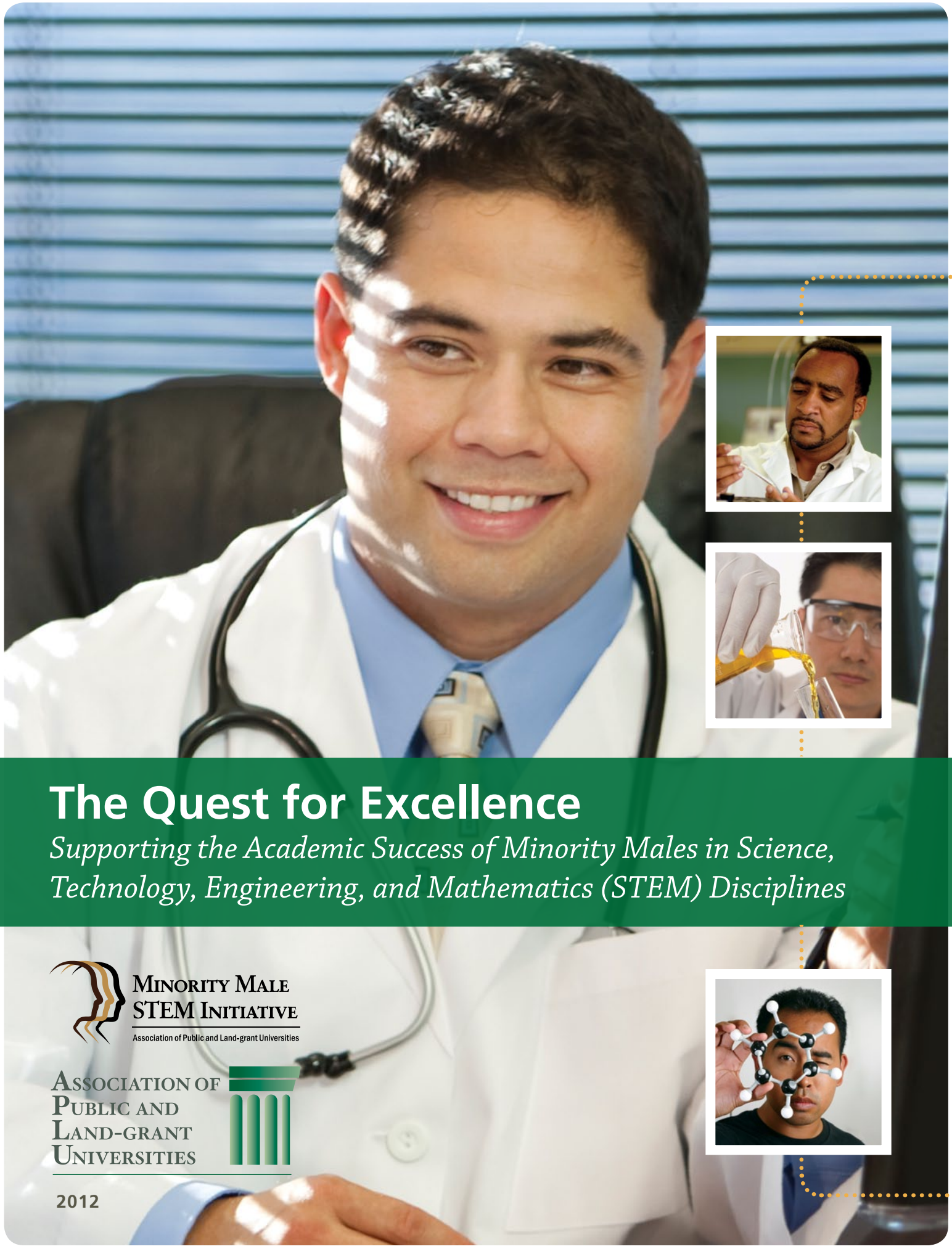

The Quest for Excellence

Supporting the Academic Success of Minority Males in Science, Technology, Engineering, and Mathematics (STEM) Disciplines

Minority Male STEM Initiative

Association of Public and Land-grant Universities

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2012

The Quest for Excellence

Supporting the Academic Success of Minority Males in Science, Technology, Engineering, and Mathematics (STEM) Disciplines

Ivory A. Toldson, Ph.D.

Lorenzo L. Esters, Ed.D.

2012

Association of Public and Land-grant Universities

Minority Male STEM Initiative
Association of Public and Land-grant Universities

Alfred P. Sloan Foundation 1934

ASSOCIATION OF PUBLIC AND LAND-GRANT UNIVERSITIES

The Association of Public and Land-grant Universities (A•P•L•U) is a research and advocacy organization of public research universities, land-grant institutions, and state university systems with member campuses in all 50 states, U.S. territories and the District of Columbia.

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FOREWORD

As part of its commitment to access, diversity, and excellence in U.S. higher education, the Association of Public and Land-grant Universities (A•P•L•U) is pleased to present *The Quest for Excellence: Supporting the Academic Success of Minority Males in Science, Technology, Engineering, and Mathematics Disciplines*. A•P•L•U is proud to publish this report and gratefully acknowledges the generous support of the Alfred P. Sloan Foundation.

Public, research, and land-grant universities play an essential role in educating minority males who will enter the nation's science, technology, engineering, and mathematics (STEM) workforce. A•P•L•U member institutions enroll about 55 percent of minority males who are matriculating at public universities at the undergraduate level and about 67 percent of those enrolled at public universities at the graduate level. Overall, the proportion of minority male students enrolled at A•P•L•U member universities is about 5 percent higher than the proportion of minority women.

In order to regain the nation's once-preeminent international position in educational attainment, public, research and land-grant universities should be deeply engaged in the effort to matriculate and graduate populations of Americans who traditionally have been underrepresented at the postsecondary level, particularly in STEM disciplines. Given that minority males account for a significant part of the enrollment at member institutions and their importance to the global competitiveness of the nation, A•P•L•U decided to focus on—addressing the issue of low enrollment and graduation rates for minority males in STEM disciplines. A part of A•P•L•U's mission is to provide a forum for the discussion and development of policies and programs affecting higher education and the public interest. With that mission, and its more than 120-year history of educational advocacy, A•P•L•U members can set an educational priority to address this issue.

There is widespread awareness that there are gaps in the educational achievement in our nation based on race. Unfortunately, there is less awareness of the gender gaps that exist in educational achievement, the unique challenges faced by underrepresented populations, and the differences between the challenges faced by men and those faced by women. The objective of this report is to provide an increased understanding of the specific challenges and, more importantly, the opportunities to better serve and support underrepresented minority men who major in STEM disciplines. While this report focuses on underrepresented minority males, this is not a zero-sum game. Certainly, we have to find ways to better serve both male and female underrepresented minorities.

