The Relationship between Student Engagement and Selected Desirable Outcomes in the First Year of College

Robert M. Gonyea
Indiana University Center for Postsecondary Research
rgonyea@indiana.edu
812.856.3014

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Abstract

This study examines the relationships between student engagement in the first year of college and three desirable outcomes of undergraduate education. Student engagement is a domain of constructs that measures both the time and energy students devote to educationally purposeful activities and how students perceive different facets of the institutional environment that facilitate and support their learning. The three outcomes represent a portion of what is meant by success in the first year experience, namely obtaining good grades, acquiring intellectual skills that are important for future academic achievement and success in the professional world, and gaining knowledge of a general nature in step with the commonly embraced liberal arts mission of the general curriculum. The study is a secondary analysis of existing data utilizing two primary data sources: student responses to the fourth edition of the College Student Experiences Questionnaire and student records maintained by Indiana University Bloomington. Structural equation modeling (SEM) was employed to model the complex relationships between the students' precollege characteristics, engagement behaviors and perceptions, and the outcome variables. The findings point to four conclusions: (a) different forms of engagement are precursors to different outcomes, (b) different forms of engagement interact to contribute to desired outcomes, (c) high expectations coupled with adequate support are requisite conditions for learning and development in the first college year, and (d) grades do not necessarily represent how much students believe they have learned. Implications for research, policy and practice are also offered.

The Relationship between Student Engagement and Selected Desirable Outcomes in the First Year of College

For more than two decades higher education institutions have been under pressure to conduct assessment and produce evidence for accountability. In this context, process indicators that measure student engagement have emerged as a hopeful source of evidence of student success and institutional quality (Kuh, 2001; Kuh, Pace, & Vesper, 1997). Student engagement is a domain of constructs that measures both the time and energy students devote to educationally purposeful activities, and how students perceive different facets of the institutional environment that facilitate and support their learning (Kuh, 2001). Also in response to the forces of accountability, and under pressure to retain tuition-paying students, colleges and universities place increasing attention, effort, and resources toward enhancing the first year experience (Cuseo, 2000; Gardner, Barefoot, & Swing, 2001; Hayek & Kuh, 2004; Upcraft, Gardner, & Associates, 1989). It is believed that student success is largely determined by experiences during the first-year of college (Noel, Levitz, & Saluri, 1985; Siegel, 2003) and that retaining students after the first year not only makes economic sense for the institution but is beneficial to the students who might not otherwise achieve important goals in life (Braxton, 2000; Tinto, 1987). Institutions invest a disproportionate amount of resources to help students make successful transitions into college, enhance their ability to learn, and lay a strong foundation for the remainder of the undergraduate program. Yet, first-year students are a diverse group in terms of their sex, age, race, financial status, abilities, and other background characteristics, and research suggests that conditional effects of student types on learning experiences exist (Pascarella and Terenzini, 1991).

This study examines the effect of student engagement in the first year of college on three desirable outcomes of undergraduate education, and tests whether or not conditional effects based on student differences play a role. The three outcomes are chosen because they represent a portion of what is meant by success in the first year experience: (a) learning as measured by grades, (b) self-reported gains in general education learning, and (c) self-reported gains in intellectual skills. Thus, two research questions direct the study:

(1) Does student engagement predict first-year student success as represented by the three domains of desired college outcomes?

(2) Do student background characteristics (e.g., sex, race, first-generation status) have conditional effects upon the relationships between student engagement and the three outcome measures?

Such an investigation is important for at least two reasons. First, it adds to a growing number of studies testing the validity of links between engagement constructs and desired student outcomes. Second, the study provides findings, conclusions, and recommendations for researchers and administrators interested in the quality of the first year of college.

Literature Review

First-Year Student Outcomes

For over two decades colleges and universities have placed increasing attention, effort, and resources specifically toward enhancing the freshman year experience (Cuseo, 2000; Gardner, Barefoot, & Swing, 2001; Hayek & Kuh, 2004; Upcraft, Gardner, & Associates, 1989). Upcraft, Gardner, and Associates (1989) define freshman success in broad terms, more than merely passing classes and getting good grades:

> We believe freshmen succeed when they make progress toward fulfilling their educational and personal goals: (1) developing academic and intellectual competence; (2) establishing and maintaining interpersonal relationships; (3) developing an identity; (4) deciding on a career and life-style; (5) maintaining personal health and wellness; and (6) developing an integrated philosophy of life (p. 2).

Similarly generous in scope, Cuseo (2000) groups measurable outcomes pertinent to the first college year into three domains – academic outcomes, personal development outcomes, and special measures of development. This provides a broad and inclusive structure by which campus professionals might plan assessment of the first year of college.

Yet, estimating the amount students learn in college has been an elusive task for higher education researchers. Learning is highly complex, involving multiple perspectives, intelligences, and styles, and must be integrated in a holistic way rather than in unidimensional patterns (Baxter Magolda & Terenzini, 1999). Student learning occurs any time and anywhere, not necessarily within the bounds of the classroom and not precisely at the time the course is taken. Because of this, learning must be assessed not only by faculty members and administrators, but also by student affairs professionals who have considerable responsibility and points of contact with students' lives out of the classroom (Kuh, 1993, 1995; Kuh, Douglas, Lund, & Ramin-Gyurnek, 1994; Maki, 2002). As expected, the strongest evidence of learning from the first year to senior year has to do with subject area content (Pascarella & Terenzini, 1991). Measures of subject area content are widely available, formalized, and designed to be longitudinally consistent. For example, students completing the SAT as a college entrance exam may also complete the GRE, GMAT, or other substantively and structurally linked graduate and professional school placement exams. Yet modest to strong findings also support the notion that students make gains in general curricular areas such as the development of cognitive, verbal and quantitative skills. This dimension also includes vital abilities in critical thinking, speaking, reasoning, problem solving, and being able to sustain multiple perspectives on ill-defined issues. Those with a college degree therefore, are likely to be better learners and more adaptive in changing environments and complex situations. Furthermore, these effects persist in the presence of controls for maturation, personal intellectual and academic ability (Pascarella & Terenzini, 1991).

The current study models three different measures of student learning in order to get a broader view of student growth during college, and each is discussed below.

Grades

Grades, a nearly indispensable aspect of college and perhaps the best predictor of a student's success in attaining a college diploma, probably do reflect learning (Pascarella &

Terenzini, 1991). Moreover, grades at the end of the first year are often believed to be the most important factor in the decision to drop out of college (Bean, 1980; Choy, 2002; Pascarella & Chapman, 1983; Pascarella, Smart, & Ethington, 1986; Tinto, 1975). Still, some scholars dispute their validity as a measure of learning and are wary of overemphasizing their importance (Milton, Pollio, Eison, & Braxton, 1988; Pascarella & Terenzini, 1991). Others assert that the grade point average is an unstandardized measure, and thus is unreliable when used between instructors, departments, or institutions (Miller, Imrie, & Cox, 1998).

Grades have long been known to be dependent upon a student's pre-college intellectual capacity (Cabrera, Nora, & Castaneda, 1993; Eimers & Pike, 1997; Mathiesen, 1984; Pike, 1989; 1991a; Pike & Saupe, 2002). However, grades are not *entirely* dependent on a student's ability, but can be influenced by other factors such as personal motivation, organization, study habits, and quality of effort (Pascarella & Terenzini, 1991, Tinto, 1987, 1993). Grades are also influenced by the student's major (Astin, 1982; Cunningham & Lawson, 1979), mode of course instruction (Cunningham & Lawson, 1979), course grading policies (Sgan, 1970; Von Wittich, 1972), instructor rank (Prather & Smith, 1976), and professorial style and personality (Theodory & Day, 1985). In addition, programs designed to improve academic skills were found to help students' grades increase (Kulik, Kulik, & Shwalb, 1983). Mixed findings are reported for the effect of gender on grades (Pascarella, Smart, & Ethington, 1986; Pike, 1989, 1991a). Finally, the relationship between students' out-of-classroom activities and grades has received uncertain results in higher education research. Pike (1989) found that involvement in cultural activities is unrelated to grades, and research in the 1980s showed mixed results about the effect of student-faculty interaction (Bean & Kuh, 1984; Pascarella, 1980) and peer interaction (Aitken, 1982; Bean & Bradley, 1986) on grades.

Gains in General Education

Because first-year students are likely to be enrolled in more core curriculum courses than courses in the major or program, their learning outcomes have more to do with general education rather than learning within a single discipline. General education requirements are intended to address the expansive intended outcomes that appear in institutional mission statements. Among the subjects included in the general education curriculum are mathematics and basic sciences, oral and written communication, critical thinking and problem solving, information technology, and diversity and multiculturalism. Involvement variables having positive relationships with general learning include courses that emphasize writing skills, science or scientific inquiry, history or historical analysis, having instructors critique written papers, and discussing racial or ethnic issues (Astin, 1993b).

Gains in Intellectual Skills

The development of intellectual skills is a commonly researched outcome of the first year experience (Cuseo, 2000; Gardner, Barefoot, & Swing, 2001; Moody, 1993; Schilling, 2000). For example, Astin (1993b) found that discussing racial or ethnic issues has a positive relationship and taking remedial courses and receiving tutoring had a negative relationship with communication skills. Terenzini (1995) reported that critical thinking ability is positively influenced by the number of courses that emphasize writing skills, interdisciplinary courses, taking science and history, having class papers reviewed by instructors, and discussing racial and ethnic issues. Many of the same involvement items also contributed positively to Astin's (1991) Overall Academic Development factor which consisted of the ability to think critically,

analytical and problem-solving skills, general knowledge, knowledge of a particular field or discipline, and writing skills.

Student Background Characteristics

As will be discussed later, models estimating the net effects of college experiences on student outcomes require knowledge of student background characteristics believed to affect student success. Only after controlling for these pre-existing characteristics can the researcher estimate the net effects of a particular experience. Conditional effects on learning and cognitive development based on background variables are reported (Pascarella & Terenzini, 1991), and are shown to have at least an indirect relationship with student retention by way of interactions with college experiences (Terenzini & Pascarella, 1980). Many examples are available in the literature: First-generation students are known to arrive at college with a host of deficits that may inhibit their ability to persist and thrive in the college environment (Terenzini & et al., 1996). White male students at public institutions are more likely to have lower engagement scores than women, students of color, and private college students (Hu & Kuh, 2001). Full-time students make the greatest strides in critical-thinking skills, even controlling for other factors (Pascarella & et al., 1996). Women tend to perceive the campus climate as unfriendly or unsupportive are less likely to show cognitive growth (Pascarella et al., 1997). Background characteristics found to have an effect on grades include gender (Aitken, 1982; Pascarella, Smart, & Ethington, 1986), high school grade point average (Bean & Bradley, 1986; Pascarella, Smart, & Ethington, 1986; Pike, 1991a), and standardized test scores (Aitken, 1982; Pike, 1991a). Males achieved higher cumulative grades at the end of the first year of college as a result of participation in a tutoring program (House & Wohlt, 1990). Students of color leave college at higher rates than do their majority counterparts (Fleming, 1984; Padilla et al., 1997) leading many to believe that cultural barriers play a part in student success. Academic motivation is related to persistence (Vallerand, 1992), and higher grades (Reynolds, 1988; Vallerand, 1993).

