysis purposes.

Finally, as previously noted, it is possible that programming at the institution studied may have been a factor influencing the result of the third and fourth path models. In other words, programming for low SES students provided by IUPUI may have provided sufficient supply to meet the Social Environment needs of low SES students. IUPUI provides a number of programs that offer both academic and social support for low SES students. The 21st Century Scholars Success Program offers peer mentoring, success coaching, and various other events for students who qualify for Indiana's 21st Century Scholarship (IUPUI, 2018). Likewise, IUPUI also has Student Support Services, a TRIO program that provides academic advising, financial aid counseling, tutoring, and mentoring for first generation students (University College, n.d.). The presence of these and other services on campus may have attenuated the effects of student-

institution fit on retention obtained in the present study. This study may be repeated at other campuses to determine if the effects are similar.

Conclusion

Existing research left several gaps in the understanding of the relationship between student-institution fit and retention. Specifically, the relationship between nontraditional student characteristics, low SES, student-institution fit, and retention had not previously been explored. A measure of student-institution fit initially proposed by Gilbreath et al. was first modified based on the results of two confirmatory factor analyses. Then, using the Horn and Carroll nontraditional student scale, the present study did find a relationship between SE fit and retention, net the effect of nontraditional status and first-term GPA. However, neither SE fit nor AE fit or PE fit had a significant effect on retention when receipt of a Pell grant and amount of unmet financial need were included in the structural equation model. The results of this study provide information for both higher education researchers seeking to further explore the effect of student-institution fit as well as institutional researchers hoping to understand the factors affecting the success of nontraditional students and students from low SES backgrounds at their institution. Continued study of student-institution fit, nontraditional level, low SES, and the effect of these factors on student success could lead to enhanced success and degree completion for many students.

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*Appendix A:**Student-Institution Fit scale*

Item	Need Reliability ¹	Supply Reliability ¹
Academic Environment fit	0.59	0.72
A1 A scholarly/intellectual campus climate		
A2 State-of-the-art classrooms, labs, library		
A3 A highly regarded academic reputation		
A4 Great school size		
Social Environment fit	0.80	0.79
S1 Enjoyable social life		
S2 Sports and recreational opportunities		
S3 Great student body		
S4 A highly regarded athletic reputation		
S5 Great support services (e.g. academic counseling, health care, and placement center)		
S6 Great non-academic facilities (e.g. gyms, dining, and game room)		
S7 A diverse student body		
Physical Environment fit	0.54	0.62
P1 Great geographic location		
P2 A safe environment		
P3 A pleasing physical environment (aesthetics)		
P4 Convenient campus lay-out		
P5 Great affordability		

Notes: Adapted from Gilbreath, Kim, & Nichols (2011). ¹ Cronbach alpha estimates obtained from Gilbreath, Kim, & Nichols (2011)

Appendix B

Full Student-Institution Fit Survey

7/12/2016

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Fit items

S/S.

IRB STUDY #1506071694

INDIANA UNIVERSITY STUDY INFORMATION SHEET FOR IUPUI Student-Institution Fit Survey

You are invited to participate in a research study to determine if the fit between IUPUI students and IUPUI may affect persistence into the next fall semester. You were selected as a possible subject because this is your first semester at IUPUI, and we are attempting to assess the extent to which you are fitting in on campus. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

The study is being conducted by Steven Graunke with the Office of Student Data, Analysis, and Evaluation at IUPUI under the supervision of Gary Pike with the Indiana University School of Education. It is not funded.

STUDY PURPOSE

The purpose of this study is to determine if student-institution fit has an effect on first-year students returning to IUPUI net the effect of external commitments and unmet financial need. These data will be used to improve the ability of IUPUI faculty and staff to identify students at risk for departure. Ultimately, this research will be used to help students remain enrolled at IUPUI and help them identify a potential niche on campus to facilitate graduation. Data will also be used in recruitment efforts to identify profiles of students who might fit in well at IUPUI and ultimately remain enrolled and graduate. These data may also be merged with academic records for the purpose of scholarly research on the relationship between student-institution fit and retention. The open ended items at the end of this survey will be used to improve this survey to better meet the needs of IUPUI students.