Given the changing demographics of our nation and of the student populations served by public four-year universities, we must act now. If the downward trend in graduation for underrepresented minority males continues at its current rate, the competitive knowledge base of the nation's overall workforce will be impacted. Moreover, a rapid increase in the proportion of minority

males that are insufficiently educated will create more economic difficulties and social disparity. It is readily apparent that the situation for low-income and minority males requires a targeted approach to promote their access to and success in higher education, particularly in STEM disciplines. It is our hope that the findings in this report will be helpful to our member university community as well as to K–12 education leaders and policy makers.

M. Peter McPherson
PRESIDENT
ASSOCIATION OF PUBLIC AND LAND-GRANT UNIVERSITIES

MESSAGE FROM THE PROJECT DIRECTOR

> *The world around us really belongs to youth for youth will take over its future management. Our children must never lose their zeal for building a better world. They must not be discouraged from aspiring toward greatness, for they are to be the leaders of tomorrow . . . and we must have the courage to change old ideas and practices so that we may direct their power toward good ends.*
>
> — Mary McLeod Bethune

The excerpt from Mary McLeod Bethune's *My Last Will and Testament* is as meaningful today as it was in 1955 when it was penned by the great American educator. It is clear that Ms. Bethune knew that in order to support the academic excellence of young people it is necessary for people and systems to be willing to change. That is what this report is about—having the courage to change old ideas and practices toward improving outcomes for young people, in this case minority males who choose to major in Science, Technology, Engineering and Mathematics disciplines. The underlining message from this report is that the success of minority males in STEM must be an owned responsibility by many. It must be owned by the minority males themselves, their families, higher education administrators, faculty, and policy leaders and beyond.

I trust that readers of this report will find it useful in the effort to better serve a unique segment of the nation's population. The study revealed some of the strategies that work toward better serving minority males. What respondents have shared in this report speaks to what all humans need—to have others who believe in them, who will encourage them, and who are willing to share in celebrating their success.

I am truly grateful to the Alfred P. Sloan Foundation for its support of this project. I am also grateful to Ivory Toldson, co-author for the report, and the many colleagues, both at A♦P♦L♦U and across the nation, who contributed to the success of this effort. Finally, and most importantly, I thank the students, faculty and administrators from the 14 A♦P♦L♦U-member universities who responded to the survey.

Thank you for continuing to believe in the academic excellence of all Americans.

Best regards,

Lorenzo L. Esters, Ed.D.
director, minority male stem initiative, and vice president,
association of public and land-grant universities

ACKNOWLEDGEMENTS

The Association of Public and Land-grant Universities (A•P•L•U), the members of the A•P•L•U Commission on Access, Diversity, and Excellence (CADE), and the Minority Male Science, Technology, Engineering, and Mathematics (STEM) Task Force are deeply grateful for the support of the Alfred P. Sloan Foundation for its generous award of a planning grant to support the Minority Male STEM Initiative (MMSI). We are hopeful that the findings from this initiative, through its surveys of university administrators, STEM faculty, and students in STEM disciplines, will help to improve understanding about the specific challenges faced by minority males in STEM disciplines and enhance efforts to support their success in years to come.

We want to thank Lorenzo L. Esters, MMSI project director and A•P•L•U Vice President for the Office for Access and the Advancement of Public Black Universities, for his leadership and vision in developing this initiative as well as all the members of the Task Force for their advice, counsel and contributions to this report. The lead writer for this report was Ivory A. Toldson, associate professor in the Counseling Psychology Program at Howard University. The MMSI Task Force truly appreciates Ivory's contributions to the success of this effort. Another key contributor to the success of this report was Lamont Flowers, distinguished professor and executive director of the Charles H. Houston Center for the Study of the African American Experience in Education at Clemson University. Ivory and Lamont both assisted in the analysis of the MMSI Survey data. Moreover, this work could not have been a success without the significant contributions of key staff from A•P•L•U, including Christine Keller, Wendell Hall, Irelene Ricks, and Jame'l Hodges. We offer a very special thank you to James L. Moore, professor, The Ohio State University, for serving as the project liaison for Institutional Review Board approval, which was granted through The Ohio State University.

We also acknowledge the work of multiple campus administrators and liaisons, as they were instrumental in administering the survey at the 14 participating higher education institutions. Finally, we offer our sincere appreciation to the 1,443 students, 137 faculty, and 71 administrators who took the time to respond to the survey and provided us with their thoughts, experiences, and perspectives.

The production of this report was the result of work by many over a twelve-month period. It is in the truest sense a team effort. For that, we are grateful.

E. Gordon Gee, Chair
A•P•L•U, MINORITY MALE STEM INITIATIVE TASK FORCE
PRESIDENT, THE OHIO STATE UNIVERSITY

J. Keith Motley, Chair
A•P•L•U COMMISSION ON ACCESS, DIVERSITY, AND EXCELLENCE (CADE)
CHANCELLOR, UNIVERSITY OF MASSACHUSETTS, BOSTON

Executive Summary

This report outlines exemplary practices for recruiting, retaining, and graduating African American,[1] Hispanic/Latino,[2] Native American, Alaska Native, and Southeast Asian/Pacific Islander males in postsecondary science, technology, engineering, and mathematics (STEM) disciplines.[3] Information for this report was gathered from reviewing background literature, examining successful programs, reviewing related policies, and analyzing secondary data from the American Community Survey (ACS) and primary data through the Minority Male STEM Initiative (MMSI) survey, an online survey of administrators, faculty, and students at selected postsecondary institutions.

The purpose of the MMSI survey was to identify practices and activities that support the enrollment, retention, and graduation of minority men in STEM disciplines and to better understand the perceptions and experiences of students, faculty, and administrators on university campuses. The survey was conducted during the academic semester of fall 2011. The findings contained in this report are based on responses from 1,443 STEM students, 137 STEM faculty, and 71 university administrators from 14 higher education institutions.

Critical Findings

Results from the MMSI survey yielded several meaningful findings. The following are the key findings influencing policy implications:

Experiences and Perceptions of Successful Minority Male Students in STEM

MINORITY STEM STUDENT DEMOGRAPHICS.

- The participants across all races/ethnicities consisted of mostly full-time students who were working toward an undergraduate degree in STEM fields including 92 percent of African Americans, 100 percent of Native Americans, 93 percent of Asian/Pacific Islanders and 92 percent of Hispanics.

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1 African Americans (also referred to as Black Americans or Afro Americans) are citizens or residents of the United States who have origins in any of the black populations and include those of Caribbean descent.

2 Hispanics and Latinos are used interchangeably in this report. "Hispanic" is used in the United States to denote people who are of Spanish-speaking or ethnic origin (Hispanics and Latino Americans).

3 For the purpose of this report, STEM disciplines are defined as math, computer science, engineering, biological sciences, physical sciences. Social science disciplines are not included.