Student Engagement

The concept of student engagement has been the focus of scholarly discussion in higher education literature for decades (Astin, 1977, 1984, 1996; Astin & Panos, 1969; Kuh, 1981, 2001, 2004; Kuh & et al., 1991; Pace, 1979, 1982, 1984; Pike, 1991a). Previous models of college impact portrayed the student as a passive subject impacted upon by the college environment, but Pace (1964, 1982) believed the student to be an active participant in his or her own learning, and that one of the most important determinants of student success is the investment of the student in taking advantage of the educational resources and opportunities of the campus. In his modification of Pace's concept of quality of effort, Astin's (1984; 1991; 1993b) theory of student involvement suggests that students who are more invested in their college experience are more likely to be successful in college. Astin (1984) defines involvement as "the amount of physical and psychological energy that the student devotes to the academic experience" (p. 297).

Recently, Kuh and others (Hu & Kuh, 2001; Kuh, 2001, 2003; Kuh & Associates, 2001) have promoted the concept of student engagement as an important antecedent of student success and indicator of institutional quality. Student engagement is a domain of constructs that measures both the time and energy students devote to educationally purposeful activities, and how students perceive different facets of the institutional environment that facilitate and support their learning (Kuh, 2001). Engagement has both behavioral and psychological elements. *Behaviorally*, student engagement includes initiating interactions with faculty members, cooperating with peers in

learning activities, actively investigating new and useful sources for learning, and spending time studying, rehearsing, doing problem sets, and other learning tasks. Thus, student engagement implies a simple equation: the amount students learn in college is a function of how much they put into it. The *psychological* element of engagement includes student perceptions and attitudes concerning the norms of the institution. Students hold individual beliefs about coursework activities, the quality of relations with agents of socialization on the campus (students, faculty members, and administrators), and the emphasis the institution puts on scholarly activities, respect for diversity, appreciation of the arts, and vocational preparation (Kuh, 2001). Because beliefs and attitudes are antecedents to behavior (Bean & Eaton, 2000), perceptions of the campus environment are a critical piece in assessing a student's receptivity for learning.

Measures of student engagement are often called *process indicators* of institutional quality. Even with rich evidence of outcomes, institutions still need to know what programs, processes, activities, and student efforts produced those outcomes (Banta, 2002; Kuh, Pace, & Vesper, 1997). Perhaps the best known list of process indicators is the *Seven Principles for Good Practice in Undergraduate Education* (Chickering & Gamson, 1987, 1999). These principles call for institutions to deliver their programs and services to shape student behavior in desired directions. They include student-faculty contact, cooperation among students, active learning, prompt feedback from faculty members, time on task, high expectations, and respect for diverse talents and ways of learning. All are believed to be highly associated with student success in a variety of ways.

Student-Faculty Interaction

A commonly reported measure of student engagement is the amount of interaction between students and faculty members. Kuh and Hu (2001) examined the effects of student-faculty interaction on satisfaction and self-reported gains as a result of the college experience. As expected, the frequency of student-faculty interaction increased from first year through senior year, and such interactions had positive effects on the quality of students' efforts in other engagement activities. Yet, the study also revealed that in certain situations more interaction with faculty was not necessarily better. Different types of students benefit differently from contact with their instructors and students at smaller colleges benefited more from faculty interaction than their counterparts.

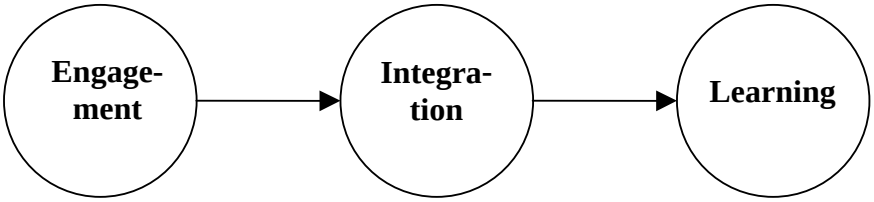
Diversity Interactions

Although much is still unknown about the relationship between diversity and student experiences in college, diversity-related experiences arguably benefit individual students, institutions, and society at large (Hurtado, et al., 1999). A diverse student body makes possible an environment where students interact often with peers of different backgrounds (Gurin, 1999), where relationships and mutual understandings between diverse groups of students are improved, and students' thinking about diversity issues is tested throughout the enriched exchange of ideas (Chang, 2001). Correspondingly, studies show that students who report more diversity experiences show greater relative gains in critical and active thinking (Milem, 1994). Experience with diversity also appears to be positively associated with persistence and degree aspirations (Chang, 2001, 2002; Gurin, 1999; Milem & Hakuta, 2000), and higher levels of civic engagement, cultural awareness, and commitment to improving racial understanding (Umbach & Kuh, 2003).

Integration

Chickering (1974) argued that, in addition to engagement in academic and social activities, learning requires *integration* of what students experience as they apply what is learned to different settings. Integrative learning activities may include students being asked to apply what they have learned to a different setting, bringing ideas from various sources together in a paper or project, or explaining material to another person such as a family member or in a tutoring relationship. Research utilizing structural models showing strong reciprocal relationships among different types of engagement experiences lends indirect evidence to the integration component (Davis & Murrell, 1993; Pike, 1995), and recent studies (Pike, 1999, 2000; Pike & Killian, 2001; Pike, Kuh, & Gonyea, 2003) offer more direct evidence for the validity of the integration construct. These studies also support the causal ordering of engagement, integration, and learning in structural models as shown in Figure 1.

Figure 1
Causal Ordering of Engagement, Integration, and Learning Constructs
(From Pike, Kuh, & Gonyea, 2003)



Modeling Student Outcomes

Research questions that require a longitudinal analysis are often represented in models that represent causes and effects through observations on multiple variables through time. Such models help institutional planners shape ways to identify influences on student development, particularly those associated with programs or policies under the control of the institution. Perhaps the most basic framework for assessing student outcomes is Astin's (1991) input-environment-outcome (I-E-O) model. The I-E-O model is conceptually appealing, accessible and provides a general starting point for the construction of structural models that piece together college student data collected over time. Astin makes a convincing argument to researchers that measures within all three components are necessary for adequate modeling. However, the I-E-O model provides little guidance on the complex interrelationships that exist among the numerous input, environment, and outcome variables available to institutional researchers.

Other structural-type models are utilized in the study of student persistence (Bean, 1980; Braxton, Duster, & Pascarella, 1988; Pascarella & Terenzini, 1980; Tinto, 1975, 1987, 1993). The best known of these is Tinto's (1975; 1987; 1993) Interactionalist Theory of College Student Departure. This model explains student departure in a longitudinal series of sociopsychological interactions between the student and the college environment. The model follows pre-college goals and commitments to the ultimate decision whether or not to stay with the institution. Though Tinto's model is meant to explain student attrition, its relevance extends into other measures of college impact, and researchers have applied Tinto's model and model components in studies of an array of student outcomes (Pascarella & Terenzini, 1991).

Pascarella's (1985) General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development is another structural

framework for explaining student learning and development (Figure 2). Pascarella theorizes that student precollege traits are correlated with institutional types, and that both of these influence the institutional environment and interactions with agents of socialization, such as faculty members, key administrators, and peers. Pascarella acknowledges that student background also has a direct effect on learning and cognitive development, beyond the other intervening variables. A category entitled "quality of student effort" is a key component of this causal model, thereby affirming Pace's (1984) notion that students' behaviors toward their learning and development are an important aspect of learning. Quality of student effort is influenced by student background and precollege traits, the institutional environment, and by the interactions students have with agents of socialization. The relationships among the variables depicted in this model have been confirmed by various studies (Arnold, Kuh, Vesper, & Schuh, 1993; Astin, 1993a; Kuh, Pace, & Vesper, 1997; Kuh & Vesper, 1997; Pace, 1990; Pascarella & Terenzini, 1991; Pascarella et al., 1996). This General Causal model contains significant content overlap with the present study, and thus may offer the best representation of the variables. Thus, it forms the basis for the study's conceptual model.

Conceptual Model

The starting point in creating a structural model is to hypothesize a conceptual model that seeks to explain the longitudinal phenomena within the data. Though reality is perceptibly more complex than a conceptual model is able to depict, such models carry advantages for understanding multiple and simultaneous relationships. Conceptual models help research analysts identify essential components of the complete student experience, reveal the importance or influence of each of the components within the model, and make possible a level of explanation above and beyond what is available from descriptive statistics or multivariate linear regression (Pike, 1991a).

Figure 3 portrays the conceptual model, based primarily on Pascarella's (1985) General Causal Model, that serves as the analytical basis for this study. The conceptual model proposes directions of influence among the student background, engagement, environment, and outcome variables. *Engagement with agents of socialization* represents a group of latent constructs that includes student-faculty interaction, diversity interaction, and substantive conversations between students and their peers. Latent constructs within the *forms of academic engagement* include writing experiences, amount of reading and writing, and use of computers and information technology. Two observed variables also fall within this category – use of the academic tutoring center and the amount of time spent per week doing academic work.