NUMBER OF PEOPLE TAKING PART IN THE STUDY:

7/12/2016

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If you agree to participate, you will be one of 3,000 subjects who will be invited to participate in this research.

PROCEDURES FOR THE STUDY:

If you agree to be in the study, you will do the following things:

You will be asked to complete a brief survey that will take no more than ten to fifteen minutes. Once you complete each page, please click the right facing arrows below. You are free to skip any questions you do not feel comfortable answering.

Data from this survey may be merged with academic records (birthdate, school of major, high school GPA, transfer GPA, credit hours transferred, receipt of a Pell grant, and unmet financial need) for the purposes of identifying the impact of fit net the effects of other risk factors. These links will be made using a unique identifier which the research team will not be able to connect with identifying information. No identifying information (name, email, University ID, etc.) will be merged with these data or provided to the research team. Data will only be reported in aggregate. Individual responses will be shared with no one.

RISKS OF TAKING PART IN THE STUDY:

The greatest risk associated with participation is in disclosure of students' individual responses. However, measures have been taken to ensure that no student's individual responses can be identified by members of the research team. No member of the research team will have access to any potentially identifying information. Individual responses will only be reported in aggregate.

Respondents may find some questions difficult or uncomfortable to answer. However, students are free to skip any questions and may choose to discontinue the study if they do not feel comfortable. Skipping items will not adversely affect the respondents' relationship with IUPUI or the research in any way. Students who might be uncomfortable are encouraged to contact Counseling and Psychological Services (CAPS) at (317) 274-2548 or via email at capsindy@iupui.edu.

BENEFITS OF TAKING PART IN THE STUDY:

Participants will not receive any direct benefit. However, the information obtained will be used to help future students better connect to IUPUI and assess factors that may negatively impact retention and graduation at IUPUI. In other words, the results will be used to improve the success of all students.

ALTERNATIVES TO TAKING PART IN THE STUDY:

Instead of being in the study, you may click the link indicating that you do not wish to participate and you do not want to receive further emails. Your relationship with IUPUI will not be affected in any way. Respondents may also click the "opt out" link included with the original invitation email in order to no longer receive reminders. Again, your relationship with IUPUI will not be affected.

CONFIDENTIALITY

Efforts will be made to keep your personal information confidential. We cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Your identity will be held in confidence in reports in which the study may be published and databases in which results may be stored.

Organizations that may inspect and/or copy your research records for quality assurance and data analysis include groups such as the study investigator and his/her research associates, the Indiana University Institutional Review Board or its designees, and (as allowed by law) state or federal agencies, specifically the Office for Human Research Protections (OHRP), who may need to access research records.

A key containing a link between the randomly generated survey ID and student ID will be maintained by a staff member in the Office of Student Data, Analysis, and Evaluation who is not a member of the research team. No one other than this staff member has access to this link, including members of the research team, or other faculty, staff, and students at IUPUI. The key will be destroyed one year following the completion of the research.

PAYMENT

You will not receive payment for participation in this study.

CONTACTS FOR QUESTIONS OR PROBLEMS

For questions about the study, contact the researcher Steven Graunke at sgraunke@iupui.edu or (317) 274-3617 or Gary Pike at pikeg@iupui.edu or 274-8213.

For questions about your rights as a research participant or to discuss problems, complaints or concerns

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about a research study, or to obtain information, or offer input, contact the IU Human Subjects Office at (317) 278-3458 or [for Indianapolis] or (812) 856-4242 [for Bloomington] or (800) 696-2949 or by e-mail at irb@iu.edu.

VOLUNTARY NATURE OF STUDY

Taking part in this study is voluntary. You may choose not to take part or may leave the study at any time. Leaving the study will not result in any penalty or loss of benefits to which you are entitled. Your decision whether or not to participate in this study will not affect your current or future relations with any of the faculty, staff, or students associated with IUPUI.

Consent. Do you understand the information above and agree to participate in this study?

Yes

No

Trans_int. What is the likelihood that you will transfer from IUPUI to another college?

None

Small

Moderate

High

Very High

Bach_int. What is the highest college degree you expect to obtain?