- The most frequently listed college grade point average (GPA) among all minority males regardless of race/ethnicity fell between 3.00 and 3.49 on a 4-point scale.
- For financing their education, African American and Hispanic students primarily used student loans and Pell grants; the majority of the Native American and Alaska Native male students used scholarships and grants, followed by student loans; and Asian American male students used family resources, followed by Pell grants.
- The majority of African American respondents' parents (67 percent) and Native American and Alaska Native respondents' parents (97 percent) were born in the United States, yet the majority of Latino respondents' parents (65 percent) and Asian respondents' parents (83 percent) were born outside of the United States.
- While most African American students did not know their family's annual income or preferred not to reveal it, the majority of Native American and Alaska Native, Asian and Latino students estimated their family's annual income to be $30,000 or below.

MINORITY STEM STUDENTS' BACKGROUND AND PREPARATION.

- The majority of African American males (75 percent), Native American and Alaska Native males (91 percent), Asian American males (81 percent), and Latino Males (85 percent) attended public high schools.
- The majority of African American, Asian, and Latino males in STEM reported high school grade point averages between 3.0 and 3.75. The majority of Native American and Alaska Native males in STEM reported high school grade point averages between 3.0 and 3.5.
- The most frequently listed high school activities for African American, Asian, Native American and Alaska Native, and Latino males were extracurricular activities, volunteer/community service, and Advanced Placement (AP) courses.
- For African American, Native American and Alaska Native, and Latino males, the top three reasons for choosing a STEM major were an interest in STEM fields of study, employment goals, and their own educational aspirations. For Asian American males, the top three reasons were their own educational aspirations, an interest in STEM fields of study, and success in courses and subject matter.
- When asked the reasons for choosing their current college/university, the most frequently chosen reasons for African American males were the university's/college's good academic reputation, the cost/affordability, and a campus visit. The most common reasons for Native American and Alaska Native, Asian, and Latino males were cost/affordability, wanting to live near home, and the institution's good academic reputation.
- Support from family was a key theme for the majority of minority males who entered STEM fields in college.

MINORITY STEM STUDENTS' EXPERIENCES AT THE UNIVERSITY.

- Minority male students generally had positive perceptions of their university experiences.
- On average, minority males agreed that the campus environment was welcoming and that they had a sense of belonging on the campus and felt support from their peers in STEM courses.
- Minority male students also rated their interactions within the classroom as generally positive. Minority males indicated that interactions with STEM faculty members have been positive, that their professors were approachable, and that their professors encouraged them to seek help when needed.

UNIVERSITY SERVICES.

- Thirty-seven percent of minority males agreed that their current institution was doing a good job of recruiting, retaining, and graduating students of color, and they rated their institution high on allocating adequate resources and having top leadership that was committed to this objective.
- The majority (54 percent) of minority male participants agreed or strongly agreed that they have appropriate opportunities to work with faculty on research teams or projects.
- The majority (63 percent) of minority males in STEM also felt that they had appropriate exposure to science internship information.
- The majority (67 percent) of respondents agreed that they receive support from faculty to attend conferences and that they know faculty members who would write a recommendation for an internship or graduate school.

MINORITY STEM STUDENTS' PERSONAL AND MOTIVATIONAL FACTORS.

- On average, African American, Asian, and Latino males estimated that they spent six to ten hours a week studying or preparing for their STEM classes and one to five hours engaging in social/recreation activities and allotted no time for participating in co-curricular activities. On average, Native American males estimated that they spent 11 to 15 hours a week studying or preparing for their STEM classes, six to ten hours a week engaging in social/recreational activities, and one to five hours participating in co-curricular activities.
- About half (48 percent) of all minority males responded that they did not work for pay, while 17 percent worked 20 or more hours per week.
- Collectively, 86 percent of all minority males responded that they were aware of academic requirements to graduate with a degree in STEM and had control over the period within which they would graduate.
- Collectively, 89 percent of all minority males agreed that they knew what it took to succeed and that they were prepared to do whatever it took.

- Collectively, 68 percent of all minority males agreed that they generally made good use of available campus resources and that they were generally self-directed and self-motivated, and the majority of participants agreed that they were attentive to their physical, mental, and spiritual health.
- On average, African American, Native American and Alaska Native, Asian, and Latino male students found it easy to understanding educational expectations, to interact with peers, to be away from family and friends, and to manage their own schedules.
- In each minority group, a majority planned to attend graduate school in a STEM discipline or pursue a career in a STEM discipline. Among African American males, 43 percent planned to attend graduate school in a STEM discipline and 35 percent planned to pursue a career in STEM; among Hispanic males, 43 percent planned to pursue a career in STEM and 37 percent planned to attend graduate school in a STEM discipline; among Native American males, 42 percent planned to pursue a career in STEM and 36 percent planned to attend graduate school in a STEM discipline; and among Asian males 42 percent planned to attend graduate school in a STEM discipline and 40 percent planned pursue a career in STEM.
- Fifty-percent of African American and Latino male students, 45 percent of Native American and Alaska Native male students, and 59 percent of Asian male students responded that they aspire to attain a doctoral degree in their lifetime. Further, another 45 percent of Native American and Alaska Native students indicated they aspire to attain a master's degree.
- The majority of African American, Native American and Alaska Native, Asian, and Latino males felt that they were adequately equipped with the necessary tools and requirements needed to be competitive in the field and to succeed.

Experiences and Perceptions of Faculty and Administrators Serving Minority Males in STEM

SUMMARY OF STRENGTHS.

- Most university faculty and administrators understand the importance of achieving racial and gender diversity on campus.
- Most university faculty and administrators understand that important segments of society lack adequate representation on their campus and desire an inclusive environment.
- Most university faculty and administrators understand that achieving diversity in STEM will not occur through happenstance or business-as-usual practices and that some internal and external resources are required to create a representative environment.

SUMMARY OF WEAKNESSES.

- Faculty and administrators generally had difficulty articulating specific programs or action steps they were taking to create a more diverse environment.

- Very few faculty and administrators had formal mechanisms in place to evaluate their progress in recruiting, retaining, and graduating minority males in STEM.
- Formal programs and evaluation measurement was, in large part, tied only to external funding, with little initiative to leverage internal financial or intellectual capital to achieve racial and gender diversity.
- Faculty and administrators stated many barriers to achieving diversity, including budget cuts, lack of scholarships, lack of diversity in faculty, disconnect with the community, and lack of institutional commitment.

Policy and Practice Recommendations

Recommendations for K–12 Education

PROTECT AND STRENGTHEN PUBLIC HIGH SCHOOLS. The majority of the participants in this study reported they were educated within the public school system in their respective hometowns. This finding suggests there is a great need to protect and strengthen public education in America.

PROVIDE QUALITY COUNSELING AND ADVISEMENT FOR COLLEGE-BOUND STUDENTS IN GRADE SCHOOLS. Survey respondents expressed the need for better counseling and advisement in predominantly minority grade schools. In some instances, the guidance provided in their respective school systems was inadequate, severely limiting the opportunities of these students. Concerted efforts must be made on the part of counselors, particularly those in predominantly minority grade schools, to ensure students are being steered in the direction necessary for successful entry into and completion of postsecondary education.

