

**2008 AIR RESEARCH GRANT PROPOSAL**

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**The Effects of College on Degree Attainment for Women and Underrepresented Minorities in the Sciences at Four-year Colleges and Universities**

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Grant Amount Requested: \$39,781

Beginning Postsecondary Students Longitudinal Study (BPS) 96/01

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## PROJECT SUMMARY

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A commonly used phrase to describe the status of women and underrepresented minorities in the sciences is that “the devil is in the details” (Commission on Professionals in Science and Technology, 2006, p. 2). This is largely the case because the overall enrollment and degree completion in the sciences for these two populations have increased over the past four decades. Therefore, it is tempting to think that women and underrepresented minorities have reached parity with their counterparts in the sciences. The reality is that although women have outnumbered men in undergraduate education for the last two decades, their presence in traditionally male dominated fields of study is lacking. Additionally, there remains a sizable gap between underrepresented minorities and their counterparts in the sciences. Such gender and racial/ethnic disparities in the sciences speak to the need for more research on the status and experiences of women and underrepresented minorities in science majors at four-year colleges and universities.

Using data from the 1996/2001 Beginning Postsecondary Students (BPS) Longitudinal Survey, the proposed study will examine the status of women and underrepresented minorities in the sciences and to assess the extent to which gender and racial/ethnic gaps have narrowed over the last decade. Additionally, the proposed study will examine factors that influence degree attainment in the sciences across race/ethnicity and gender and whether or not the effects of the college experience are general or conditional. In other words, do some college experiences have a greater impact on degree completion for certain gender and racial/ethnic groups than for others? Descriptive statistics will be used to determine enrollment trends in the sciences by race/ethnicity and gender over the six year period between 1996 and 2001. These data will be compared to data from the 1990/1994 BPS survey data. Logistic regression analysis will be used to examine the predictability of background characteristics, institutional characteristics and college experiences on degree attainment. Logistic regression is appropriate when the researcher is attempting to determine the best combination of variables that predict an outcome by estimating the odds probability of the dependent variable occurring as the values of the independent variables change. In the case of this study the PI is interested in the best set or combination of institutional factors that predict degree completion in 6 years.

This study will add to the literature on the status of women and underrepresented minorities in the sciences at four-year institutions. Previous studies have examined the extent to which students in the sciences are engaged in

educational activities; however, less is known about the extent to which these experiences impact degree completion for students in science majors. An innovative aspect of this study is that it will use the most current wave of BPS data to examine the extent to which the effects of the college experience on degree completion are general or conditional across gender and race.

Development of the *entire* talent pool in the sciences is necessary to stay current and competitive with other countries, particularly given the current state of global affairs. Moreover, equity and access to fields of study in which certain groups have been consistently underrepresented are two equally important policy issues of concern. Therefore, the findings from this study will have implications for improving the status and degree completion of women and underrepresented minorities in science related fields and will be of interest to college and university administrators, institutional researchers, and policy makers.

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## PROJECT DESCRIPTION

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### Statement of Problem

The status of women and underrepresented minorities in postsecondary education has been an issue of concern since the 1960s, a time period when equity and access to higher education was not proportionate across race/ethnicity and gender. This also marked a time period when there was national concern about producing talented scientists in the United States (Meinholdt & Murray, 1999; Rossi, 1965). Over the past few decades, the numbers of women and underrepresented minorities in higher education has steadily increased. In fact, women have outnumbered men in undergraduate education for the past two decades (National Center for Educational Statistics, 2006). As such, the overall bachelor's degree attainment for women and underrepresented minorities has increased as well, even in scientific fields of study. However, increases in bachelor's degree enrollment and attainment for women and underrepresented minorities have not been equal across all science, mathematics, and engineering (SME) majors. Although gender and racial disparities in SME fields of study have improved over time, these groups have not reached parity with their counterparts in the sciences to date.

According to data collected by the Higher Education Research Institute at UCLA, about 1/3 of all freshmen intend to major in the sciences and that this trend has held over the past two decades (NSB, 2006). Moreover, the diversity of students who intend to enroll in SME programs has increased over time. For example, from 1983 to 2004 women who planned to enroll in SME majors increased from 38% to 45%. Asian/Pacific Islanders and Hispanics experienced the greatest SME growth rates in enrollment compared to other racial/ethnic groups. On the other hand, White students experienced a decline in SME enrollment from 85% in 1983 to 72% in 2004. African Americans stalled at 10% in planned SME enrollment over the last 20 years. It is tempting to think that women and underrepresented minorities have reached parity with their counterparts given the increases in representation over the last few decades; however, more men in all racial/ethnic groups planned to major in the sciences compared to women, and a higher percentage of Asian Pacific Islanders intended to major in the sciences compared to all other racial/ethnic groups in 2004.