None, just taking classes

Associate's

Bachelor's

Graduate degree (Master's or Doctorate)

Needs. How important are the following to you?

	Not at all (1)	(2)	(3)	(4)	(5)	(6)	Very Much (7)
State-of-the-art classrooms, labs, library	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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A highly regarded academic reputation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Great student body	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sports and recreational opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Great support services (e.g., academic counseling, health care, and placement center)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Great non-academic facilities (e.g., gyms, dining, and game room)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A pleasing physical environment (aesthetics)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Great geographic location	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A diverse student body	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A safe environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Great school size	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Great affordability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenient campus layout	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enjoyable social life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A scholarly/intellectual campus climate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A highly regarded athletic reputation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Supplies. To what degree does IUPUI provide the following?

	Not at all (1)	(2)	(3)	(4)	(5)	(6)	Very Much (7)
Great student body	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A scholarly/intellectual campus climate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Great support services (e.g., academic counseling, health care, and placement center)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A highly regarded							

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athletic reputation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Great non-academic facilities (e.g., gyms, dining, and game room)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sports and recreational opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A highly regarded academic reputation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Great school size	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A safe environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enjoyable social life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A diverse student body	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenient campus lay-out	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A pleasing physical environment (aesthetics)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Great affordability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Great geographic location	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
State-of-the-art classrooms, labs, library	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Satisfaction Items

Q1.

Please indicate how satisfied you have been with your experiences at IUPUI.

	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
Overall, how satisfied are you with your <u>academic experiences</u> at IUPUI?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with your social experiences at IUPUI?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with the physical environment at IUPUI?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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How satisfied are you with the quality of faculty at IUPUI?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with the quality of the academic programs at IUPUI?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How satisfied are you with your relationships with other students at IUPUI?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Demographic/classification items

hours. About how many hours per week do you spend on the following activities?

Note: there are 168 hours in a week.

In class lecture or lab	<input type="text" value="0"/>
Studying	<input type="text" value="0"/>
Sleeping	<input type="text" value="0"/>
Commuting to IUPUI	<input type="text" value="0"/>
Working for pay (both on and off campus)	<input type="text" value="0"/>
Taking care of dependents (children, older adults living with you, etc.)	<input type="text" value="0"/>
Taking care of household responsibilities (cleaning, preparing meals, household chores, etc.)	<input type="text" value="0"/>
Engaged in activities related to intercollegiate athletics	<input type="text" value="0"/>
Engaged in extracurricular activities	<input type="text" value="0"/>
Other activities not listed	<input type="text" value="0"/>
Total	<input type="text" value="0"/>

Diploma. Did you receive a GED or High School Diploma?

High School Diploma

GED

Dependent. Did your parents or anyone else claim you as a dependent on their most recent

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tax return?

Yes

No

I'm not sure

Married. Are you currently married, living with a partner, divorced, separated, widowed, or have you never been married?

Married

Living with a partner

Divorced

Separated

Widowed

Never been married

Don't know

Prefer not to answer

Kids. Do you have any children?

Yes

No

Qual_desc. In order to improve this survey for future administrations, we would like to know a little bit more about what you thought of the items.

Please describe how you would define each of the following. Remember, you are allowed to skip any items you might not feel comfortable answering.

ES_desc. Enjoyable social life

SR_DESC. Sports and recreational opportunities

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Stubd_Desc. Great student body

AR_Desc. A highly regarded athletic reputation

spsrv_desc. Great support services (e.g., academic counseling, health care, and placement center)

nacf_desc. Great non-academic facilities (e.g., gyms, dining, and game room)

divrs_desc. A diverse student body

siclm_desc. A scholarly/intellectual campus climate

croom_desc. State-of-the-art classrooms, labs, library

Acrep_desc. A highly regarded academic reputation

Size_Desc. Great school size

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Geo_desc. Great geographic location

safe_desc. A safe environment

Phys_desc. A pleasing physical environment (aesthetics)

clo_desc. Convenient campus lay-out

affrd_desc. Great affordability

Powered by Qualtrics

Steven Scott Graunke

stgraunke@aol.com

sgraunke@iupui.edu

Objective: To receive a doctorate from Indiana University.