Figure 2:
Pascarella's (1985) General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development

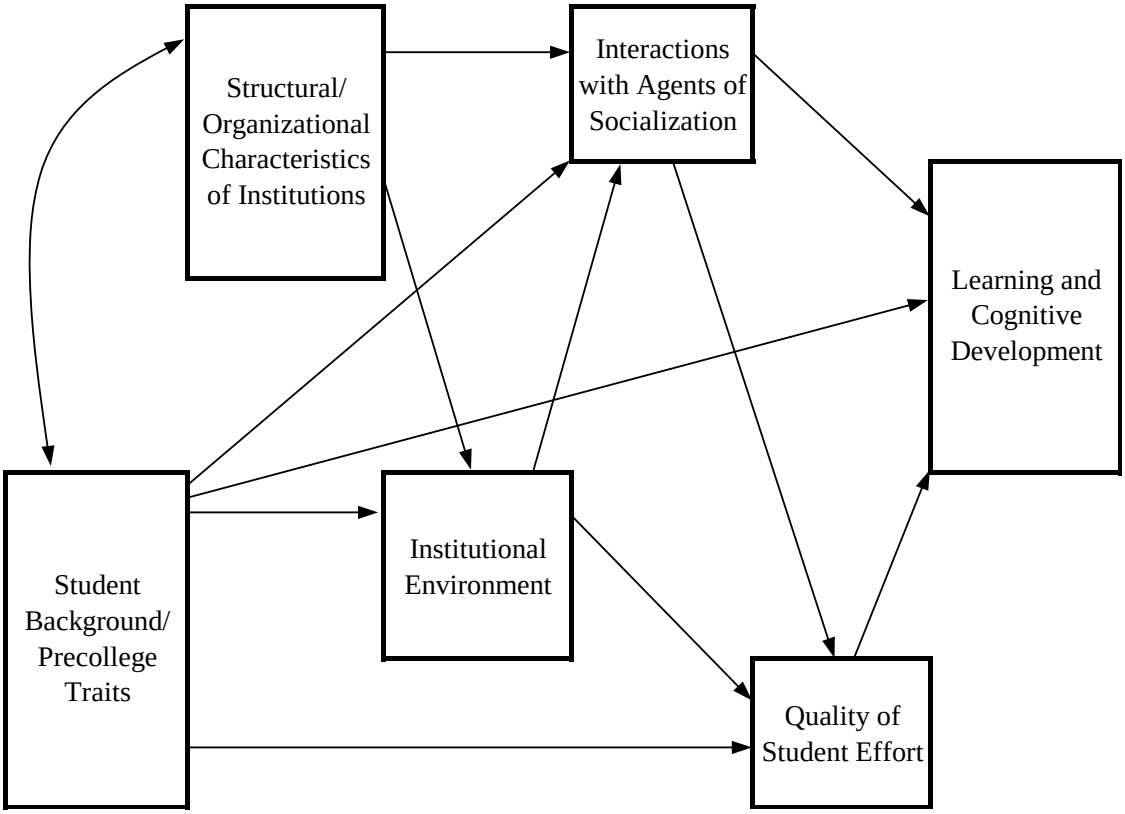
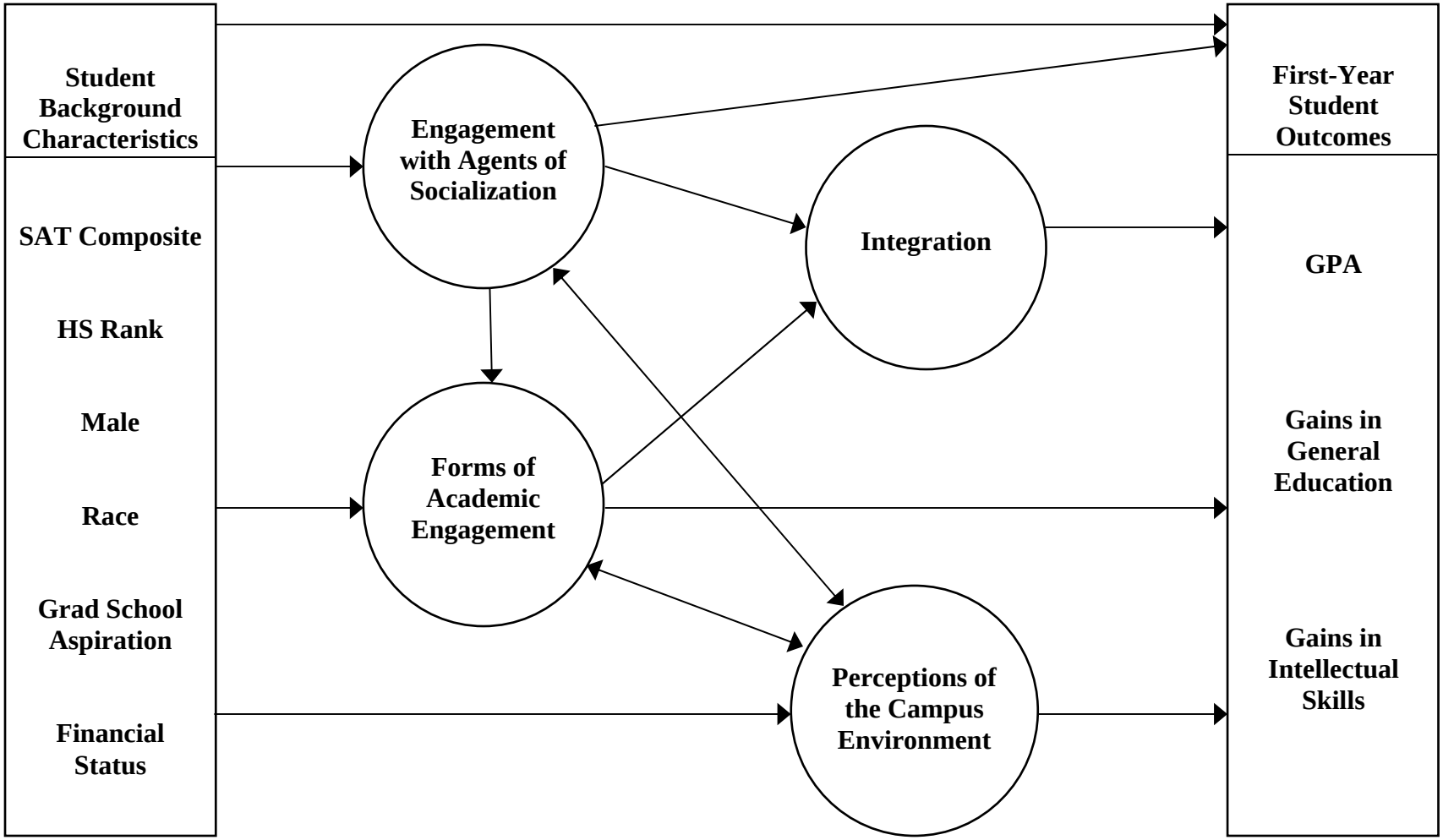


Figure 3
Conceptual Model for Three First-Year Outcomes



Based on the literature, the model hypothesizes that successful outcomes in the first-year of college are a function of student background characteristics, forms of engagement, the amount of integration of learning experiences and perceptions of the campus environment. Consistent with Pascarella's (1985) model, the degree to which the student is engaged with institutional agents of socialization influences the student's overall academic engagement. Finally, the model sees similar relationships between perceptions of the campus environment and background characteristics, academic engagement, and engagement with agents of socialization.

Methods

Data Sources

The setting for this study was Indiana University Bloomington (IUB), a Doctoral/Research-Extensive public institution that enrolls more than 30,000 students. The study is a secondary analysis of existing data from two primary sources: student responses to the fourth edition of the *College Student Experiences Questionnaire* (CSEQ) and student records maintained by IUB. Over 4,500 undergraduates at IUB, first-year through senior, completed the online version of the CSEQ during the spring semester in 2001, and 4,000 IUB students completed the CSEQ during the spring semester in 2002. The final data file yielded 1,607 first-year students with matching records from IUB for the purposes of this study.

College Student Experiences Questionnaire

The CSEQ has good psychometric properties in that it reliably measures educational practices that affect student outcomes (Ewell & Jones, 1994, 1996; Pace, 1984, 1990) and has good indicators of variance, univariate normality, internal reliability and validity (Gonyea et al., 2003; Kuh et al., 1997; Pace, 1984, 1990). The CSEQ asks about the student's experience with the institution in three areas: (a) college activities, (b) the college environment, and (c) estimates of gains. The *college activities* items measure the frequency by which students engaged in opportunities and resources provided by the institution for their learning and development. The activities are grouped into thirteen categories or scales. In addition, the CSEQ has items that quantify the amount of reading and writing the student has experienced during the current school year. Ten *college environment* items assess the student's perceptions of the campus climate for learning (Pace, 1984). Seven of these ask students to rate how strongly the campus emphasizes various aspects of student development, and three ask for a rating of relationships among students, faculty, and administrative personnel and offices at the institution. The *estimates of gains* items ask students to reflect on their entire experience at the institution and estimate how much progress they feel they have made on 25 holistic learning outcomes, such as gaining a broad general education, writing clearly and effectively, becoming aware of different philosophies, cultures, and ways of life, and gaining the ability to think analytically and logically.

In addition to the thirteen activities scales that form latent constructs representing different facets of student engagement, the CSEQ Research Program (Gonyea et al., 2003) derives three factors from the ten environment items: (a) scholarly and intellectual emphasis, (b) vocational and practical emphasis, and (c) quality of personal relations, and five factors from the 25 gains items: (a) gains in general education, (b) gains in intellectual skills, (c) gains in personal and social development, (d) gains in vocational preparation, and (e) gains in science and technology.

Data collected by the CSEQ rely on self-reports about student behavior, attitudes, and growth associated with learning and development. Research supports using self-reports as proxies for direct measures of learning such as achievement test scores, and in areas where direct measures are not available or not feasible (Baird, 1976; Ewell & Jones, 1994; Lowman & Williams, 1987; Pike, 1995, 1996). Student self-reports are generally valid when five decisive factors are present: (a) when the information requested is known to the respondents, (b) the questions are phrased clearly and unambiguously, (c) the questions refer to recent activities, (d) the respondents think the questions merit a serious and thoughtful response, and (e) answering the questions does not threaten, embarrass, or violate the privacy of the respondent or encourage the respondent to respond in socially desirable ways (Gonyea, 2006; Kuh & Associates, 2001; Kuh & Hu, 2001).

Student Records

Student records, matched using student identifiers collected during the CSEQ online administration, were provided by the institutional research office at Indiana University Bloomington (IUB). These arrived in four general categories of information: (a) family background (e.g., financial status, parental education level, first generation student status), (b) intellectual and academic ability (e.g., high school class rank and college entrance exam scores), (c) information from the students' applications to IUB (e.g., when the student applied, various questions about the student's expectations and reasons for applying), and (d) information about the student's academic experiences at IUB (e.g., cumulative and semester grades, enrollment status, credit hours per semester, courses of study, retention information, declared majors). Another variable obtained from IUB is a record of the number of times the first-year students used the services of two academic support centers located within separate residence halls on campus. These centers provide tutoring in the areas most commonly addressed in the first-year general education curriculum at the institution. Each time students visited the center they were asked to swipe a student ID, thus providing a count of the number of times the student visited for tutoring help.