IMPLEMENT A COLLEGE-BOUND CURRICULUM AND ADVANCED PLACEMENT CLASSES IN ALL HIGH SCHOOLS. Many of the respondents reported they benefited greatly from exposure to a rigorous curriculum through their respective schools' Advanced Placement program. However, not every school offers a rigorous curriculum to its students. Educational policies are needed that ensure that every school, regardless of its resources and geographic location, has an Advanced Placement or college preparatory program, thereby providing equal access to higher education for all students.

Recommendations for STEM Faculty

PROVIDE MEANS AND MECHANISMS FOR MINORITY MALES IN STEM TO FOSTER MORE PERSONAL AND MEANINGFUL RELATIONSHIPS WITH FACULTY MEMBERS. Some of the study participants reported experiencing aloofness from faculty members. Many students in this study noted that they greatly benefited from having close-knit relationships with faculty as these interactions contributed much to their academic growth and development. They also expressed the need to have faculty members who "understand their culture." Over the years, institutions

of higher education have expressed a commitment to supporting and promoting diversity on their campuses, among both the student body and the faculty. Yet, people of color are still largely underrepresented on the faculty at most colleges and universities. Programs are needed within higher education that recruit and retain an adequate representation of faculty of color at every institution as this is necessary to keep pace with a rapidly changing multicultural and pluralistic student body. It is also necessary to ensure that all faculty are more culturally aware so that they may more effectively work with minority students. In addition, programs are needed that foster a culture of student-faculty mentorship and offer incentives to faculty to build closer relationships with their students.

Recommendations for Student Affairs Professionals and Administrators

REDUCE FEELINGS OF ISOLATION AMONG MINORITY MALES ON COLLEGE CAMPUSES. The higher education experiences of some of the minority males in this study were associated with feelings of being "just a number" on campus. Strategies are needed to assist minority males in developing a sense of belonging and fully integrating them into the academic and social fabric of higher education institutions. One such example could include developing peer-to-peer mentoring relationships between upperclassmen and freshmen males so that a support system is created for entering minority males.

PROVIDE RESOURCES FOR FIRST-GENERATION COLLEGE STUDENTS. Many of the respondents reported being first-generation college students. Programs are needed at the secondary education level that target prospective first-generation college students and provide them with the guidance needed for successful college admissions. In addition, support is also needed for these students at the postsecondary level to ensure they persist through graduation from college.

PROVIDE SUPPORT FOR MINORITY MALES IN STEM TO DEVELOP TIME MANAGEMENT AND STUDY SKILLS. Study respondents also reported a great need for study skills training and instruction in time management. Programs are needed at the postsecondary level to assist students in these areas. Such programs should be required at the earliest possible opportunity for entering students.

PROVIDE MECHANISMS FOR MINORITY MALES IN STEM TO ATTEND TO THEIR PHYSICAL, MENTAL, AND SPIRITUAL HEALTH. In addition, study findings also suggest the need for mechanisms that promote the physical, mental, and spiritual health of students. As noted in a study conducted by the UCLA Higher Education Research Institute, students experience a significant decline in physical and mental health during the college years. Thus, programs are needed at all postsecondary institutions that can provide a means for students to meet their physical, mental and spiritual needs as the availability of these services is critical to their academic success and overall well-being.

TAKE MINORITY MALES ON COLLEGE TOURS. Students reported that they greatly benefited from opportunities provided through their schools or local communities to participate in college tours. For many students, seeing is believing. Thus, visiting an institution of interest is often a major step in the college decision-making process and can assist a student in sorting through details important to the college experience such as the size of school, college major, course offerings, social activities available on campus, and the like.

PROVIDE RESOURCES FOR STUDENTS FROM LOWER SOCIOECONOMIC BACKGROUNDS. The majority of the respondents were also of lower income homes. Low-income students are less likely to have access to information regarding financial aid procedures and are more likely to be intimidated by the college admissions process. There is a great need to demystify the college admissions and financial aid process for this unique group of students.

Recommendations for Academic Affairs Professionals and Adminstrators

PROVIDE STUDENTS WITH STRUCTURAL AND EMOTIONAL SUPPORT TO PURSUE POST-BACCALAUREATE STUDY. Study participants also expressed the need for assistance in preparing for post-baccalaureate study. Faculty members play a key role in providing students with opportunities that will aid in preparing them for graduate studies. One such mechanism for doing this is through student participation on research teams or projects and institutional support to attend conferences to present their research. At the postsecondary level, programs are needed that identify early in their academic career those students who are interested in pursuing post-baccalaureate study. Through these programs, students can be assisted in exploring their options for graduate study and provided with information on internship programs and the graduate school admissions process.

ENSURE THAT THERE IS COMMITMENT FROM THE HIGHEST LEVEL OF THE INSTITUTION. Many of the STEM faculty reported limited financial resources and the lack of clear accountability from the highest level of the administration for supporting the academic success of minority males in STEM. Improving the academic outcomes for minority males in STEM will require a focused commitment from the president of the university and from the chief academic officer. This expectation for accountability must then be communicated to those at the dean and faculty level.

GATHER THE DATA NEEDED TO MAKE INFORMED DECISIONS TOWARD CHANGE. The MMSI survey results indicated that many institutions do not have processes in place for monitoring the academic success of students by race, gender, and academic discipline. Institutions must work with their institutional research office to create appropriate metrics for measuring outcomes. The measurement and evaluation strategies must be in place before any plan toward improvement can be developed. Gathering baseline data to better understand the current state of affairs is a required first step.

ACT TO INITIATE CHANGES IN THE ACADEMIC PROCESSES. Campus and middle level administrators must be prepared to develop new academic processes based on what is learned from the data and monitor the effects of the new process over time. Often changes must be made that more clearly put student success as a priority. For example, individual departments may develop trend data on the retention and success rates of its students and determine where the bottlenecks are—in what courses do students generally not succeed, at what levels are early interventions needed, etc.

HOLD MID-LEVEL ADMINISTRATORS ACCOUNTABLE FOR THE TRACKING OF OUTCOMES BY RACE, GENDER AND ACADEMIC DISCIPLINE AT THE DEAN AND DEPARTMENT LEVEL. Many of the administrators responded that their institution does not track outcomes for STEM students by race, gender, and academic discipline. Commitment and responsibility for improving student success must be present at all levels of the institution. Leadership at the dean and department level must drive the process for accountability once it is communicated from the university leadership. Mid-level administrators must have direct access to both the human and financial resources required to implement any needed changes. A culture of accountability through the use of disaggregated data must be built among the faculty and staff as well.