Education: ED.D., Higher Education and Student Affairs, Indiana University,
Anticipated August 2018
Dissertation Title: Student-Institution Fit, External Commitments, and
Persistence

Certificate in College and University Teaching,
Ball State University, 2010

M.A., Counseling, Ball State University, 2004
Mental Health Track

B.A., Psychology, Butler University, 2001
Minor: Chemistry

Professional Experience: **Director of Institutional Research and Assessment, 2015 - present**
Office of Institutional Research and Decision Support
Indiana University-Purdue University Indianapolis
Major Responsibilities: Provide thorough analyses of IUPUI institutional data to support decision making at all levels of the institution; Perform formal presentations translating data and complex statistical analysis for a wide variety of constituencies; Complete advanced analyses to support the enrollment management function, including enrollment projections and assessments of policies related to the Division of Enrollment Management; Conduct analyses using data obtained from assessments of student learning; Lead the administration of campus-wide student survey projects, including the National Survey of Student Engagement (NSSE); Coordinate completion of IUPUI submission to the Common Data Set; Directly supervise the work of three full-time professional staff and indirectly supervise the work of two full-time staff and one graduate student employee; Assist with administrative responsibilities, including budgeting, leading search committees, managing schedules, and coordinating emergency planning.

**Professional
Experience:
(cont.)**

Director of Student Data, Analysis, and Evaluation, 2014 - 2015

Office of Student Data, Analysis, and Evaluation

Indiana University-Purdue University Indianapolis

Major Responsibilities: Lead large-scale multi-method research projects to assess the effectiveness of various university programs; Create and disseminate reports and presentations using data obtained from university-wide surveys and enterprise database systems; Design, distribute, and analyze the results of university-wide surveys and coordinate the local data collection for national survey projects; Supervise one full-time staff and as many as three graduate assistants; Assist with administrative functions including budgeting and reporting of office effectiveness

Assistant Director of Survey Research and Standard Reports, 2009-2013

Office of Information Management and Institutional Research

Indiana University-Purdue University Indianapolis

Major Responsibilities: Coordinate university-wide survey projects; Local coordination for the NSSE survey; Internal and external reporting of survey results and institutional data, including the Delaware Survey of Instructional Costs and Productivity; Supervised graduate student employees

Assessment Research Analyst, 2004-2009

Office of Academic Assessment and Institutional Research

Ball State University; Muncie, IN

Major Responsibilities: Developed Student Athlete Exit Survey; Coordinated administration of Major Field Tests across multiple departments; Led administration of multiple university-wide survey projects, including Graduate Student Exit Survey, Withdrawing Student Survey, and Making Achievement Possible Survey; Provided consultation on multiple assessment project for the Office of Student Affairs as well as several grant projects.

Graduate Assistant, 2002-2004

Office of Academic Assessment and Institutional Research

Ball State University; Muncie, IN

Major Responsibilities: Assisted Dr. Sherry Woosley with numerous technical reports, research studies, and other ad-hoc projects. disabilities in educational and employment settings.

Counseling Intern, 2003-2004

Youth Opportunity Center; Muncie, IN

Instructor, 2001-2002

Noble of Indiana; Indianapolis, IN

**Teaching
Experience:**

Psychology B110: Introduction to Psychology
August-December 2015
August-December 2016
August-December 2018

Psychology B311: Introductory Lab in Psychology (Co-instructor with Robert Stewart).
May-August 2010

Awards and Honors:

Best Paper: Indiana Association for Institutional Research Annual Forum, 2010

**Grants and
Fellowships:**

Carol D. Nathan Staff Scholarship (IUPUI Staff Council, 2012), \$250 per semester for two semesters

2009 Association for Institutional Research and the National Center for Education Statistics Fellowship Program in Institutional Research, \$3,000 per academic year for two years for travel and graduate study expenses

Publications:

Graunke, S. S., Lin, W., & Fewell, N. (2018, accepted for publication) Defining non-traditional students for retention studies. *Proceedings of the 14th Annual National Symposium on Student Retention*.