Measurement Model

The measurement models consisted of 69 measured variables that comprise ten factors (see Table 1). All alpha reliabilities are greater than .70 with the exception of the reading and writing factor (READWRIT) which has an alpha reliability of .49. It may be that the reading and writing items are better represented as a summative scale rather than as a factor that requires inter-item correlation for adequate properties. Therefore caution is advised when interpreting results utilizing this variable in the model, as underestimation of coefficients may be possible. The analysis also utilizes nine measured variables that are not incorporated within factors. These include SAT Composite Score, high school class rank, gender (being male), race/ethnic identification, aspiration to attend graduate school, financial status, participation in the campus tutoring center and cumulative grade point average. All factors and measured variables in the study were represented in their standardized form, allowing interpretation of each unstandardized *B* coefficient as an effect size. Thus the magnitude of the effect of each variable within the model is comparable from one relationship to the next.

Item parceling

In an effort to produce a more stable structural model and a smaller ratio of variables to sample size, this study employed the technique of item parceling (Bagozzi & Edwards, 1998;

Bagozzi & Heatherton, 1994). Within-factor variables were summed into 2- and 3-item parcels before constructing measurement models. Given that the majority of items on the CSEQ consist of a limited four-option response set (very often, often, occasionally, never), combining the 2- and 3-item groupings creates measured variables with a broader range and greater variance upon which to build the latent constructs. This technique aims to reduce the number of observed components within each measurement model to 3 or 4, thereby optimizing the mathematical properties that lead to better fit. Parceling is a proven technique to reduce bias in the estimates of structural parameters and results in better fitting solutions (Bandalos, 2002).

Table 1
Factors, Alpha Reliabilities, Component Items, and Factor Loadings

Factor (Alpha Reliability) and Component Items	Loading
COMPUTE Computer and Information Technology (α =.77)	
Used a computer tutorial to learn material for a course or developmental/remedial program	.52
Participated in class discussions using an electronic medium (e-mail, list-serve, chat group, etc.)	.50
Used a computer to retrieve materials from a library not at this institution	.49
Used to a computer to produce visual displays of information (charts, graphs, spreadsheets, etc.)	.77
Used a computer to analyze data (statistics, forecasting, etc.)	.79
Developed a Web page or multimedia presentation	.53
INTEGRAT Integrative Learning Activities (α =.87)	
Tried to see how different facts and ideas fit together	.54
Applied material learned in a class to other areas (your job or internship, other courses, relationships with friends, family, co-workers, etc.)	.67
Used information or experience from other areas of your life (job, internship, interactions with others) in class discussions or assignments	.67
Tried to explain material from a course to someone else (another student, friend, co-worker, family member)	.65
Worked on a paper or project where you had to integrate ideas from various sources	.57
Referred to knowledge you acquired in your reading or classes	.70
Explored different ways of thinking about the topic	.67
Referred to something one of your instructors said about the topic	.73
Subsequently read something that was related to the topic	.67
WRITING Experiences with Writing (α =.80)	
Used a dictionary or thesaurus to lookup the proper meaning of words	.57
Thought about grammar, sentence structure, word choice, and sequence of ideas or points as you were writing	.45
Asked other people to read something you wrote to see if it was clear to them	.64
Referred to a book or manual about writing style, grammar, etc.	.67
Revised a paper or composition two or more times before you were satisfied with it	.73
Asked an instructor or staff member for advice and help to improve your writing	.69

Factor (Alpha Reliability) and Component Items	Loading
STUFAC Student-Faculty Interactions (α =.87)	
Talked with your instructor about information related to a course you were taking (grades, make-up work, assignments, etc.)	.71
Discussed your academic program or course selection with a faculty member	.72
Discussed ideas for a term paper or other class project with a faculty member	.70
Discussed your career plans and ambitions with a faculty member	.68
Worked harder as a result of feedback from an instructor	.70
Participated with other students in a discussion with one or more faculty members outside of class	.51
Asked your instructor for comments and criticisms about your academic performance	.74
Worked harder than you thought you could to meet an instructor's expectations and standards	.61
INTDIVRS Interactional Diversity (α =.90)	
Became acquainted with students whose interests were different from yours	.67
Became acquainted with students whose family background (economic, social) was different from yours	.70
Became acquainted with students whose age was different from yours	.61
Became acquainted with students whose race or ethnic background was different from yours	.72
Became acquainted with students from another country	.69
Had serious discussions with students whose philosophy of life or personal values were very different from you	.75
Had serious discussions with students whose political opinions were very different from yours	.65
Had serious discussions with students whose religious beliefs were very different from yours	.70
Had serious discussions with students whose race or ethnic background was different from yours	.80
Had serious discussions with students from a country different from yours	.70
CONTOPS Engaging in Substantive Conversations (α =.86)	
Current events in the news	.59
Social issues such as peace, justice, human rights, equality, race relations	.78
Different lifestyles, customs, and religions	.65
The ideas and views of other people such as writers, philosophers, historians	.73
The arts (painting, poetry, dance, theatrical productions, symphony, movies, etc.)	.49
Science (theories, experiments, methods, etc.)	.48
Computers and other technologies	.41
Social and ethical issues related to science and technology such as energy, pollution, chemicals, genetics, military use	.71
The economy (employment, wealth, poverty, debt, trade, etc.)	.64
International relations (human rights, free trade, military activities, political differences, etc.)	.75
READWRIT Amount of Reading and Writing (α =.49)	
During this current year, about how many textbooks or assigned books have your read?	.55
During this current year, about how many assigned packs of course readings have your read?	.37
During this current school year, about how many essay exams have you written for your courses?	.43
During this current school year, about how many term papers or other written reports have you written?	.39
ENVIRON Perceptions of the Campus Environment (α =.79)	
Emphasis on academic, scholarly, and intellectual qualities	.74
Emphasis on aesthetic, expressive, and creative qualities	.69
Emphasis on critical, evaluative, and analytical qualities	.74
Emphasis on understanding and appreciation for human diversity	.55
Emphasis on information literacy skills (using computers, other information resources)	.56

Factor (Alpha Reliability) and Component Items	Loading
GNGENED Gains in General Education (α =.81)	
Gaining a broad general education about different fields of knowledge	.48
Broadening your acquaintance with and enjoyment of literature	.74
Seeing the importance of history for understanding the present as well as the past	.72
Gaining knowledge about other parts of the world and other people (Asia, Africa, South America, etc.)	.69
Becoming aware of different philosophies, cultures, and ways of life	.64
GNINTSK Gains in Intellectual Skills (α =.84)	
Writing clearly and effectively	.66
Presenting ideas and information effectively when speaking to others	.70
Using computers and other information technologies	.53
Thinking analytically and logically	.76
Putting ideas together, seeing relationships, similarities, and differences between ideas	.76
Learning on your own, pursuing ideas, and finding information you need	.67

Data Analysis

The primary tool used for data analysis was structural equation modeling (SEM) using EQS version 5.7b (Bentler, 1995; Byrne, 1994). Byrne (1994) defines SEM as a "statistical methodology that takes a confirmatory or hypothesis-testing approach to the multivariate analysis of a structural theory bearing on some phenomenon. Typically, this theory represents 'causal' processes that generate observations on multiple variables" (p. 3). Several higher education researchers have demonstrated that SEM is a powerful and appropriate tool for the estimation of relationships among components of input, environment, and output in the study of college impact (Cabrera, Nora, & Castaneda, 1992, 1993; Davis & Murrell, 1993; Hossler & Stage, 1992; Li, Long, & Simpson, 1998; Pike, 1991b, 1992; Pike, Kuh, & Gonyea, 2003). Concepts such as achievement, satisfaction, and engagement – antecedents learning, grades, and retention – are difficult to measure directly, so treating them as latent constructs provides practical advantages over traditional statistical models (Pike, 1991a).

Model Fitting

The standard goodness-of-fit measure for analyzing structural models is the chi-squared statistic, a measure of the comparison between the actual data and the model representation of the data. A nonsignificant chi-squared statistic indicates a good fit between the model and the data. Chi-squared values, however, are strongly influenced by sample size. As alternatives, Raykov, Tomer, and Nesselroade (1991) recommend the Normed Fit Index (NFI), Non-normed fit index (NNFI), and the Comparative Fit Index (CFI). Of these, the CFI is cited by experts as the index of choice (Bentler, 1990; Byrne, 1994) because it takes sample size into account. Values of the CFI range from 0.00 to 1.00, and current standards for acceptable fit suggest that it should exceed .90 for an acceptable fit, and .95 for models considered to fit very well (Byrne, 1994). Boomsma (2000) also recommends a misfit index known as the Root Mean Square Error of Approximation (RMSEA). The RMSEA score should be equal to or below .10 for a good fit and below .05 for the models considered to fit well.

The conceptual model depicted in Figure 3 guided the process of fitting variables for three models. In each model, relationships among seventeen observed and latent variables are hypothesized along with their influence on the dependent variable, generating over 300 potential

relationships to be specified in each model. Rather than build and run initial models that provide an exact match to the conceptual model, the models were built in stages by fitting one piece of the conceptual model at a time. This method reduced the complexity of the model building process and avoided the problem of specification errors that inevitably result from estimating so many simultaneous equations.

The first step involved testing the items that were suggested by the conceptual model to have direct effects on each outcome variable. To assist the model fitting process, the EQS program provides a Lagrange Multiplier (LM) Test to investigate hypotheses regarding the statistical viability of adding relationship paths between model variables, and a Wald Test to determine if any non-significant paths between variables could be eliminated. However, because the LM and Wald tests are based solely on statistical criteria, Byrne (1994) strongly recommends consulting substantive theory before adding or relaxing any constraints with the model. Thus, a bivariate relationship was included if the change was reasonable in terms of what is known about the constructs from the literature, and substantially improved model fit. Paths were eliminated from the model if the effect parameters were not statistically significant and if excluding the path from the model did not adversely affect goodness of fit. This process allowed a model to be specified, tested, re-specified, and re-tested until an acceptable model was identified.

Limitations

This study has at least four notable limitations. First, the analysis utilizes data from only one institution. Further research in other colleges and universities, and especially multi-institution studies whenever possible, will be needed to confirm the results of the current study. Second, student self-estimates of gains consistently produce moderate positive correlations across all domains (Kuh et al., 1997; Pace, 1990). This points toward the existence of a general outcome factor that may mask the relationships between educational outcomes and college experiences (Pike, 1995, 1996; Terenzini, Pascarella, & Lorang, 1982). Pike (1999a) investigated this “constant error of the halo” and cautioned institutional researchers to take it into account when interpreting student self-reported gains. Third, the use of the self-reported items introduces a potential problem with the temporal ordering of some measured variables in the study. The study assumes, for example, that students’ opinions of the campus climate preceded their gains in intellectual skill development. Yet students completed both the environment items and the gains items during one sitting. Therefore, it is plausible that the gains caused the student’s attitude toward the campus environment to shift. Finally, a potential drawback in assessing first-year students is that it may be too soon in the college experience to observe the impact of some aspects of student engagement on their development. For example, one study speculated that the effects of student-faculty interaction and peer interaction may not be fully evident until the junior or senior years (Bean & Kuh, 1984).