In regards to degree attainment, women have experienced increases in just about all scientific fields of study since the 1960s (Commission on Professionals in Science and Technology, 2006). For example, the bachelor's degree attainment for women in computer, physical, and biological sciences has steadily increased over the past two decades. However, the growth for women has declined and/or stalled at various points over the last two decades in

fields such as engineering and mathematics. Despite the increases in bachelor's degree attainment for women in computer, physical, and biological sciences, the degree attainment percentages lag far behind that of their male counterparts.

The situation is considerably more daunting for underrepresented minorities in engineering fields. According to NCES data, there is a sizeable gap between the large numbers of minorities graduating from high school and the low percentage of minority graduates who are eligible for engineering majors based on high school grades and courses taken (NSB, 2006). Underrepresented minorities who are eligible for engineering are slightly more likely to select engineering compared to all other majors, but nevertheless make up a small percentage of the total number of engineering admits. Over the past 20 years, underrepresented minorities have steadily increased their enrollments and degree attainment in engineering. However, the numbers of underrepresented minorities in engineering has stalled since the mid-1990s. African Americans, in particular, have experienced a decline in engineering enrollments since the mid-1980s.

On the other hand, underrepresented minorities have experienced steady increases in biological sciences, nearly doubling their bachelor's degree attainment since 1985. Underrepresented minorities have also increased their degree attainment rates in the physical sciences, computer science, and mathematics, but the numbers have remained constant over the past decade. Again, despite the overall increases for underrepresented minorities in some scientific fields of study, the numbers lag far behind White and Asians and even women in the same fields of study.

Such disparities in the sciences, as illustrated above speak to the need for more research on the experiences of women and underrepresented minorities in the sciences at four-year colleges and universities. In particular, it would be useful to know what institutional factors influence degree completion for this population and if those effects are general or conditional across race and gender. In other words, do some experiences have a greater impact on degree attainment for certain groups than for others? Thus, the purpose of the proposed study is to examine changes in the status of women and minorities over the past decade and to assess the extent to which college impacts degree completion across gender and race/ethnicity in the sciences.

### **Review of Relevant Literature**

As early as the 1980s, scholars began trying to understand empirically reasons for attrition and persistence of women and minorities in the sciences. These studies have focused largely on the pipeline into the sciences, as well as factors related to attrition and persistence of women and underrepresented minorities in science fields.

Collectively, these two lines of inquiry have identified a number of variables that influence the extent to which women and minorities enroll, leave, and persist in SME fields of study.

Level of parental education has been studied extensively and has been found to have an impact on selecting and persisting in science majors. Having highly educated parents has been linked to high levels of parental encouragement, which also has been found to influence entry and persistence in the sciences for women (Astin & Sax, 1996; Haung, Taddese, & Walter, 2000; Maple & Stage, 1991; Rayman & Brett, 1995). Further, the influence of parental education has been found to differ across race/ethnicity. Some studies have found father's level of education to be influential for women (Gruca, Ethington, & Pascarella, 1988; Ware, Steckler, & Leserman, 1985), whereas mother's level of education has been found to be influential for African Americans (Gruca, Ethington, & Pascarella, 1988; Maple & Stage, 1991). Yet, Grandy (1998) found that for high ability minority students, level of parental education was not significant in their success in science and engineering. Finally, in a study of persistence in science and engineering, Haung, Taddese, & Walter (2000) found that financial support from parents was a significant predictor of degree completion for both women and underrepresented minorities.

Studies have also examined the extent to which academic preparation at the high school level impacts selection of and persistence in science majors at the college level. According to 2002 NCES data, 20% of students planning to major in the sciences reported needing remedial math, and 10% reported needing remedial work in the sciences (NSB, 2006). These percentages are slightly higher than the 1983 figures and more students who intended to major in social and behavioral sciences reported needing remedial work compared to freshmen in the hard sciences. Also, male freshmen reported needing less remediation in math and science compared to female freshmen. In general, factors such as the number of math and science courses taken (Rayman & Brett, 1995; Sax, 1994), math SAT score (Maple & Stage, 1991; Sax, 1994), and high school grade point average (Sax, 2001) have been found to predict persistence in the sciences, mostly for women.