Implications for Postsecondary Education Policy

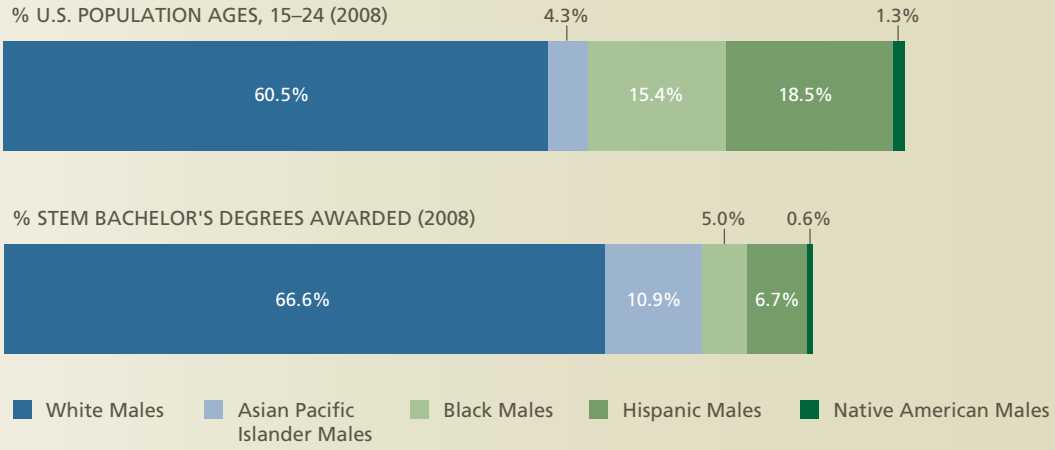
PROTECT AND EXPAND PELL GRANTS AND NEEDS-BASED SCHOLARSHIPS. Respondents expressed the need for greater access to Pell Grants and need-based scholarship programs. These programs address many of the socioeconomic challenges faced by underrepresented populations and are essential to the recruitment and retention of low-income students. For many students, federally based financial aid is the primary means by which they finance their postsecondary education—and is critical to their ability to access institutions of higher education. These programs are also critical to their ability to complete a postsecondary degree.

SUPPORT AND ENHANCE MINORITY SERVING COLLEGES AND UNIVERSITIES. Findings from this study indicated a need to emphasize the importance of minority serving institutions. These institutions serve a large proportion of students that identify as minorities. Historically, these institutions have played a large role in providing educational opportunities for traditionally underrepresented groups. In order for them to realize their respective missions, it is necessary that they continue to receive the funding needed to achieve long-term financial stability and to develop programs, policies, and practices that promote recruitment, retention, and graduation among the minority students they so diligently serve. For example, tribal colleges and universities have done an excellent job of providing postsecondary certificates and degrees in vocational and technical fields that allow Native Americans to remain closer to their homes and communities—a key element to success for minority populations (AIHEC, 2011).

Chapter 1: Introduction

If America is to widen the science, technology, engineering, and mathematics (STEM) pipeline, the nation must ensure broad participation by all Americans. Today, disparities still exist. Underrepresented minorities continue to lag behind their white counterparts in K–12 math and science preparation, enrollment in STEM majors in higher education, and participation in STEM careers. The success of women—more recently, minority women—in undergraduate STEM programs has been a key area of focus for past STEM initiatives. However, men of color—African American,[4] Latino,[5] Native American, and Asian / Pacific Islander males—are now recognized as equally disenfranchised from entering and succeeding in STEM. Figure 1 illustrates the underrepresentation of African American, Hispanic, and Native American males in STEM (as measured by bachelor's degree attainment) relative to their respective shares in the U.S. population. Figure 2 shows that this pattern persists in doctoral degree attainment in STEM fields for African American, Hispanic, and Native American males.

FIGURE 1.1: **2008 MALE U.S. POPULATION (AGES 15–24) AND STEM B.S. RECIPIENTS FOR SELECTED RACIAL/ETHNIC GROUPS**

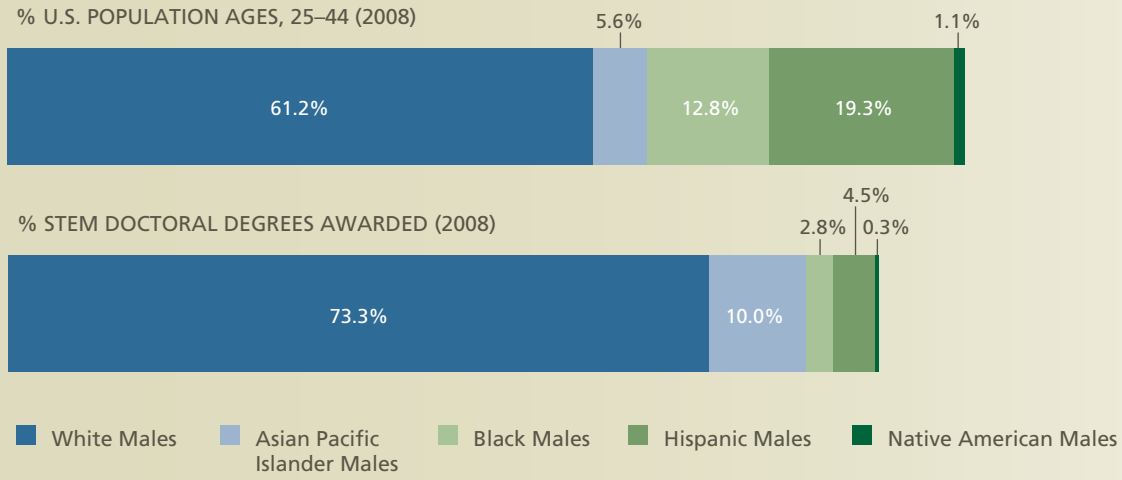


Source: National Center for Education Statistics, 2009; United States Census Bureau, 2009

4 African Americans (also referred to as Black Americans or Afro Americans) are citizens or residents of the United States who have origins in any of the black populations and include those of Caribbean descent.

5 Hispanics and Latinos are used interchangeably in this report. "Hispanic" is used in the United States to denote people who are of Spanish-speaking or ethnic origin (Hispanics and Latino Americans).

FIGURE 1.2: **2008 MALE U.S. POPULATION (AGES 25–44) AND STEM PH.D. RECIPIENTS FOR SELECTED RACIAL/ETHNIC GROUPS**



Source: National Center for Education Statistics, 2009; United States Census Bureau, 2009