Results

Results of the three structural models are below. The description of each model includes a discussion of goodness-of-fit statistics, and direct and indirect effects. Following that is a discussion revisiting the two research questions and conclusions that are based on what is learned overall from the three models.

First Year Cumulative Grade Point Average

The final structural model estimating relationships among precollege, engagement, and environment variables as they explain cumulative grades at the end of the first year of college is shown in Figure 4 and Table 2. Goodness-of-fit statistics for the model show a Comparative Fit Index (CFI) of .922, indicating a good fit (>.90), but perhaps not a strong fit (>.95) (Bentler, 1990; Byrne, 1994). The Root Mean Squared Error of Approximation (RMSEA) is .045 which meets the .05 standard for goodness-of-fit (Boomsma, 2000).

Direct Effects

Consistent with previous studies, precollege ability is the strongest predictor of first-year student grades. High school class rank (HSRANK) shows the strongest direct coefficient (.39) followed by the total SAT score (SATTOT) (.28). Other significant direct effects on first year GPA include the amount of time spent in academic preparation (ACADPREP) (.14), attendance at the academic tutoring center (TUTOR) (.10), and the writing experiences factor (WRITING) (.09). Taken together, these five components explain 37% of the variance in first year GPA.

Indirect Effects

Six items had an indirect effect on first year GPA. For example, the amount of reading and writing assigned (READWRIT) has a moderately strong impact on the amount of time the student spends in academic preparation (.37) and on the frequency of engagement in good writing practices (.39). Taken together, these paths total a modest total effect of .09 for the reading and writing factor. The SAT Composite score affects GPA indirectly through two components, attendance at the tutoring center (TUTOR) and writing experiences (WRITING), and both are negatively related. In other words, students with lower SAT scores are more likely to seek tutoring assistance and to engage in remedial writing activities than students with higher SAT scores. But the model also shows that when students get tutoring and practice good writing habits they can improve their grades. Thus the direct effect of the SAT score is mitigated by activities that are intended to support lower ability students.

Figure 4:
Factors Contributing to First-Year Cumulative Grade Point Average

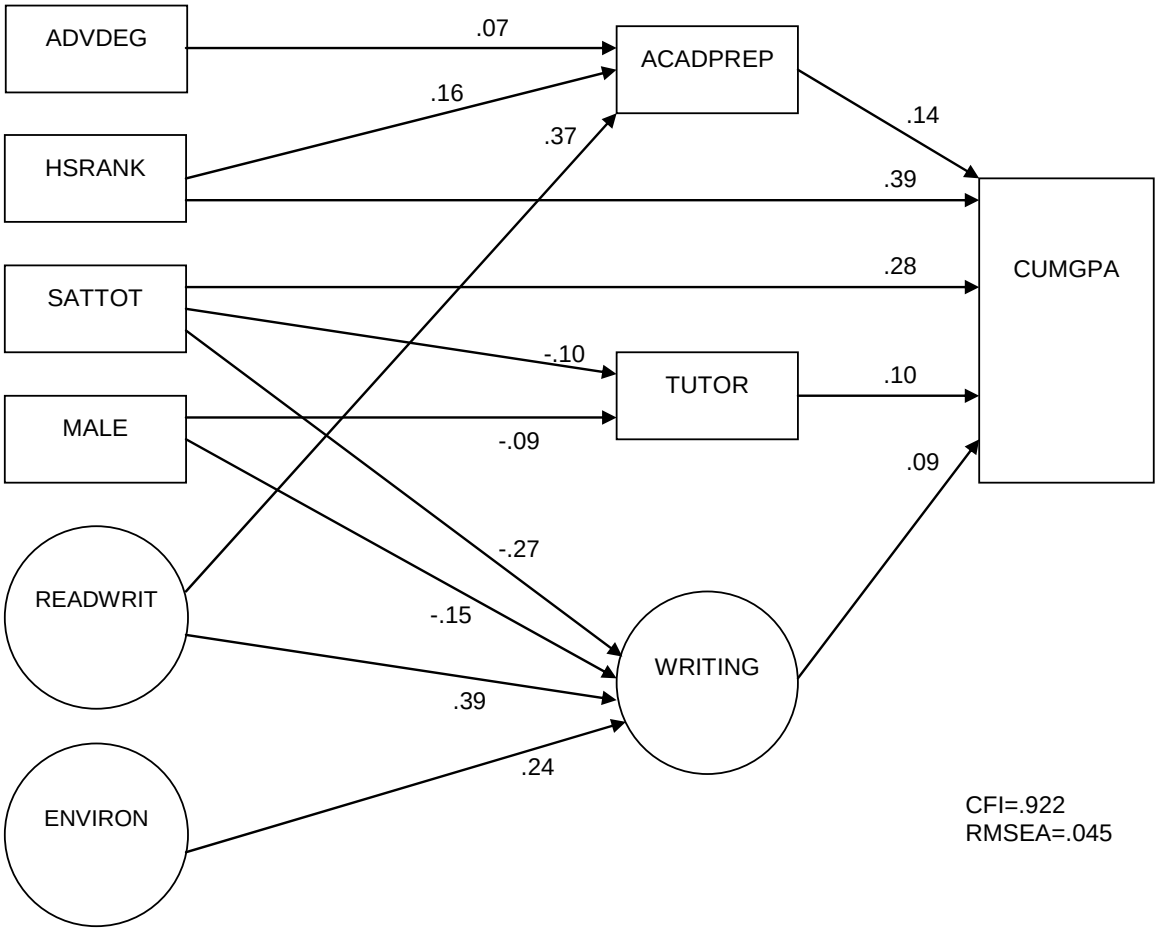


Table 2
Direct, Indirect, and Total Effects on First-Year Cumulative GPA

Variable Name	Variable Description	Direct Effects	Indirect Effects			Total Effects
			Indirect Path	*Effect of Indirect Path*	*Total Indirect Effects*	
SATTOT	SAT total score (math + verbal)	.28	SATTOT-WRITEXP-CUMGPA	-.02	-.03	.25
			SATTOT-TUTOR-CUMGPA	-.01		
HSRANK	High school class rank	.39	HSRANK-ACADPREP-CUMGPA	.02	.02	.42
WRITING	Writing experiences	.09				.09
TUTOR	Number of visits to academic support center	.10				.10
ACADPREP	Number of hours in academic preparation	.14				.14
MALE	Male=1; Female=0		MALE-WRITEXP-CUMGPA	-.01	-.02	-.02
			MALE-TUTOR-CUMGPA	-.01		
ADVDEG	Intention to enroll in post-baccalaureate degree program		ADVDEG-ACADPREP-CUMGPA	.01	.01	.01
ENVIRON	Perception of institutional emphasis on scholarly and intellectual activities		ENVIRON-WRITEXP-CUMGPA	.02	.02	.02
READWRIT	Amount of reading and writing		READWRIT-WRITEXP-CUMGPA	.03	.09	.09
			READWRIT-ACADPREP-CUMGPA	.05		

Goodness of fit statistics: CFI = .922; RMSEA = .045

First Year Gains in Intellectual Skills

The second structural model estimates relationships among precollege characteristics, engagement, and environment variables as they affect gains in intellectual skills during the first year of college (Figure 5 and Table 3). The dominant relationship contained within the model positions the amount of reading and writing assigned by instructors as a precursor to the other five factors. Goodness-of-fit statistics for the model show a Comparative Fit Index (CFI) of .914, indicating a good fit (>.90), but perhaps not a strong fit (>.95) (Bentler, 1990; Byrne, 1994). The Root Mean Squared Error of Approximation (RMSEA) is .049 indicating a good fit (Boomsma, 2000).

Direct Effects

Four latent factors are shown in Figure 5 to have positive direct effects on gains in intellectual skills: experiences with writing (WRITING), quality of effort in computing and information technology (COMPUTE), integrative learning activities (INTEGRAT), and perceptions of the campus environment (ENVIRON). The first three are quality of effort activities that have logical relationships with individual items within the intellectual skills factor, which contains gains items with a degree of content overlap. The fourth, perceptions of the campus environment (ENVIRON), has the strongest direct relationship (.42) with the intellectual skills factor.

Indirect Effects

Being male has a negative effect (-.20) on WRITING and a positive effect (.17) on COMPUTE. Because the products of the two indirect paths from MALE to the dependent variable are in opposite directions, the total effect of gender on this particular outcome variable is a wash. The other background item with an indirect effect is aspiring to an advanced degree (ADVDEG). This item has a modest relationship (.18) with the amount of reading and writing, the most influential factor within the model. Thus, ADVDEG has five different indirect paths to the dependent variable, and combines several small, positive effects into a non-trivial total indirect effect of .10. The latent factor representing the quality of effort in topics of conversation (CONTOPS) has one of the most robust indirect effects (.16) on gains in intellectual skills. It does this by strongly influencing the integrative learning factor (INTEGRAT). Most prominent among the indirect variables, however, is the influence of the amount of reading and writing with the model. READWRIT functions as the leverage point by positively influencing five other factors that in turn have a positive impact on gains in intellectual skills. Each of these indirect paths has a moderate effect on the dependent variable, and in total show that READWRIT has a strong effect (.57) on gains in intellectual skills, in fact stronger than any of the direct relationships.