Other research suggests that noncognitive or social-psychological factors impact selection of and persistence in science majors. This body of work focuses on internal aspects of individual students, such as personal self-concept about one's ability to succeed and general attitudes about math and science. Low self-confidence usually indicates that students will not select a science major and declining self-concept can lead to switching to a non-science major (Seymour & Hewitt, 1997; Ware & Lee, 1988). Moreover, research supports that women express lower self-concept related to math ability than men, despite the fact that they performed better than men in the

classroom and on tests (DeBoer, 1986; Marsh, Smith, & Barnes, 1985; Sax, 1995; Sherman, 1983). Sax (1994) studied this phenomenon in depth by examining factors related to the development of mathematical self-concept. Overall, she found a general decline in mathematical self-concept over the four year period that was more pronounced at selective colleges. Although no gender differences in decline of math self-concept were found, women fell out of rating themselves in the highest 10% in greater proportion compared to men. In a longitudinal study of factors that predict degree attainment, Haung, Taddese, & Walter (2000) found that high self-confidence and high aspirations for degree attainment were significant in predicting degree completion. Further, high self-confidence and high aspirations for degree attainment helped to mediate the effect of family financial support and parental level of education. In other words, high self-confidence and high aspirations decreased the effect of family financial support and level of parental education on degree completion. Ferreira (2003) examined factors related to attrition rates of graduate students in biology and chemistry and found that women had higher attrition rates in both majors and that men in chemistry had higher levels of self-confidence compared to women. Astin and Sax (1996) suggest that the “lifelong exposure to cultural messages that women are not cut out for science does much to explain this underestimation” (p. 97).

The lack of parity for women and underrepresented minorities in the sciences coupled with the general decline in self-confidence during the college years have led researchers to study institutional and environmental factors that might influence attrition and persistence in the sciences. Institutional factors such as size, control, and type have been included in most studies. The weight of the evidence suggests that students who major in the sciences at four year colleges and universities are more likely to persist (Commission on Professionals in Science and Technology, 2006; Sax, 2001). Also, single-sex institutions have been linked to the persistence of women in science and have been found to enhance women’s academic and intellectual self-concept (Astin, 1977; 1993a). Historically black institutions have been instrumental in the persistence of African Americans in the sciences; however, their influential role has been declining over the past twenty years (Commission on Professionals in Science and Technology, 2006). Financial aid received has also been studied as an institutional factor related to persistence and degree completion in the sciences. Haung, Taddese, & Walter (2000) found that financial aid received increased the likelihood of degree completion for a national sample of college students attending four-year institutions.

Environmental factors such as campus climate have been found to be influential on the success of women and underrepresented minorities in the sciences. Some studies suggest that women and underrepresented minorities experience a chilly climate in science majors and report experiencing a “null environment” in which they were ignored or excluded (Meinholdt & Murray, 1999, p.245). In a longitudinal study of high ability minority students in science and engineering, Grandy (1998) found that minority support had a strong effect on science commitment in the sophomore year of college. In turn, the sophomore year status was a strong predictor of persistence in the sciences two years later. The author viewed minority support as a mechanism to counter discrimination experienced by minority students in the study. Not having a critical mass of women and minorities in the sciences has also been cited as an issue for women and underrepresented minorities. The lack of a numerical presence of women and underrepresented minorities necessary to bring about positive changes in the climate can have a significant influence on attrition rates for these populations (Ferreria, 2003; Rayman & Brett, 1995). However, other researchers suggest that the proportion of women at the institution has no effect on college grades, satisfaction with and persistence in the major, and intellectual and social self-concept (Astin & Sax, 1996).

According to Astin and Sax (1996), “research consistently finds that for both women and men, the likelihood of persisting in science depends on the experiences they have in college” (p. 109). Moreover, the authors suggest that the *type* of activity in which sciences students engage is important. Chickering and Gamson (1987) have also identified educational activities, known as the Seven Principles of Good Practice, which contribute to student learning, satisfaction, and educational attainment. The seven principles are: 1) student-faculty contact; 2) cooperation among students; 3) active learning; 4) prompt feedback; 5) time on task; 6) high expectations; and 7) respect for diverse talents and ways of learning. A few studies have examined the impact of the undergraduate college experience on persistence in the sciences. In a study of gender differences in graduate enrollment in the sciences, Sax (1994) found that college grade point average and interaction with faculty were significant for both males and females. Further, hours per week spent socializing had a negative effect and hours per week spent doing homework had a positive effect for men in the study. It was not clear in the study if socializing less kept men focused on their major or if the commitment of pursuing a science major prevented men from socializing with other students. Using data from the National Survey of Student Engagement (NSSE), Zhao, Carini, and Kuh (2005) examined the extent to which science majors were engaged in educational activities, as well as gender differences in engagement. Generally, they found that women in the sciences were just as engaged in and satisfied with their

college experience as males in the sciences. However, this study did not examine the extent to which engagement in educational activities and satisfaction with the college experience influenced degree completion.