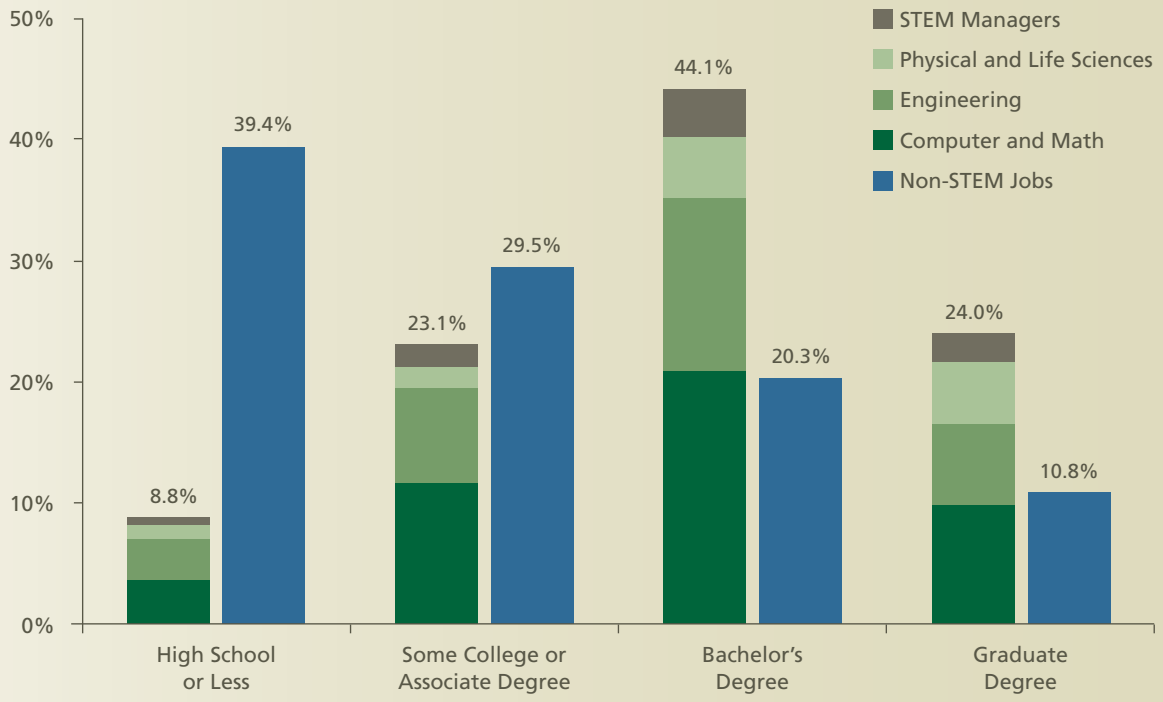
The academic, cultural, and socioeconomic contexts for each of these groups are unique in many ways, yet there are also many shared experiences and barriers. From a policy perspective, there are several salient arguments for the inclusion of more minority males in STEM overall. Without engaging the communities that have historically been less likely to pursue a STEM education, our nation risks further weakening its diminishing economic and innovative force in a global context.

Technology has changed the way that we operate globally, and now our world is dominated by advancements in technology. It requires scientific solutions to health and environmental challenges, demands immediate production and highly engineered solutions, and has an insatiable desire for technological products. Each of these forces ensures the rapid growth in and demand for the STEM workforce. According to the U.S. Department of Commerce (2011), STEM jobs have grown at a rate three times that of non-STEM jobs over the past 10 years. This means that STEM workers play a major role in the growth of our national economy and can help the United States "win the future" (U.S. Department of Commerce, 2011, p. 1).

Key facts highlighted in this report include:

- There were 7.6 million STEM workers (about 1 in 18) in the United States in 2010.
- STEM jobs have been projected to grow by 17 percent between 2008–2018.
- STEM workers earn 26 percent more than non-STEM workers.
- Regardless of their job, graduates with a STEM degree earn more than graduates with a non-STEM degree.

FIGURE 1.3: **PERCENT DISTRIBUTION OF STEM AND NON-STEM EMPLOYMENT BY EDUCATIONAL ATTAINMENT, 2010**



Source: ESA calculations using Current Population Survay public-use microdata.
Note: The estimates are for all employed persons age 16 and over.

Figure 1.3 shows that members of the workforce who have STEM jobs are more educated than those who do not. The majority of STEM jobs require some form of credential beyond high school (Harvard Graduate School of Education, 2011). Not all minority males who wish to pursue STEM careers will ultimately obtain a postsecondary degree; however, with the right social and academic supports and encouragement, seeking a STEM career could very well lead more minority males and other underrepresented groups to higher education's doorstep. The U.S. Department of Commerce (2011) report also states that if a person holds a STEM credential, he or she is also more likely not to only earn more money but also to be employed—a critical point, given the current recession and widening gap between lower- and middle-class Americans. A career in STEM is not only a good path for job security, it is a good path for low-income minority male students who wish to pull themselves and their families out of poverty's grip to secure a stable future. And it is a path that leads to healthier family structures.

The U.S. Census Bureau (2008) projects that African American, Latino, Native American, and Asian American populations will grow rapidly over the next few decades. In fact, those populations will collectively comprise approximately 50 percent of the total U.S. population by the year 2050. Given the rapid growth of racial/ethnic minority populations, it is imperative that the

United States make a concerted effort to increase the college enrollment, retention, and persistence of underrepresented minority males in STEM. Tables 1.1 through 1.4 display the changes in the percentage of males in STEM occupations by race/ethnic group over the last 30 years. Currently, in the United States, 68.28 percent of adult males are White, 11.12 percent are African American, 4.57 percent are Asian, 14.59 percent are Latino, and 1.43 percent are another race, including Native American.

TABLE 1.1: **PERCENT OF MALES IN COMPUTER AND MATHEMATICAL OCCUPATIONS**

	NON-HISPANIC WHITE	NON-HISPANIC BLACK	NON-HISPANIC ASIAN	NON-HISPANIC OTHER	HISPANIC
1980	86.36	7.39	2.88	0.11	3.26
1990	83.47	7.98	4.32	0.13	4.11
2000	75.64	5.69	12.11	1.86	4.71
2001	73.93	6.33	12.95	1.67	5.13
2002	74.21	5.64	13.3	1.62	5.24
2003	73.63	5.49	14.24	1.34	5.29
2004	72.51	5.58	15.03	1.13	5.74
2005	71.68	5.86	15.98	1.3	5.18
2006	71.2	5.75	16.28	1.41	5.35
2007	71.5	6.14	15.24	1.57	5.54
2008	71.14	6.17	15.35	1.75	5.6
2009	70.92	6.22	15.34	1.74	5.78

Note. The Integrated Public Use Microdata Series (IPUMS) consists of sixty-six high-precision samples of the American population drawn from fifteen federal censuses, from the American Community Surveys of 2000–2009, and from the Puerto Rican Community Surveys of 2005–2009. Data from Integrated Public Use Microdata Series (2009). *Version 4.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor].

TABLE 1.2: **PERCENT OF MALES IN HEALTHCARE AND TECHNICAL OCCUPATIONS**

	NON-HISPANIC WHITE	NON-HISPANIC BLACK	NON-HISPANIC ASIAN	NON-HISPANIC OTHER	HISPANIC
1980	81.28	10.79	2.36	0.11	5.45
1990	73.83	13.87	4.38	0.08	7.84
2000	76.63	6.78	8.93	1.7	5.96
2001	77.03	6.5	8.64	1.62	6.21
2002	75.78	6.57	9.97	1.21	6.48
2003	75.16	7.66	10.04	1.17	5.96
2004	73.98	6.85	10.89	1.04	7.24
2005	74.45	6.86	10.93	1.23	6.53
2006	73.2	7.23	11.24	1.11	7.21
2007	72.89	7.5	11.27	1.19	7.16
2008	72.93	7.44	10.98	1.26	7.39
2009	72.23	7.17	11.5	1.31	7.79

Note. The Integrated Public Use Microdata Series (IPUMS) consists of sixty-six high-precision samples of the American population drawn from fifteen federal censuses, from the American Community Surveys of 2000-2009, and from the Puerto Rican Community Surveys of 2005–2009. Data from Integrated Public Use Microdata Series (2009). *Version 4.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor].