Figure 5
Factors Contributing to First-Year Gains in Intellectual Skills

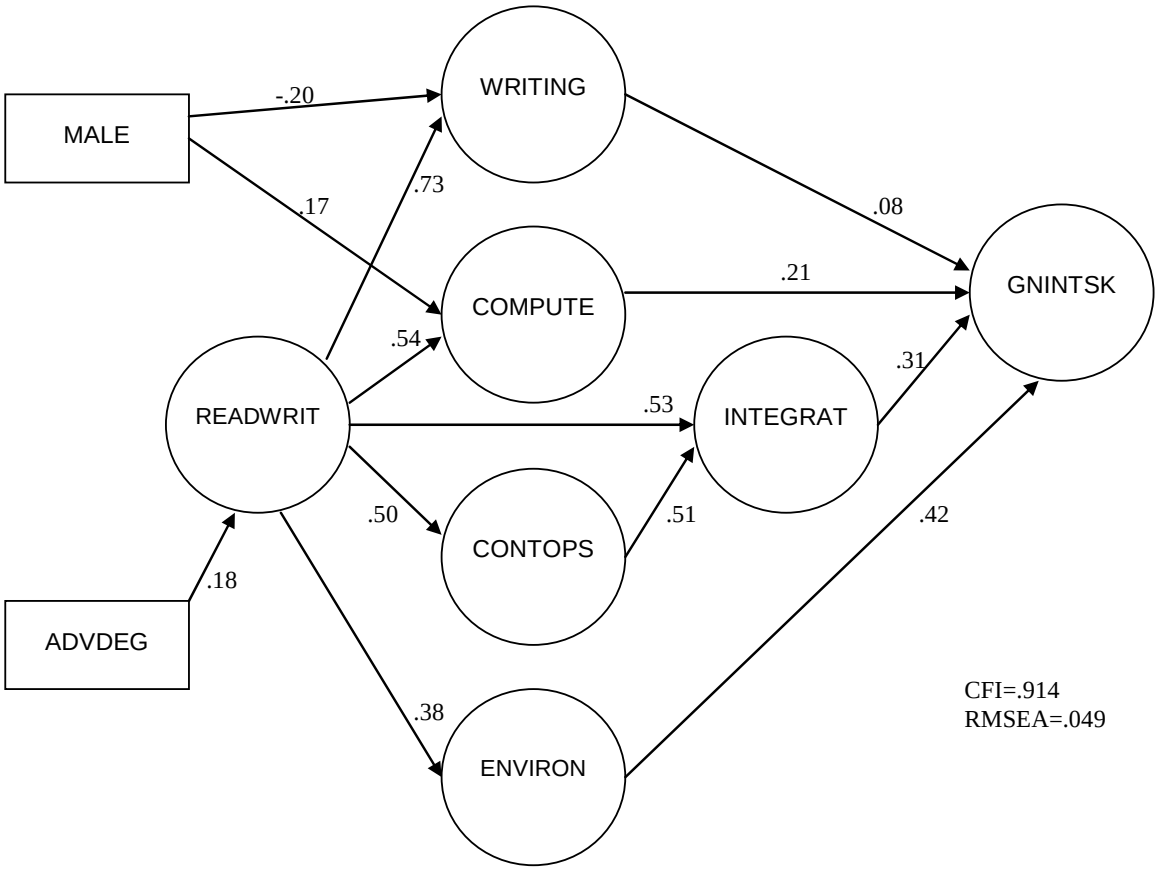


Table 3
Direct, Indirect, and Total Effects on First-Year Gains in Intellectual Skills

Variable Name	Variable Description	Direct Effects	Indirect Effects			Total Effects
			Indirect Path	*Effect of Indirect Path*	*Total Indirect Effects*	
WRITING	Quality of effort in writing experiences	.08				.08
COMPUTE	Quality of effort in using computers and information technology	.21				.21
ENVIRON	Institutional emphasis on scholarly and intellectual activities	.42				.42
INTEGRAT	Integration of learning	.31				.31
CONTOPS	Quality of effort in topics of conversation		CONTOPS-INTEGRAT-GNINTSK	.16	.16	.16
MALE	Male=1, Female=0		MALE-WRITEXP-GNINTSK	-.02	.02	.02
			MALE-COMPUTE-GNINTSK	.03		
ADVDEG	Intention to enroll in advanced degree program		ADVDEG-READWRIT-ENVIRON-GNINTSK	.03	.10	.10
			ADVDEG-READWRIT-WRITEXP-GNINTSK	.01		
			ADVDEG-READWRIT-COMPUTE-GNINTSK	.02		
			ADVDEG-READWRIT-INTEGRAT-GNINTSK	.03		
			ADVDEG-READWRIT-CONTOPS-INTEGRAT-	.01		
READWRIT	Amount of reading and writing		READWRIT-ENVIRON-GNINTSK	.16	.57	.57
			READWRIT-WRITEXP-GNINTSK	.06		
			READWRIT-COMPUTE-GNINTSK	.11		
			READWRIT-INTEGRAT-GNINTSK	.16		
			READWRIT-CONTOPS-INTEGRAT-GNINTSK	.08		

Goodness of fit statistics: CFI = .914; RMSEA = .049

First Year Gains in General Education

The third structural model, estimating relationships between background, experiences, perceptions of the environment, and gains in general education, is shown in Figure 6 and Table 4. Goodness-of-fit statistics for the general education model show a Comparative Fit Index (CFI) of .900, just at the standard cut-off point indicating a good (>.90), but not strong (>.95), fit (Bentler, 1990; Byrne, 1994). The Root Mean Squared Error of Approximation (RMSEA) is .047, indicating a good fit (Boomsma, 2000).

Direct Effects

Three latent factors, integrative learning activities (INTEGRAT), interactional diversity activities (INTDIVRS), and perceptions of the campus environment (ENVIRON), have a direct effect on gains in general education. Of these, INTEGRAT has the strongest relationship (.51) and serves as the focal point of the model through which five variables having indirect effects through it to the dependent variable. ENVIRON has a moderately-sized effect (.30) and has no relationship with any other component within the model. INTDIVRS plays a variety of roles within the model, including covariance with two latent factors, STUFAC and CONTOPS, and an additional indirect relationship to the dependent variable via INTEGRAT. Also, as expected, INTDIVRS is influenced somewhat by the dummy-coded race variable.

Indirect Effects

Six variables have a measurable indirect effect on gains in general education, including plans to pursue an advanced post-baccalaureate degree (ADVDEG), the amount of reading and writing (READWRIT), student-faculty interactions (STUFAC), topics of conversations (CONTOPS), interactional diversity activities (INTDIVRS), and race/ethnicity (RACE). Five of these influence the single most effective latent variable in the model, INTEGRAT, and thus are able to have sizeable indirect effects. For example, ADVDEG has a small but non-trivial indirect effect of .04. The indirect role of READWRIT has not nearly the same magnitude as within the intellectual skills model. In addition, the model includes an estimate of covariance between READWRIT and STUFAC that was necessary to improve model fit. Three latent factors akin to interactions with agents of socialization (Pascarella, 1985) are intercorrelated within the general education model, and have modest indirect effects through the integrative learning activities factor. These are STUFAC (.15), CONTOPS (.31), and INTDIVRS (.04).

Figure 6
Factors Contributing to First-Year Gains in General Education

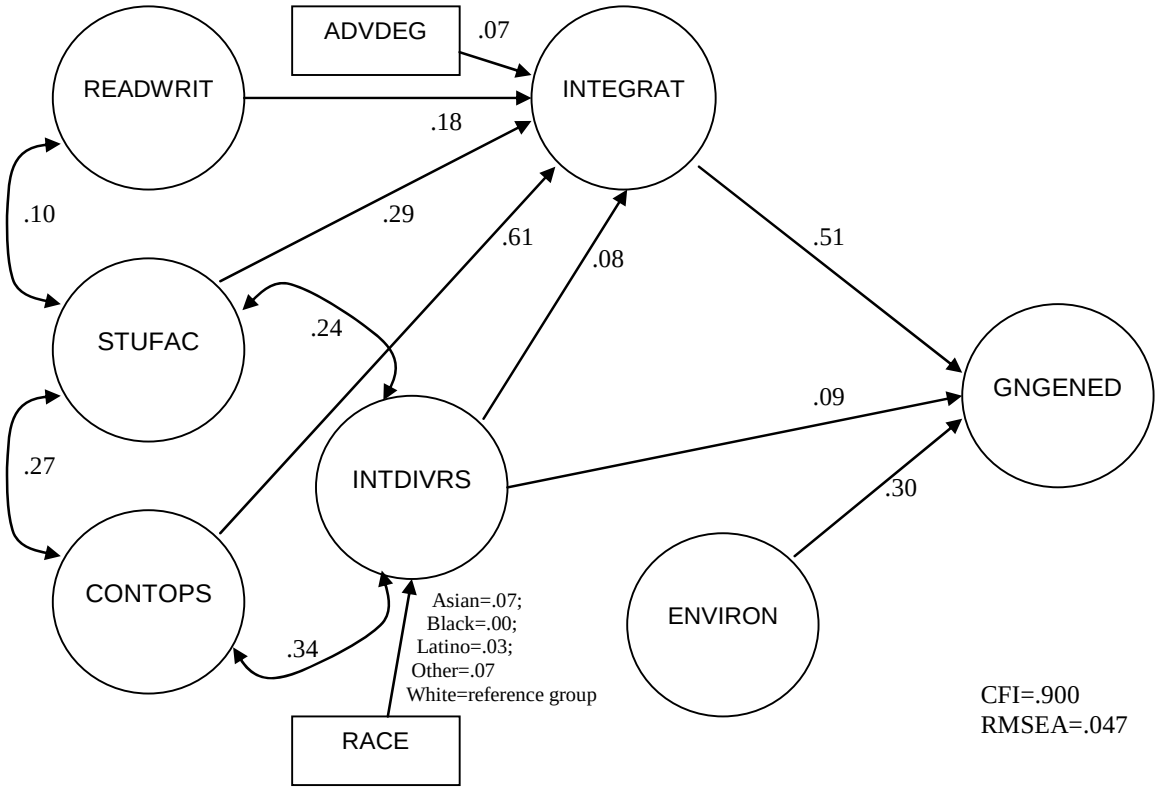


Table 4
Direct, Indirect, and Total Effects on First-Year Gains in General Education

Variable Name	Variable Description	Direct Effects	Indirect Effects			Total Effects
			Indirect Path	*Effect of Indirect Path*	*Total Indirect Effects*	
INTDIVRS	CSEQ Interactional Diversity Scale	.09	INTDIVRS-INTEGRAT-GNGENED	.04	.04	.13
INTEGRAT	CSEQ Integration of Learning Scale	.51				.51
ENVIRON	Perceptions of the Campus Environment	.30				.30
READWRIT	Intensity of Reading and Writing		READWRIT-INTEGRAT-GNGENED	.09	.09	.09
STUFAC	Student-Faculty Interaction		STUFAC-INTEGRAT-GNGENED	.15	.15	.15
CONTOPS	CSEQ Topics of Conversation Scale		CONTPS-INTEGRAT-GNGENED	.31	.31	.31
ASIAN	Asian or Pacific Islander		ASIAN-INTDIVRS-GNGENED ASIAN-INTDIVRS-INTEGRAT-GNGENED	.01 .01	.01	.01
BLACK	Black or African American		BLACK-INTDIVRS-GNGENED BLACK-INTDIVRS-INTEGRAT-	.00 .00	.00	.00
LATINO	Latino, Mexican American, or Other Hispanic		LATINO-INTDIVRS-GNGENED LATINO-INTDIVRS-INTEGRAT-	.00 .00	.00	.00
OTHER	Other Race or Ethnicity		OTHER-INTDIVRS-GNGENED OTHER-INTDIVRS-INTEGRAT-	.01 .01	.01	.01
ADVDEG	Plans to Pursue an Advanced Degree		ADVDEG-INTEGRAT-GNGENED	.04	.04	.04

Goodness of fit statistics: CFI = .900; RMSEA = .047

Discussion

This section discusses the results of the two research questions. Rather than discuss each of the three models sequentially as in the previous section, the research questions are best informed by a comprehensive interpretation of the results.