Thus, the purpose of the proposed study is to examine the status of women and underrepresented minorities in the sciences and to assess the extent to which gender and racial/ethnic gaps have narrowed over the last decade. Additionally, the proposed study will examine factors that influence degree attainment in the sciences across race/ethnicity and gender and whether or not the effects of the college experience are general or conditional. The following research questions will guide this study:

- 1) Are there gaps in persistence in science majors by race/ethnicity and gender over the six year period between 1996 and 2001?
- 2) What background characteristics, institutional characteristics, and college experiences influence degree attainment in science majors by race/ethnicity and gender?
- 3) Are gender and racial/ethnic differences in science degree attainment general or conditional? In other words, are the factors that influence degree completion the same in magnitude and direction across gender and race/ethnicity or are some factors more important than others for certain groups?

### **Proposed Plan of Work**

#### **Conceptual Framework**

One of the most frequently used models in the research literature to explain the impact of college on educational outcomes is Astin's (1993a, 1993b) Input-Environment-Outcome (I-E-O) framework. In the I-E-O model, student outcomes are presumed to be a function of the interactions of individual inputs and various components of the environment (Pascarella, & Terenzini, 1991; 2005). The I-E-O model allows the researcher to examine the impact of individual experiences and the college environment on educational outcomes, after controlling for traits and characteristics students bring with them to college. A fundamental assumption of the model is that who the students are and what they do in college will affect college outcomes.

In the proposed study, this research based conceptual framework will be used to examine the impact of three categories of variables on degree attainment: a) precollege characteristics, b) institutional characteristics, c) college experiences. A diagram of the conceptual framework for the proposed study is illustrated in Figure 1. The specific way in which the framework will be used to inform the study is described below.

### **1996/2001 Beginning Postsecondary Students Longitudinal Survey**

Data for this study will come from the 1996/2001 Beginning Postsecondary Students (BPS) Longitudinal Survey, which collects data on persistence in and completion of degrees in postsecondary education, and the impact of higher education on the lives of students. The survey was designed to answer questions such as the percentage of students who complete degree programs, what factors influence attrition and persistence, and the impact of financial aid on degree attainment. The 1996/2001 survey, the second cohort of data collected by the National Center for Education Statistics, followed a nationally representative sample of students who enrolled for the first time in 1996-97 academic year through the National Postsecondary Student Aid Study (NPSAS). The first follow up occurred in 1998 and included 9,000 students from 800 schools. The second follow up occurred in 2001, six years after first time enrollment. Data were collected on their undergraduate experience, persistence in college, degree completion, and employment after college.

### **Student Sample for Study**

Two subpopulations of students will be constructed from the BPS dataset to study factors related to persistence in the sciences by race/ethnicity and gender. The entire BPS population, excluding those 30 years of age and older, will be used to examine enrollment trends in the sciences by gender and race/ethnicity over the 6 year period. The second subpopulation will be defined as students who enrolled in a bachelor's degree program in the sciences in their first year (1996) of college. This cross-section of students will be followed over the six year period to examine key factors related to persistence and attrition across race/ethnicity and gender. For the purpose of this study, the sample will be limited to students in the sciences at four year institutions. Additionally, the definition of science majors used by NCES will be used for the proposed study, which excludes social sciences and psychology because women and minorities are not considered to be underrepresented in these fields of study.

### **Dependent and Independent Variables**

The variables for this study will be derived from the 1996/2001 BPS data set. The primary dependent variable in this study will be degree attainment in the sciences by the end of six years. Science majors will include biological sciences, engineering, physical sciences, and mathematics and computer science. Degree attainment will be measured based on the cumulative persistence outcome for students in the 2000-2001 academic year.

Independent variables will be grouped into three categories: a) background characteristics and precollege traits; b) institutional characteristics; c) college experiences. Background characteristics will consist of parental

educational attainment, family financial support, race/ethnicity, gender, aspiration for advanced education, delayed college entry, and test scores. These variables have been included in most studies on women and minorities in the sciences as discussed in the review of relevant literature. Intellectual self-concept is the only variable that is not able to be studied because that question was not asked on the 1996/2001 survey.

Institutional characteristics will consist of institutional control, college selectivity, institutional size, and amount of financial aid received. Institutional level will be restricted to four year institutions; thus, it will not be included as an institutional variable. Variables related to the college experience will be categorized into four groups: a) interaction with faculty; b) interaction with peers; and c) participation in student clubs and activities, and d) participation in academic related activities. Interaction with faculty will be measured based on the sum of three items pertaining to the extent to which students talked with and socialized with faculty outside the classroom and met with their academic advisor. Interaction with peers will be measured based on the extent to which students went places with friends at the institution. Participation in clubs and activities will be measured based on the sum of two items, participation in clubs and intramurals. Lastly, participation in academic related activities will be measured based on the sum of three items, participation in groups and projects, use of library, and writing papers. Table 1 in the appendices contains more information on the operational definition for each variable in the proposed study.