TABLE 1.3: **PERCENT OF MALES IN LIFE, PHYSICAL, AND SOCIAL SCIENCE OCCUPATIONS**

	NON-HISPANIC WHITE	NON-HISPANIC BLACK	NON-HISPANIC ASIAN	NON-HISPANIC OTHER	HISPANIC
1980	88.75	6.09	1.59	0.11	3.45
1990	86.5	6.61	2.32	0.06	4.51
2000	79.14	4.74	9.75	1.43	4.93
2001	78.22	6.11	9.64	1.5	4.52
2002	79.47	4.27	10.42	1.53	4.32
2003	77.39	4	11.81	1.1	5.69
2004	77.03	5.84	11.25	0.92	4.97
2005	76.44	4.77	11.6	1.37	5.83
2006	76.46	5.05	11.72	1.38	5.38
2007	77.17	5.37	10.61	1.26	5.58
2008	76.65	4.58	11.6	1.55	5.62
2009	76.23	4.74	11.26	1.73	6.04

Note. The Integrated Public Use Microdata Series (IPUMS) consists of sixty-six high-precision samples of the American population drawn from fifteen federal censuses, from the American Community Surveys of 2000-2009, and from the Puerto Rican Community Surveys of 2005–2009. Data from Integrated Public Use Microdata Series (2009). *Version 4.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor].

TABLE 1.4: **PERCENT OF MALES IN ARCHITECTURE AND ENGINEERING OCCUPATIONS**

	NON-HISPANIC WHITE	NON-HISPANIC BLACK	NON-HISPANIC ASIAN	NON-HISPANIC OTHER	HISPANIC
1980	88	6.67	2.18	0.15	3
1990	84.63	7.2	4.27	0.05	3.85
2000	81.62	4.29	7.76	1.45	4.88
2001	80.66	4.49	8.2	1.19	5.47
2002	79.22	4.69	8.68	1.21	6.21
2003	79.38	4.49	9.43	0.99	5.72
2004	79.33	4.63	8.93	1.01	6.11
2005	79.05	4.74	9.38	0.95	5.88
2006	78.79	4.73	9.53	1	5.95
2007	78.77	4.72	9.07	1.1	6.35
2008	78.45	4.63	9.45	1.28	6.19
2009	77.62	4.74	9.83	1.38	6.43

Note. The Integrated Public Use Microdata Series (IPUMS) consists of sixty-six high-precision samples of the American population drawn from fifteen federal censuses, from the American Community Surveys of 2000-2009, and from the Puerto Rican Community Surveys of 2005-2009. Data from Integrated Public Use Microdata Series (2009). *Version 4.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor].

Current Status of Minority Males in U.S. Higher Education

African Americans

According to the ACS, in the United States, 80 percent of African American males and 83 percent of African American females age 25 and older have completed high school or obtained a GED. Forty-five percent of African American males and 53 percent of African American females have attempted college, and 16 percent of African American males and 19 percent of African American females have completed college. When restricting the age to 25 to 35, 15 percent of African American males and 22 percent of African American females have graduated from college, indicating a recent uptick in degree attainment among African American females and a small downtick among African American males (Ruggles et al., 2009).

This analysis presents data on bachelor's degree attainment for African American people in the United States based on the 2009 American Community Survey (ACS) and National Center for Education Statistics (NCES) population of institutions. In 2009, across all disciplines, 270,582 African American females and 133,026 African American males graduated from a four-year college or university (see Table 1.5). During the same year, 1,683,338 African American males and 2,514,135 African American females in the U.S. population reported having at least a bachelor's degree (see Table 1.6). African American males and females reported a wide variation of majors, a fact that has some implications for the representation of African Americans in certain fields.

TABLE 1.5: **NUMBER OF DEGREES/AWARDS CONFERRED IN 2009 BY GENDER AMONG BLACK PEOPLE IN THE UNITED STATES**

ACADEMIC DISCIPLINE, BROAD	FEMALE	MALE	SUBTOTAL
Total	270,582	133,026	403,608
Other Non-sciences or Unknown Disciplines	33,757	31,599	65,356
Business and Management	55,551	29,302	84,853
Science and Engineering Technologies	45,189	14,503	59,692
Vocational Studies and Home Economics	18,394	8,143	26,537
Math and Computer Sciences	4,628	7,944	12,572
Education	25,725	7,603	33,328
Life Sciences	32,584	7,349	39,933
Social Sciences	14,401	7,083	21,484
Arts and Music	4,259	3,231	7,490
Engineering	1,262	3,191	4,453
Communication and Librarianship	5,869	2,812	8,681
Psychology	11,473	2,542	14,015
Humanities	4,867	2,452	7,319
Religion and Theology	1,315	1,462	2,777
Law	2,156	1,202	3,358
Social Service Professions	7,105	1,108	8,213
Physical Sciences	837	641	1,478
Architecture and Environmental Design	321	423	744
Interdisciplinary or Other Sciences	841	360	1,201
Geosciences	48	76	124

Note. Data from WebCASPAR database of National Center for Education Statistics (NCES) Data Sources. WebCASPAR emphasizes S&E, but its data resources also provide information on non-S&E fields and higher education in general. For more information, visit https://webcaspar.nsf.gov/.

MOST POPULAR DEGREES AMONG AFRICAN AMERICAN MALES AND FEMALES. A review of the number of degrees conferred across disciplines by gender among African Americans at NCES institutions in 2009 indicates some differences in population trends that might affect the future landscape of professional occupations. Although business remained the top identifiable discipline among African American males and females, the category of "science and engineering technologies" ranked in the top three for African American males and females. Education remains a popular major choice for African American females. In 2009, African American females received more than three times the number of degrees in education as African American men. Of the 20 broad discipline areas explored, African American men outnumbered African American women in the number of degrees awarded in five discipline areas: engineering, math and computer