Research Question 1: Effects of Student Engagement on First-Year Outcomes

The engagement variables were presented in four main groupings, academic engagement, social engagement, integrative learning, and perceptions of the campus environment. Table 5 summarizes the total effects of each variable within all three models.

Academic Engagement

The measurement model listed five measures representing the student's effort and involvement in academic engagement: (a) writing experiences, (b) amount reading and writing, (c) utilization of tutoring services, (d) hours per week spent in academic preparation, and (e) employing computers and information technology. The writing experiences factor, composed of six items that take a decidedly remedial approach to the quality of effort toward writing practice, has a small, positive direct effect in both the GPA and intellectual skills models. Though small, this effect on the cumulative GPA may mean that a little extra effort by a student to improve writing could raise his or her course grade. The second academic engagement factor is the amount of reading and writing assigned through coursework. This factor contributes considerably, and in the case of intellectual skills, centrally, in all three structural equation model solutions, although in no situation does the amount of assigned reading and writing have a direct effect on the dependent variable. In all three models, assigned reading and writing drives student behaviors toward other engagement activities and the outcomes that result. In this case, the direction of the causal relationship is clear because students learn of the amount of required reading and writing the first day of classes through course syllabi and verbal introductions to the course by instructors. The reading and writing factor plays an indispensable central role within the intellectual skills model, indicating that the rigor of assigned reading and writing is a large reason for student gains in intellectual skills. Utilizing the campus tutoring center paid off for students with a direct modest impact on cumulative GPA. Women and students with lower SAT Composite scores were more likely to work with a tutor, and were thus more likely to see better grades as a result.

The number of hours students spent outside of class on activities related to their academic program, such as studying, writing, reading, lab work, rehearsing, etc., was moderately related to GPA, but had no effect within either of the other models. This item was influenced by three other variables in the model: expectation to enroll in a post-baccalaureate study program, high school class rank, and the amount of assigned reading and writing. It takes motivation and self-discipline to spend many hours doing academic work outside of class. The total of these indirect influences through the academic preparation variable perhaps offer a definition of the motivated student. Students who expect to attend graduate school after earning a bachelor's degree have a high measure of self-confidence in their academic abilities, and strive to achieve good grades in order to reach their educational goals. Likewise, as a precollege indicator, high school class rank is a measure of students who were competitive within their graduating class. Often students graduate higher in their class than their SAT scores indicate, a difference attributed to the level of the student's motivation to succeed. Finally, the amount of reading and writing, as discussed

above, was a force that impels students to spend more time doing academic work outside of class. In sum, these three represent the student's past (high school rank), present (reading and writing) and future (expectation to enroll in advanced degree program) sources of motivation.

Table 5
Summary of Total Effects in Three First-Year Student Outcome Models

Variable		Variable Name	Model Dependent Variable: GPA	Intellectual Skills	General Education
Background Characteristics	SAT total score	SATTOT	.25	-	-
	High school class rank	HSRANK	.42	-	-
	Male	MALE	-.02	.02	-
	Race	RACE	-	-	-
	Graduate school aspiration	ADVDEG	.01	.10	.04
	Financial status	FINANCE	-	-	-
Engagement with Agents of Socialization	Student-faculty interaction	STUFAC	-	-	.15
	Diversity interaction	INTDIVRS	-	-	.13
	Conversation topics	CONTOPS	-	.16	.31
Academic Engagement	Writing experiences	WRITEXP	.09	.08	-
	Reading and writing	READWRIT	.09	.57	.09
	Attend tutoring center	TUTOR	.10	-	-
	Amount of time studying	ACADPREP	.14	-	-
	Use of the library	LIBRARY	-	-	-
	Comput/tech experiences	COMPUTE	-	.21	-
Integrative learning activities		INTEGRAT	-	.31	.51
Perceptions of the scholarly environment		SCHOLENV	.02	.42	.30

The factor representing use of computers and information technology was a significant component in the intellectual skills model. In this model, computing experiences have a direct effect on gains in intellectual skills, and are modified by gender and the amount of reading and writing assigned to students. The direct relationship to the intellectual skills factor is not

surprising given that one of the skills that comprise this factor is making progress in using computers and other information technologies. However, it also stands to reason that these same experiences could benefit other items within the intellectual skills factor, namely, writing ability, thinking analytically and logically, synthesizing different ideas, and learning on one's own. Indeed, the amount of reading and writing has a direct impact on this factor in the intellectual skills model. In this case, computing and information technology may be a considered a versatile tool that enriches learning for students. Moreover, men put computing skills into practice more than women, and thus may realize more gains indirectly through these experiences. This may offset the deficit males experience by engaging in remedial writing experiences less often than do women.

Engagement with Agents of Socialization

The measurement model listed three measures representing the student's engagement with agents of socialization on the campus: (a) student-faculty interaction, (b) interactional diversity, and (c) engaging in substantive conversations. The student-faculty interaction factor does not produce a significant relationship within either the GPA or intellectual skills models, but it does play a somewhat ambiguous role in the general education model, covarying with three other factors: amount of reading and writing, conversations, and interactional diversity. Student-faculty interaction also has a direct, positive relationship with the integrative learning factor, and thus an indirect effect of .15 on gains in general education. One might have expected the items in this factor to have an influence within the other two models as well. One explanation, especially concerning GPA, is that while we often think of motivated and academically-oriented students visiting their professors, students are also likely to visit faculty members when they are failing or doing poorly in the class. Too often an improvement in grades is too late by the time this latter event occurs. The non-significant bivariate correlation between this factor and cumulative GPA supports the notion that both successful and unsuccessful students interact with faculty members. Like student-faculty interaction, the interactional diversity factor is significant only in the general education model. In addition to the aforementioned triangle of covariance with student-faculty interactions and conversations, this factor has a direct effect on gains in general education. This relationship makes sense given that the individual items composing the general education model overlap in content in areas such as gains in knowledge about other parts of the world and people, and gains in understanding of different philosophies, cultures, and ways of life. One would expect, then, that frequent conversations with peers, diverse in terms of family background, age, interests, race and ethnicity, religious beliefs, and political opinions, would foster a sense that students have gained more in such general education topics. Interactional diversity also has an indirect effect on general education gains through the integrative learning factor.

Engaging in substantive conversations has indirect effects within both the intellectual skills and general education models. In both, it influences the integrative learning factor strongly and positively, which in turn has a direct impact on the outcome variable. That conversations have a strong relationship with integrative learning is understandable. Students who are more inclined to converse with others about a variety of topics are also more likely to, as the items with integrative learning suggest, refer to information from their coursework, explore different ways of thinking about a topic, quote or paraphrase what an instructor said, or seek out additional reading material on the topic.

Integration

The intellectual skills and general education models support Chickering's (1974) idea of integration, and also the research by Davis and Murrell (1993), Pike (1995), and Pike, Kuh, and Gonyea (2003). The integration factor has a direct effect on the outcome in both models, and plays an especially important role in students' self-reported gains in general education. In addition, in both models it is influenced by other engagement factors that have indirect effects on the outcome variables. In the intellectual skills model, high expectations for reading and writing may give students the opportunity to struggle with new ideas, to formulate their own opinions, make connections, and borrow from other areas of their life to make sense of the information. It may also be that the writing process requires integration. Good writing forces the student to make connections, draw from various sources, bring in their own experiences, and apply what they have learned to new situations. In this sense, writing and integration are mutually reinforcing. Participating in a variety of intellectual conversations is also a fruitful exercise for the first-year student. Like writing, a thoughtful conversation requires the student to communicate coherent and persuasive thoughts, and is thus depends on integration to be effective. Students draw not only from their coursework, but also from their lived experiences.

Perceptions of the Campus Environment

The factor representing perceptions of the campus environment (ENVIRON) is significant in all three models, but less so in the GPA model where it only has a small indirect effect on cumulative grades. In the intellectual skills and general education models perceptions of the campus environment have a direct positive effect on the outcome variable, and both are of moderate magnitude. In the intellectual skills model, as mentioned earlier, the amount of reading and writing that students are asked to do influences their perceptions of the campus environment, and thus has a meaningful effect on the outcome.

Research Question 2: Effects of Student Background Characteristics

In the conceptual model, six precollege measures were posited to have influence on the three outcome measures. These are the SAT Composite score, high school class ranking, gender (being male), race, aspiration to attend graduate school, and financial status. Consistent with prior research, precollege ability measures of SAT and HS class rank are strong predictors of GPA, but neither is significant within the other two models. Interestingly, they have differing indirect effects within the GPA model. SAT has a negative relationship with student use of the tutoring center and with the writing experiences factor. Students with higher intellectual ability are probably less in need of tutoring from peers or remedial writing activities. In addition to its direct effect on GPA, high school class rank has a positive relationship with the academic preparation factor. It may be that their success in high school was the result of a strong work ethic, and that work ethic is carried forth into college. It may also be that success in high school leads to academic confidence, which is evident in the amount of time the student spends doing course-related work.

Gender is a significant variable in both the GPA and intellectual skills models. In the GPA model, men are less likely to utilize the tutoring service and to put effort toward improving their writing, although these effects are small. What is unfortunate for men, however, is that both of these activities lead to improvements in grades at the end of the first year of college. Seeking tutoring and the activities comprising the writing experiences factors are essentially about asking for assistance. It may be that socialization factors lead to a greater willingness among women to seek help than men. Likewise, in the intellectual skills model, men score lower than women on

the writing experiences factor, but they have higher scores on the computer and information technology factor, thus having opposite effects in the model. However, because the computer and information technology factor has a stronger impact on the outcome variable, the total result favors men slightly.

According to the three models, race/ethnic status appears unimportant when it comes to success in the first year of college. This finding is consistent with reports from the National Survey of Student Engagement saying that students of different racial and ethnic groups are engaged at comparable levels on the various indices of effective educational practice. However, it is, at least for this institution, somewhat incongruent with conclusions about cultural barriers playing a part in student success, and that underrepresented racial groups are disadvantaged (Hurtado & et al., 1996; Hurtado et al., 1997; Hurtado et al., 1998).