### **Data Analysis**

To address the first research question, descriptive statistics will be used to determine science enrollment by race/ethnicity and gender across the six year period. Using the full BPS sample, students enrolled in a science major in one of the six years will be identified on a yearly basis. Comparisons will be made by race and gender. Further, the findings will be compared to data from the 1990/1994 BPS survey data to assess the extent to which the racial/ethnic and gender gaps have narrowed over time. The second and third research questions will be addressed using logistic regression on a subsample of BPS students who selected a science major in the first year of college (1996). Logistic regression is appropriate when the researcher is attempting to determine the best combination of variables that predict an outcome by estimating the odds probability of the dependent variable occurring as the values of the independent variables change. In the case of this study the PI is interested in the best set or combination of institutional factors that predict degree completion in 6 years. A series of independent t-tests will be conducted to determine if significant differences exist between minority students and White and Asian students and between males and females on selected background characteristics. The outcome variable, degree completion, will

be regressed on the independent variables in steps separately by gender and race/ethnicity. To test for conditional effects, a series of cross product terms will be created for selected variables. The cross product terms will be entered as the last step in the regression equation to determine if the conditional effects explain any additional variance in the models.

### **Relationship to PI's Research**

The PI's research agenda focuses on college student learning and development, as well as diversity issues in higher education. The PI recently co-authored a manuscript on undergraduate participation in research and creative activities. Additionally, a monograph on undergraduate participation in research and creative activities, published by the Association for the Study of Higher Education, will be released early in 2008. The current study expands upon the PI's current scholarly interests and research agenda by focusing on the impact of the college experience on degree attainment for two diverse and underrepresented groups of students in the sciences.

### **Dissemination Plan**

The proposed study seeks to examine the persistence of women and underrepresented minorities in the sciences at four year college and universities. Therefore, the findings from this study will be of interest to a wide variety of higher education constituents. The findings from this study will be shared with university administrators, faculty, policy makers, and other stakeholders interested in increasing the representation of women and minorities in the sciences. Manuscripts will be submitted to journals such as *Research in Higher Education*, *The Journal of Higher Education*, *The Review of Higher Education*, and *The Journal of College Student Development* due to their focus on policy issues related to persistence in higher education, student learning and development, and the impact of college on these factors. Also, conference proposals will be submitted to annual meetings for the Association of Higher Education, American Educational Research Association and Association for Institutional Research.

The research project will begin on June 2008 and end June 2009. The research activities to be conducted during this time period are summarized below.

Research Activity	Time Period
<ul style="list-style-type: none"> <li>• Conduct extensive review of literature related to women and underrepresented minorities in the sciences (articles, books, newspaper articles, conference proceedings, etc.)</li> <li>• Write a comprehensive literature review on the status of women and underrepresented minorities in the sciences and the impact of background characteristics, institutional factors, and the</li> </ul>	June 2008 – August 2008

college experience on degree attainment	
<ul style="list-style-type: none"> <li>• Clean, code, and begin analysis of BPS data</li> </ul>	
<ul style="list-style-type: none"> <li>• Complete analysis of BPS data</li> <li>• Submit progress report to Association for Institutional Research (AIR)</li> <li>• Discuss research findings and direction for future research</li> <li>• Develop implications and recommendations</li> </ul>	September 2008 – December 2008
<ul style="list-style-type: none"> <li>• Submit final report to Association for Institutional Research (AIR)</li> <li>• Prepare and submit conference proposals</li> <li>• Prepare and submit manuscripts for publication consideration</li> <li>• Present findings at AIR Annual Forum</li> </ul>	January 2009 – June 2009

### Description of Policy Relevance

Development of the *entire* talent pool in the sciences is necessary to stay current and competitive with other countries, particularly given the current state of global affairs. Equity and access to fields of study in which certain groups have been consistently underrepresented are two equally important policy issues of concern. The purpose of the proposed study is to assess the status of women and underrepresented minorities in science related fields of study in comparison to their counterparts and to examine predictors of persistence in the sciences by race and gender using the most recent wave of national level data collected by NCES. College administrators will be interested in the impact of the college experience and institutional factors for women and underrepresented minorities. The results of the proposed study can assist college administrators in developing or revising programs and services designed to increase persistence and retention in the sciences. The financial aid variable may have important policy implications for supporting minority students in particular, and issues of access to higher education. In general, policy makers will be interested in what factors impact persistence and if the effects are conditional or general for race/ethnicity and gender. In sum, the findings from this study will have implications for improving the status and degree completion of women and underrepresented minorities in science related fields.