Graunke, S. S. (2015). Deep approaches and learning outcomes: An exploration using indirect measures. *Journal of the Student Personnel Association at Indiana University, 2015*, 49-59.

Pike, G.R. & Graunke, S.S (2014). Examining the effects of institutional and cohort characteristics on retention rates. *Research in Higher Education, 56*(2), 146-165.

Graunke, S. S., Woosley, S. A., & Helms, L. (2006) How do college students' initial goals impact their chances to graduate? An exploration of three types of commitment. *NACADA Journal, 26*, 13-18.

Graunke, S. S. & Woosley, S. A. (2005). An exploration of factors that affect the academic success of college sophomores. *College Student Journal, 39*, 367-376.

Woosley, S. A., Hyman, R. E., & Graunke, S. S. (2004). Q-sort and student affairs: A viable partnership? *Journal of College Student Development, 45*, 231-242. doi:10.1353/csd.2004.0031

**Professional/
Scholarly
Presentations:**

Hansen, M., Bradshaw, B., Graunke, S., & Fewell, N. (2018, May). *IR's Role in Supporting Strategic Enrollment Management*. Paper presented at the 2018 AIR Annual Forum, Orlando, FL.

Graunke, S. (2018, May). *Will It Work Here? Validating a Fit Survey for a New Student Population*. Paper presented at the 2018 AIR Annual Forum, Orlando, FL.

Graunke, S., Fewell, N., Troke, T. & Lin, W. (2018, May). *Developing Tools for Strategic Enrollment Planning Using Tableau*. Paper presented at the 2018 AIR Annual Forum, Orlando, FL.

Hansen, M., Graunke, S., & Mitchel, A. (2018, May). *Transforming IR Leadership and Creating Data-Informed Decision Cultures*. Paper presented at the 2018 AIR Annual Forum, Orlando, FL.

Fewell, N., Troke, T., Graunke, S., & Lin, W. (2018, March). *A Tableau Tool for Strategic Enrollment Management*. Paper presented at the 32nd Annual Conference of the Indiana Association for Institutional Research, Indianapolis, IN.

Hansen, M., Graunke, S., & Janik, R. (2018, March). *Helping Others Find Our Data: The Development and Improvement of an IR Data Workshop*. Paper presented at the 32nd Annual Conference of the Indiana Association for Institutional Research, Indianapolis, IN.

Graunke, S., Powell, A., & Angermeier, L. (2018, February). *Themed Learning Communities Leverage E-Portfolios for Integrative Learning*. Paper presented at the 37th Annual FYE Conference, San Antonio, TX.

Powell, A., & Graunke, S. (2017, October). *ePortfolios Supporting Integrative Learning in First-Year Themed Learning Communities*. Paper presented at the 2017 Assessment Institute, Indianapolis, IN.

Hatcher, J. A., Bringle, R. B., Graunke, S. S., Hansen, M. J., Hahn, T., Foste, Z., Richard, D., & Rhodes, T. (2017, October). *Conducting Assessment and Research on Service Learning and Student Civic Outcomes*. Paper presented at the 2017 Assessment Institute, Indianapolis, IN.

Hansen, M., Graunke, S., & Mitchel, A. (2017, June). *Transforming IR Guided by the Statement of Aspirational Practice*. Paper presented at the 2017 AIR Annual Forum, Washington, DC.

**Professional/
Scholarly
Presentations
(cont):**

Hansen, M. J., Graunke, S. S., & Thorington-Springer, J. (2017, April). *Scaling Up High-Impact Practices Without Compromising Quality*. Paper presented at the 2017 Higher Learning Commission Annual Conference, Chicago, IL.

Graunke, S., Fewell, N. L., & Lin, W. (2017, March). *Defining Nontraditional Students*. Paper presented at the 31st Annual Conference of the Indiana Association for Institutional Research, Indianapolis, IN.

Hansen, M. J., Graunke, S. S., Rauch, J., & Thorington-Springer, J. (2016, April). *Assessing High Impact Practices and RISE Experiences*. Paper presented at the 30th Annual Conference of the Indiana Association for Institutional Research, Indianapolis, IN.