Student intention to enroll for an advanced degree (ADVDEG) after completing their undergraduate degree, a measure of motivation to succeed as an undergraduate student, has an indirect positive influence in all three models, although the effect sizes are small. In the GPA model intending to enroll for an advanced degree has a small but non-trivial effect on the amount of hours per week in academic preparation. Thus, this item may indeed be functioning as an indicator of academic motivation. In the intellectual skills model ADVDEG has a modest effect on the amount of reading and writing a student is doing in classes, suggesting that academically motivated students are taking more rigorous courses. The interesting effect of this relationship is that this variable takes advantage of the central position of the reading/writing factor, and has a larger than expected total effect. Finally, in the general education model ADVDEG has a small effect on the integrative learning factor (INTEGRAT). Because INTEGRAT has a strong direct effect (.51) on gains in general education, any variable that affects it will also have a non-trivial effect on the outcome. In this case, the total effect of ADVDEG on the outcome variable is .04.

Finally, although the conceptual model anticipated that financial status would be an important precollege predictor of success in the first year of college, it is not significant in any of the models.

Conclusions and Implications

The conceptual model tested in this study did not fit the data very well for any of the three outcome variables. Each of the three models emerged with unique characteristics and perhaps a different story to tell. Based on a thorough analysis of the three models taken together, four conclusions are drawn about the relationships between student background, engagement, and desirable first-year student outcomes.

1. *Different forms of engagement are precursors to different outcomes.*

The models in this study are very different, one from the other, meaning that efforts required to achieve different desired outcomes at the end of the first year of college are not equivalent. This suggests that engagement is not a unidimensional construct, but is rather a general *category* of college experiences. It is important to understand what types of engagement are necessary to help students meet their goals. Researchers and practitioners need to conceptualize and study engagement with more specificity. Research in this area can help colleges and universities create programs, develop policies, and encourage faculty members to build specific pedagogies that intensify forms of engagement known to have an impact on selected desired outcomes.

2. *Different forms of engagement interact to contribute to desired outcomes.*

Certain activities are more directly related to learning and academic success, while other variables are valuable because they indirectly influence outcomes. The causal mapping of variables that have both direct and indirect effects on outcomes allows those complex relationships to emerge, thus enriching our understanding of how certain behaviors and college activities contribute to developmental outcomes. For example, integration has a direct effect on gains in general education, and serves as a critical antecedent, or gatekeeper, through which other variables have indirect influence on the outcome variable. On the other hand, in the intellectual skills model, the amount of reading and writing emerged as a forceful indirect measure by having strong effects on four other variables in the model that in turn have impact on the outcome.

3. *High expectations coupled with adequate support are requisite conditions for learning and development in the first college year.*

This conclusion evokes the decades-old educational notion of 'challenge and support' (Sanford, 1962, 1966). In the words of Sanford (1966, p. 46)

> … the institution which would lead an individual toward greater development must, then, present him with strong challenges, appraise accurately his ability to cope with these challenges, and offer him support when they become overwhelming.

Challenge in higher education takes the form of high academic expectations, and are represented by three variables in this study. The first, the amount of reading and writing expected of the student, is present in all three models, driving students to spend more time studying, seek support, interact more with peers, and other engagement activities. As they say, expect more and you get more. Second, perceptions of the campus environment influence grades indirectly, and the 'gains' outcomes directly, indicating that students had more success when the school impresses upon them to take learning seriously. A third variable, amount of time spent in academic preparation, reflects the work load of the student's academic program and directly influences grades. Again, students who are challenged more will spend more time studying and on academic work, and receive better grades as a result.

Still, academic challenge alone is not sufficient to produce intellectual development. *Support* (Sanford, 1962, 1966) is represented in the models by five items: use of the academic support center, engaging in substantive conversations, interactional diversity, writing experiences, and interactions with faculty members. Taken together, these variables indicate that it is important for students to use all the academic support resources available to them, and to interact in meaningful ways with peers and faculty members. Ultimately, first-year students who are given high expectations and who have a supportive environment will be more likely to succeed in terms of grades and perceived intellectual and general education progress.

4. *Grades do not necessarily represent how much students believe they have learned.*

The models in this study suggest that traditional grading systems are unrelated to self-reported gains in learning and development, and thus do not say everything we need to know about learning. This conclusion stems from two observations: (a) GPA does not correlate with either of the self-reported gains factors, and (b) the GPA model differs in content and structure from the other two models of self-reported outcomes. For example, pre-college ability is a good

predictor of grades, but not of self-reports of learning and growth. Self-reported gains comport more with the notion of talent development (Astin, 1993b), the net amount of learning and development that has taken place after accounting for precollege characteristics. To answer a self-reported gains item, students must first identify a baseline, or starting point, upon which they can estimate the amount of gains they have made through the year. So while the actual starting point may vary, the amount of progress the students believe they have made is what matters. This explains why students with high ability will likely earn good grades, but will not necessarily report they have *learned* a great deal. On the other hand, students with low ability may earn average grades but believe that they have made substantial progress.

Implications for Research

The conclusions from this study suggest additional areas of research, particularly with regard to engagement issues and first year students.

1. *We must examine and discuss engagement with more specificity.*

None of the three models matched the original conceptual model nor were any two models alike. So while it appears that different outcomes are produced by different forms of engagement, much more needs to be explored in this area. Which behaviors lead to which outcomes, and what is the role of indirect effects upon outcomes? It would also be necessary to include multiple engagement-related constructs within the same models so that direct and indirect causal effects as well as correlations among the constructs can be better specified. Analytical tools such as structural equation modeling and path analysis may prove to be useful in teasing out the distinct effects of different forms of engagement.

2. *We must further explore the efficacy of integrative activities to learning.*

Integration appears to be an important construct in learning. It may be time to elevate the construct of integration to the same importance as other devices in the engagement toolbox. Researchers are encouraged to explore it more fully with different outcomes, better ways to measure it, and conditionally among different student populations.

3. *More studies are needed using multi-equation approaches to examine the temporal relationships among precollege characteristics, engagement, and desired college outcomes.*

Other outcome considerations that may employ these approaches are retention, graduation, cognitive learning, and identity development. The results of this study engender confidence in the use of SEM as an approach to understanding student outcomes.

Implications for Policy and Practice

The conclusions also suggest that there are ways practitioners in higher education, particularly those working with new student programs, might more strategically allocate resources to help students gain the most in their first year of college.

1. *Consider the effects of specific forms of engagement when implementing programs and policies to improve student outcomes.*

The first conclusion from this study, different forms of engagement are precursors to different outcomes, sends a strong message to practitioners and policy makers who seek to target specific improvements in student outcomes and institutional performance. Three examples

illustrate this point. First, institutions that seek to boost the ability of first-year students to improve grades should consider ways to help students get tutoring, remedial writing assistance, and to develop a campus climate that supports time spent outside of the classroom in academic preparation. On the other hand, resources spent to promote other areas of engagement may not have much of an effect on grades. Second, faculty members responsible for curricular and course development should consider increasing the amount of course-related reading and writing, not necessarily to produce a direct effect on learning outcomes, but because students who are asked to read and write more will participate more in valuable engagement activities that are associated with learning outcomes. Third, as a matter of policy and practice, student perceptions of the campus environment are shaped by all of their interactions with the institution from the beginning. Admissions, orientation, financial aid, registrar, student affairs, and faculty share responsibility for conveying positive messages about challenge and support to students.

2. *Explore ways to promote integrative learning activities.*

Like researchers, instructors and practitioners should promote student integration in their work. Certainly, faculty members should consider different pedagogies (e.g., group discussion) and assignments (e.g., reflective writing) by which these activities are emphasized in the curriculum. They can also orchestrate interdisciplinary discussions and assignments so students consider how other course material may apply to the topic at hand. Outside of the classroom, student affairs professionals and other campus administrators must redouble their efforts to create a seamless learning environment (Kuh, 1996) whereby the academic curriculum and student experiences are integrated, mutually supportive, and convey a unified message about the values of the institution. Programs and opportunities implemented by the student affairs division need to make space for and support student efforts to process what they are learning in their courses in other settings. For example, student advisors and counselors might change a discussion prompt from “How do you like your classes?” to “What did you learn in your class this week?” Resident halls can organize study groups in the residence halls for students that are taking similar courses, and find ways to help them effectively grapple with the material in interesting ways, perhaps by even bringing faculty members in to help facilitate discussions.

3. *Explore creative ways to get students engaged in substantive conversations.*

Substantive conversations may be the essence of ‘engagement,’ i.e., students grasping the material in a social and personal sense. In a sense, the student has been captivated by learning, evoking Baxter Magolda's (1999; 2002) concept of self-authorship in which knowledge is socially constructed. The self is central to constructing knowledge, and authority and expertise are shared in the mutual construction of knowledge among peers. How do faculty members get students to make material interesting and relevant enough to their lives that they incorporate it into their social conversations with peers, family, coworkers, and others? How can student affairs professionals bring substantive issues to the intellectual lives of the students? Baxter Magolda (2002) advocates making student environments complex, challenging, and more *uncomfortable*. Finding ways to do this is challenging but promises to add a much needed dimension to the intellectual climate of the campus. Perhaps these sentiments echo Woodrow Wilson, who while president of Princeton University said, “the real intellectual life of a body of undergraduates, if there be any, manifests not in the classroom, but in what they do and talk of and set before themselves as their favorite objects between classes and lectures” (quoted in Trow, 1975, p. 270).

Final Word

The American public expects a great deal from their colleges or universities and as a consequence from students (Association of American Colleges and Universities, 2002; Bowen, 1977; Edgerton, 1997; National Education Goals Panel, 1991; Working Group on Student Outcomes from a Policy Perspective, 1997). Students are viewed variously as inputs (e.g., matriculants, first-year students), as the primary agents of their own progress (e.g., course-takers, studiers, and users of campus resources), as shapers of the campus environment (e.g., peers and student leaders), and as the products of higher education (e.g., graduates, alumni, and citizens). Because student outcomes are one important measure of institutional quality, institutions are dependent to a large extent on the students themselves. Yet, as this study suggests, institutions can do a great deal to help students be better learners and enhance their learning and developmental outcomes. Using engagement measures as process indicators of institutional quality is one way that institutions can provide evidence of their effectiveness in helping students learn. Moreover, institutions can use information about student engagement to identify policies and practices to increase their educational effectiveness.

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