### **Discussion of Innovative Aspects of Project**

The proposed study will add to the literature on women and underrepresented minorities in the sciences at four year colleges and universities in the United States. The research study has several innovative aspects. First, data analysis will be conducted using a nationally representative sample of college students from which findings can be generalized to the larger population of college students in the US. Second, this is one of the first studies to examine the status of women and underrepresented minorities using the most current wave of BPS data. Therefore, this study will be able to note changes in the status of women and underrepresented minorities over six years, as opposed to five, and provide the most current statistical information regarding their persistence in science fields of study. Third, not many studies on the persistence of women and minorities have examined the influence of the college experience on degree completion. The proposed study includes several measures of college experiences, such as interaction with faculty and peers and participation in social and academic activities. Lastly, the proposed study is unique in its statistical approach, enabling the researcher to examine the conditional effects of select characteristics and experiences on the degree attainment for women and underrepresented minorities in science majors.

### **Discussion of Audience to Whom the Project Will Be Important**

The persistence of women and underrepresented minorities in the sciences is an issue of critical importance; thus, the results of the proposed national study will be important to a number of stakeholders. University and college administrators and faculty in the sciences will be interested in the results of this study, particularly concerning the extent to which background, institutional, and college experiences impact degree attainment. Institutional researchers will likely be interested in how the characteristics of the institution impact persistence in the sciences. Parents and students interested in science related fields will also be interested in the status of women and underrepresented minorities as well as factors related to degree completion. Finally, the extent to which financial aid received impacts degree completion should be of interest to federal policy makers.

## APPENDICES

Figure 1

Conceptual Framework for Proposed Study

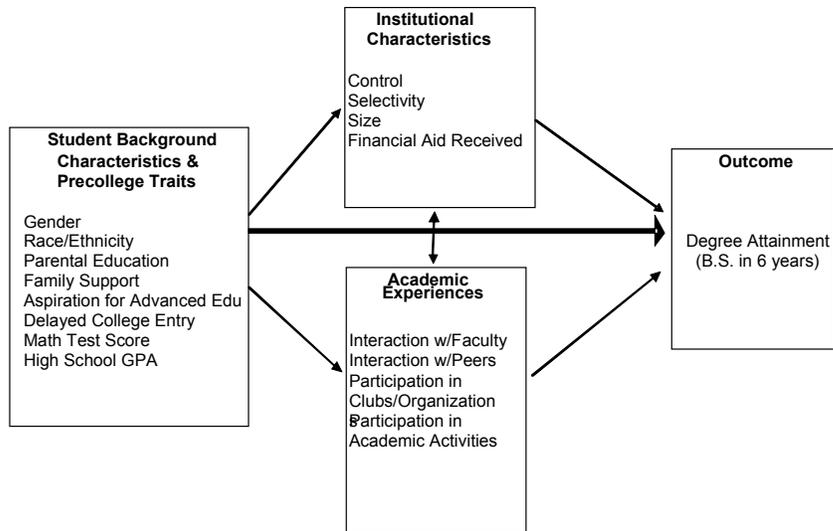


Table 1

## Operational Definition of Variables

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**DEPENDENT VARIABLE**

Degree Attainment: dichotomous variable coded: 1 = completed science degree in 6 years; 0 = did not complete science degree in 6 years (PROUTYX6)

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**INDEPENDENT VARIABLES****Background & Precollege Characteristics**

Gender: binary variable coded as: 1 = female; 0 = male (SBGENDER)

Race/Ethnicity: dichotomous variable coded as: 1 = Hispanics, African Americans, Native Americans; 0 = Whites and Asian/Pacific Islanders (SBRACE)

Parent's Educational Attainment: binary variable based on the educational level of either parent coded as: 1 = 4 or more years of college education; 0 = less than 4 years of college education (PBEDH13)

Family Financial Support: binary variable based on dependent status in the first year coded as: 1 = reported dependence on family in the first year of college; 0 = reported no dependence of family in the first year of college (SBDEP1Y1)

Aspiration for Advanced Education: binary variable based on highest degree intended coded as: 1 = aspirations for graduate education; 0 = intention to complete degree lower than graduate level (EPHDEGY1)

Delayed College Entry: binary variable based on immediate entry into college after high school graduation coded as: 1 = began college after at least a 1 year break from high school completion; 0 = began college immediately after high school completion (ENDELAY)

Test Score: continuous variable based on college examination mathematics scores in math & science (TEACTMRE, TEACTNRE, TESATMRE)

**Institutional Characteristics**

Institutional Control: dichotomous variable coded as: 1 = public institution; 0 = private institution (ITNPCT)

College Selectivity: categorical variable based on reported college entrance examination score of students at the institution coded as: 1 = very selective; 2 = selective; 3 = not very selective (INSTSEL)