Woosley, S., Fallucca, A., Goldstein, R., & Graunke, S. (2016, March). *Data as Eye Candy: Visualizing Data to Tell Your Campus Story*. Paper presented at the 2016 NASPA Annual Conference, Indianapolis, IN.

Hansen, M., Graunke, S., Childress, J., & Fewell, N. (2015, May). *Implementing a BI Project: The Cohabitation of IR Core Competencies*. Paper presented at the 2015 AIR Annual Forum, Denver, CO.

Graunke, S., Hansen, M., Rauch, J., & Wright, J. (2015, March). *Dispelling Myths with Data: An Examination of Incoming Transfer Students*. Paper presented at the 29th Annual Conference of the Indiana Association for Institutional Research, Indianapolis, IN.

Hansen, M., Graunke, S., Childress, J., Fewell, N., Hancock, S., Nunes, C., Shepherd, R., & Zalewski, N. (2015, March). *Implementing a Business Intelligence Project for Strategic Planning and Decision Making Support*. Paper presented at the 29th Annual Conference of the Indiana Association for Institutional Research, Indianapolis, IN.

Pike, G., & Graunke, S. (2014, May). *Examining the Effects of Institutional and Cohort Characteristics on Retention Rates*. Paper presented at the 2014 AIR Annual Forum, Orlando, FL.

Hansen, M. & Graunke, S. (2014, May). *Creating and Validating and Entering Student Survey*. Paper presented at the 2014 AIR Annual Forum, Orlando, FL.

Graunke, S. (2014, March). *Satisfaction and Self-Perceptions: How Are They Related?* Paper presented at the 28th Annual Conference of the Indiana Association for Institutional Research, Indianapolis, IN.

**Professional/
Scholarly
Presentations
(cont):**

Hansen, M. J. & Graunke, S. S. (2014, March). *How Can Entering Student Surveys Help You Promote Student Success*. Paper presented at the 28th Annual Conference of the Indiana Association for Institutional Research, Indianapolis, IN.

Graunke, S. & Barksdale, G. (2013, October). *Improving the Student Athlete Experience: The IUPUI End of Season and Exhausted Eligibility Surveys*. Poster presented at the 2013 Assessment Institute, Indianapolis, IN.

Graunke, S., Barksdale, G., & Forrest, K. (2013, June). *Assessing the Student-Athlete Experience: A Collaborative Effort Between Athletics and IR*. Paper presented at the 2013 HEDS 29th Annual Conference, Indianapolis, IN.

Graunke, S. (2013, May). *Critical Thinking and Deep Learning: Using NSSE with Local Survey Results*. Paper presented at the Annual Forum of the Association for Institutional Research, Long Beach, CA.

Graunke, S. (2012, June). *Disparate views of academic environments: A comparison of faculty perceptions and student reports of engagement and learning*. INAIR Best Presentation session presented at the Annual Forum of the Association for Institutional Research, New Orleans, LA.

Graunke, S. & Gorski, K. (2012, March). *Changes in Satisfaction by Student Characteristics: An analysis using satisfaction survey data*. Paper presented at the annual meeting of the 26th Annual Conference of the Indiana Association for Institutional Research, West Lafayette, IN.

Corlies, R. & Graunke, S. (2012, March). *Who's Surveying Sophomores?* Poster presented at the annual meeting of the 26th Annual Conference of Indiana Association for Institutional Research, West Lafayette, IN.

Gorski, K., Lui, J., & Graunke, S., (2011, March). *Applicability of the IUPUI Staff Survey to North Central Association Examples of Evidence for accreditation*. Poster session presented at the 25th Annual Conference of the Indiana Association for Institutional Research, Indianapolis, IN.

**Professional/
Scholarly
Presentations
(cont):**

Graunke, S. (2010, March). *Disparate views of academic environments: A comparison of faculty perceptions and student reports of engagement and learning*. Paper presented at the 24th Annual Conference of the Indiana Association for Institutional Research, Indianapolis, IN.

Graunke, S., & Whitaker, D. (2007, March). *Leaping forward: Creation of the longitudinal evaluation and assessment panel at Ball State University*. Paper presented at the 21st Annual Conference of the Indiana Association for Institutional Research, French Lick, IN.

Graunke, S. (2006, March). *Constructing policy relevant studies: A report from the AIR train the trainer program*. Paper presented at the 20th Annual Conference of the Indiana Association for Institutional Research, Bloomington, IN.

Graunke, S., Atkinson, D., Woosley, S., & Whitaker, D. (2005, March). *Making a successful transfer: Moving to a better understanding of transfer students and their needs*. Paper presented at the 19th Annual Conference of the Indiana Association for Institutional Research, Greencastle, IN.

Graunke, S., & Hoevel, K. (2005, March). *An exploration of the roles of graduate research assistants*. Poster session presented at the 19th Annual Conference of the Indiana Association for Institutional Research, Greencastle, IN.

Woosley, S., Graunke, S., & Helms, L. (2005, February). *Using assessment to provide feedback to first-year students*. Paper presented at the Annual Conference on the First Year Experience, Phoenix, AZ.

Woosley, S., Whitaker, D. & Graunke, S. (2004, March). *Sophomore slump: Myth or reality?* Paper presented at the 18th Annual Conference of the Indiana Association for Institutional Research, Terre Haute, IN.

**Selected Invited
Papers/
Presentations/
Workshops:**

Graunke, S. (2017, November). *Sharing data without violating FERPA*. eAIR 37(11). Retrieved from <https://www.airweb.org/eAIR/askeair/Pages/FERPA.aspx>

Graunke, S. S. & Hansen, M. J. (2017). Using local and national datasets to study student civic outcomes. In J. A. Hatcher, R. G. Bringle, & T. W. Hahn (Eds.) *Research on student civic outcomes in service learning: Conceptual frameworks and methods*. Sterling, VA: Stylus Publishing

Graunke, S. (2015, February). Qualtrics drill down. eAIR, 35(2). Retrieved from <https://www.airweb.org/eAIR/techtips/Pages/Qualtrics.aspx>

Graunke, S. (2014, February). Specifying Output in SAS. eAIR, 34(2). Retrieved from <https://www.airweb.org/eAIR/techtips/Pages/Specifying-Output-SAS.aspx>

Graunke, S. (2013, November). *Pivot Table Basics for Assessment Professionals*. Workshop presented at the 2013 Kentucky Association for Institutional Research Annual Conference, Louisville, KY

Graunke, S. S. & Pike, G. (2012, October). *Pivot Table Basics for Assessment Professionals*. Workshop presented at the 2012 Assessment Institute, Indianapolis, IN.

Hansen, M. J. & Graunke, S. (2011, November). *Designing and Utilizing Surveys for a University Setting*. Training Session Sponsored by the IUPUI Center for Teaching and Learning

Graunke, S & Pike, G. (2011, October). *Using pivot tables to report assessment results at school and department levels*. Demonstration presented at the 2011 Assessment Institute, Indianapolis, IN.

Institution Service: Secretary to Admissions and Credits University Senate Subcommittee, Ball State University
August 2006-May 2007, August 2008-September 2009

Professional Service: IUPUI Research Academy – Visiting Faculty, 2018

Indiana Association for Institutional Research Immediate Past President, 2014-2015

Indiana Association for Institutional Research President, 2013-2014

Indiana Association for Institutional Research Vice President and Conference Chair, 2012-2013

Organizations:

Association for Institutional Research
Summer 2005-Present

Indiana Association for Institutional Research
Spring 2003-Present

Psi Chi National Honorary Psychology Organization
Fall 1999-Present

**Publication/
Proposal Review:**

Reviewed papers for Journal of the Student Personnel Association at
Indiana University, 2017

Reviewed proposals for Indiana Association for Institutional Research
Annual Conference, 2014-2018

Reviewed proposals for National Symposium on Student Retention,
2013-2017

Reviewed proposals for AIR Forum, 2012, 2015, 2017

Student Reviewer for *Journal of College Student Development Research
in Brief*, 2011- 2013

**Other Training and
Certifications:**

CITI Training
August, 2010

Overview of IPEDS
July, 2007

Completed AIR Foundations I Institute
July, 2006