Institutional Size: continuous variable based on the full-time enrollment during the 1995-1996 academic year (ITNPCTSZ)

Financial Aid Received: binary variable based on financial aid received by institution coded as: 1 = received any grant or loan during 6 year period; 0 = did not receive any grant or loan during 6 year period

### **Academic Experiences**

Interaction with Faculty: continuous variable based on the average of three variables that measure the extent to which students spend time with faculty (CMMEET; CMSOCIAL; CMTALK)

Interaction with Peers: continuous variable based on the item that measures the extent to which students spend time with other students (CMFRIEND)

Participation in Clubs & Organizations: continuous variable based on two items that measure extent which students were involved in activities (CMCLUBS; CMINTRAM)

Participation in Academic Activities: continuous variable based on three items that measure the extent to which students were involved in academic related activities (CMSTUDGP; FQWRITY1; FQLIBY1)

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## **BIOGRAPHICAL SKETCH**

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Dr. Joy Gaston Gayles is an Associate Professor of Higher Education in the Department of Adult and Higher Education at North Carolina State University. Prior to her appointment at NC State University, Dr. Gayles was an Assistant Professor of Higher Education at Florida State University for five years. Dr. Gayles earned a Bachelor's of Science in Adapted Physical Education from Shaw University and a Master of Science in Higher Education Administration from Auburn University. In 2002, she completed a Doctorate in Higher Education from The Ohio State University. She has full-time experience as an academic advisor and coordinator of student athlete advising for the Office of Undergraduate Student Academic Services at The Ohio State University. In her current (and past) appointment as a professor of higher education, she teaches courses in student affairs administration, student characteristics and the college environment and diversity issues in higher education.

Dr. Gayles' research focuses on student learning and development for various populations of college students and diversity issues in higher education. In her scholarly work, she has examined the influence of academic and athletic motivation on student athletes' academic performance. Moreover, she developed and tested a valid scale, the Student Athletes' Motivation towards Sports and Academics Questionnaire (SAMSAQ), to measure academic and athletic motivation. Most recently, she has studied student athletes' engagement in educationally purposeful activities and the effects of engagement on their cognitive and affective development in college using data from the National Collegiate Athletic Association (NCAA). Regarding students in the general population, Dr. Gayles co-authored an article on undergraduates' experiences with research and creative activities at various institutional types. Additionally, she coauthored a monograph on undergraduate experiences with research and creative activities that will be published by the Association for the Study of Higher Education in early 2008.

Diversity issues in higher education and student affairs also represent an area of her scholarly interest. She co-authored a book and a journal article that examined the role of student affairs administrators during the Civil Rights Era. Additionally, she has published a study of graduate students' experiences with diversity in the curriculum. Dr. Gayles' research and scholarly work has been published in journals such as *The Journal of College Student Development*, *NASPA Journal*, & *Innovative Higher Education*. Additionally, Dr. Gayles has been invited to deliver a workshop for the Student Leadership & Diversity Conference in 2008 at the University of South Carolina. Also, she has delivered over 30 referred presentations and is active in many higher education professional

associations. In 2007, she was recognized as an emerging scholar by the American College Personnel Association (ACPA).

#### Brief Curriculum Vita

#### **EDUCATION**

Ph.D. The Ohio State University, Columbus, Ohio  
 M.S. Auburn University, Auburn, Alabama  
 B.S. Shaw University, Raleigh, North Carolina

#### **ACADEMIC APPOINTMENTS**

Associate Professor, Adult & Higher Education, *North Carolina State University*, Fall 2007-present.

Assistant Professor, Higher Education Program, *Florida State University*, 2002 – 2007.

#### **PUBLICATIONS**

##### Refereed Journal Articles:

Gayles, J. G., & Hu, S. H. (under review). The influence of student engagement and sport participation on college outcomes among Division I student athletes. *Journal of Higher Education*.

Eddy, P. L., & Gaston-Gayles, J. L. (in press). New faculty on the block: Issues of stress and support. *Stress, Trauma, and Crisis: An International Journal*.

Hu, S., Kuh, G. D., Gayles, J. G. (2007). Engaging undergraduate students in research activities: Are research universities doing a better job? *Innovative Higher Education*, 32, 167-177.

Gayles, J. G., & Kelly, B. T. (2007). Experiences with Diversity in the Curriculum: Implications for Graduate Programs and Student Affairs Practice. *NASPA Journal*, 44(1), 193-208.

Gaston-Gayles, J. L., Wolf-Wendel, L. E., Twombly, S., Ward, K., & Tuttle, K. N. (2005). From disciplinarian to change agent: How the Civil Rights Era changed the profession of student affairs. *NASPA Journal*, 42(3), 263-282.

Gaston-Gayles, J. L. (2005). The factor structure and reliability of the student athletes' motivation toward sports and academics questionnaire (SAMSAQ). *Journal of College Student Development*, 46(3), 317-327.

Gaston-Gayles, J. L. (2004). Examining academic and athletic motivation among student athletes at a Division I university. *Journal of College Student Development*, 45, 75-83.

Gaston-Gayles, J. L., & Kelly, B. T. (2004). Preparing the next generation of African American scholars through mentoring and professional development experiences. *NASAP Journal*, 7(1), 46-62.

Gaston-Gayles, J. L. (2003). Advising student athletes: An examination of academic support programs with high graduation rates. *NACADA Journal*, 23 (1&2), 50- 57.

Gaston, J. L. (2003). The impact of Title IX on group representation in athletic administration: A trend analysis of NCAA institutions. *NASAP Journal*. 6(1), 79-90.

##### Book:

Wolf-Wendel, L. E., Twombly, S. B., Tuttle, K. N., Ward, K., & Gaston-Gayles, J. L. (2004). *Reflecting back, looking forward: Civil rights and student affairs*. Washington, D.C.: NASPA.

##### Monograph

Hu, S., Scheuch, K., Schwartz, R., & Gayles, J. G. (accepted for publication). *Undergraduate research and creative activities*. Association for the Study of Higher Education Monograph Series.

**GRANTS:**

Gayles, J. G. (2006). Committee on Black Faculty Support for Case Study Book Project, Florida State University. \$4,000.

Gaston-Gayles, (2004). CORE Fellowship to support summer salary and student athletes and engagement research project. \$3,000.

Gaston, J. L. (2003). The First Year Assistant Professor Award (FYAP) to support summer salary and research, Florida State University. \$12,000.

Gaston, J. L. (2003). Committee on Black Faculty Support for athletic identity study, Florida State University. \$4,000.

Gaston, J. L. (2001). Student research award to fund dissertation study. National Academic Advising Association. \$500.

Brown, J. C., Gaston, J. L., & Jackson, J. F. L. (1997). Proposal to fund campus visitation program at Auburn University. Phillip Morris U.S.A. \$15,000.

## BUDGET

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**GRANT PROJECT TITLE: The Effects of College on Degree Attainment for Women and Underrepresented Minorities in the Sciences at Four-year Colleges and Universities**

**Salaries and Wages**

Principal Investigator Gales	2.25 summer months @ \$ 7,556/mo	17,000	
	7.5% academic effort	5,100	
Senior Researcher Akroyd	0.5 summer month	5,116	
GRA (Bi-weekly/hourly)	10 hours per week x \$13 per hour x 30 weeks	<u>3,900</u>	
Total Salaries and Wages			<b>31,116</b>

**Fringe Benefits**

Principal Investigator:	25% of salary	6,804	
GRA fringe	9.25% of wages	361	

**Travel**

Travel for PI to attend the Air Annual Forum/Seattle to present research results		<u>1,500</u>	
Total Benefits and Travel			<b><u>8,665</u></b>

**TOTAL AMOUNT OF REQUEST** **39,781**

## BUDGET JUSTIFICATION

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### **Personnel: \$31,116**

Funds are requested for 2.25 months of salary for the principal investigator (PI) Joy Gayles plus 7.5% of academic effort for time spent overseeing and coordinating the research project, analyzing data, writing and disseminating research results. Funds are budgeted for Senior Researcher Duane Akroyd who will coordinate data access and consult on some aspects of data analysis. PI and Sr. Researcher salaries are based on current NC State University salaries. Funds are also requested for a Graduate Research Assistant (GRA) who will assist the PI in data collection and analysis. GRA wages are calculated at 10 hours per week for 30 weeks, \$13 per hour.

### **Fringe Benefits and Travel: \$8,665**

Fringe rates for the PI and Senior Researcher are based on NC State's faculty fringe rate of 25% of salary. GRA fringe is calculated at 9.25% of wages. Travel costs, estimated at \$1,500, are also included for the PI to attend the required Annual AIR Forum in Seattle, WA in order to disseminate the research results.

### **TOTAL AMOUNT REQUESTED: \$39,781**

**CURRENT AND PENDING SUPPORT**

The principal investigator has no current or pending financial support from external resources.

**FACILITIES, EQUIPMENT AND OTHER RESOURCES**

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The proposed research project will be conducted at North Carolina State University using the equipment and facilities readily available to the Principal Investigator through the Department of Adult and Higher Education.

Existing infrastructure will be utilized in this study.

**SPECIAL INFORMATION AND SUPPLEMENTARY DOCUMENTATION**

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Not applicable for this research grant proposal.