TABLE 1.6: **FIELD IN WHICH BLACK PEOPLE IN THE U.S. POPULATION RECEIVED A BACHELOR'S DEGREE**

ACADEMIC DISCIPLINE, BROAD	MALE	FEMALE	SUBTOTAL
Total	**1,683,338**	**2,514,135**	**4,197,473**
Business	434,973	529,416	964,389
Education Administration and Teaching	143,417	453,969	597,386
Social Sciences	157,339	195,458	352,797
Medical and Health Sciences and Services	49,550	269,729	319,279
Psychology	61,022	162,650	223,672
Communications	68,149	111,162	179,311
Engineering	142,127	32,494	174,621
Biology and Life Sciences	61,841	94,162	156,003
Computer and Information Sciences	90,560	61,033	151,593
Criminal Justice and Fire Protection	58,647	68,781	127,428
Public Affairs, Policy, and Social Work	27,150	98,572	125,722
English Language, Literature, and Composition	29,919	78,511	108,430
Fine Arts	44,465	56,700	101,165
Interdisciplinary and Multi-Disciplinary Studies	37,003	51,002	88,005
Liberal Arts and Humanities	29,157	44,382	73,539
Physical Sciences	37,492	21,458	58,950
History	33,253	22,742	55,995
Mathematics and Statistics	25,395	23,107	48,502
Theology and Religious Vocations	25,861	16,131	41,992
Family and Consumer Sciences	3,766	37,531	41,297
Engineering Technologies	30,871	6,233	37,104
Physical Fitness, Parks, Recreation, and Leisure	17,971	15,868	33,839
Linguistics and Foreign Languages	7,007	15,819	22,826
Philosophy and Religious Studies	13,754	6,955	20,709
Agriculture	13,480	6,119	19,599
Architecture	12,253	5,428	17,681
Law	3,627	8,455	12,082
Area, Ethnic, and Civilization Studies	3,175	7,019	10,194
Environment and Natural Resources	4,666	3,494	8,160
Transportation Sciences and Technologies	4,100	2,004	6,104
Communication Technologies	3,439	1,454	4,893
Library Science	421	3,562	3,983
Construction Services	3,323	504	3,827
Cosmetology Services and Culinary Arts	1,929	1,200	3,129
Precision Production and Industrial Arts	969	144	1,113
Nuclear, Radiology, and Biological Technologies	237	621	858
Electrical and Mechanic Repairs and Technologies	653	114	767
Military Technologies	377	152	529

Note. The Integrated Public Use Microdata Series (IPUMS) consists of sixty-six high-precision samples of the American population drawn from fifteen federal censuses, from the American Community Surveys of 2000–2009, and from the Puerto Rican Community Surveys of 2005–2009. Data from Integrated Public Use Microdata Series (2009). *Version 4.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor].

sciences, geosciences, architecture and environmental design, and religion and theology. The number of degrees awarded to African American women outnumbered African American men more than four to one in life sciences, psychology, and social service professions.

UNDERREPRESENTED FIELDS AMONG AFRICAN AMERICAN MALES. The current census estimates that African American males represent 11 percent of all adult males in the United States, and African American women represent 12 percent of all adult females (U.S. Census Bureau, 2010). Ideally, comparable percentages should be reflected in the representation of African American men and women in their selected disciplines. Analysis of the ACS revealed little variation in degree choice by race, with the top for major selections being the same for African American and White males and for African American and White females. However, disparities in overall degree attainment appear to affect adequate representation in many fields. For instance, although engineering is the fourth most popular degree among African American males, they only represent 3.5 percent of all males with a degree in engineering. African American males have population-consistent representation in only five of the 37 degrees measured: criminal justice, industrial arts, theology and religious studies, and family and consumer sciences, with overrepresentation (greater than 11 percent) in the category of "public affairs, policy, and social work."

Native Americans or Alaska Natives

According to the ACS, in the United States, 75 percent of Native American/Alaska Native males and 78 percent of Native American/Alaska Native females age 25 and older have completed high school or obtained a GED. Forty-three percent of Native American/Alaska Native males and 50 percent of Native American /Alaska Native females have attempted college, and 12 percent of Native American/Alaska Native males and 14 percent of Native American/Alaska Native females have completed college (Ruggles et al., 2009).

In 2009, across all disciplines, 18,334 Native American/Alaska Native females and 11,424 Native American/Alaska Native males graduated from a four-year college or university (see Table 1.7). During the same year, 108,626 Native American/Alaska Native males and 198,015 Native American/Alaska Native females in the U.S. population reported having at least a bachelor's degree (see Table 1.8). Like other race groups, Native American/Alaska Native males and females reported a wide variation of majors.

MOST POPULAR DEGREES AMONG NATIVE AMERICAN/ALASKA NATIVE MALES AND FEMALES. Like other races/ethnicities, business is the number 1 major among Native American/Alaska Native males. However, education administration and teaching was the most popular choice for Native American/Alaska Native females. Business, engineering, and social sciences account for almost half of all degrees conferred on Native American/Alaska Native males in the United States. Eleven percent of Native American/Alaska Native males with a bachelor's degree have a degree in engineering, compared to 1.5 percent for Native American/Alaska Native females.

TABLE 1.7: **NUMBER OF DEGREES/AWARDS CONFERRED IN 2009 BY GENDER AMONG AMERICAN INDIANS AND ALASKA NATIVES IN THE UNITED STATES**

ACADEMIC DISCIPLINE, BROAD	FEMALE	MALE	SUBTOTAL
Total	18,334	11,424	29,758
Other Non-sciences or Unknown Disciplines	2,800	2,614	5,414
Business and Management	2,812	2,026	4,838
Science and Engineering Technologies	2,695	1,246	3,941
Life Sciences	2,498	890	3,388
Education	2,006	643	2,649
Social Sciences	1,226	735	1,961
Vocational Studies and Home Economics	966	634	1,600
Humanities	531	382	913
Arts and Music	529	368	897
Psychology	656	192	848
Math and Computer Sciences	271	531	802
Communication and Librarianship	378	200	578
Engineering	110	384	494
Social Service Professions	376	79	455
Law	202	178	380
Physical Sciences	75	126	201
Religion and Theology	51	77	128
Interdisciplinary or Other Sciences	77	48	125
Architecture and Environmental Design	53	50	103
Geosciences	22	21	43

Note. Data from WebCASPAR database of National Center for Education Statistics (NCES) Data Sources. WebCASPAR emphasizes S&E, but its data resources also provide information on non-S&E fields and higher education in general. For more information, visit https://webcaspar.nsf.gov/.

A review of the number of degrees conferred across disciplines by gender among Native American/Alaska Native people at NCES institutions in 2009 indicates some differences in population trends that might affect the future landscape of professional occupations. Business is the top identifiable discipline among Native American/Alaska Native males and females. Although "science and engineering technologies" ranked in the top three for Native American/Alaska Native males and females, females were awarded more than twice the number of degrees as males. Education remains a popular major choice for Native American/Alaska Native females. Of the 20 broad discipline areas explored, the number of degrees awarded for Native American/Alaska Native men outnumbered Native American/Alaska Native women in only two discipline areas: engineering and physical sciences.

TABLE 1.8: **FIELD IN WHICH AMERICAN INDIANS OR ALASKA NATIVES IN THE U.S. POPULATION RECEIVED A BACHELOR'S DEGREE**

ACADEMIC DISCIPLINE, BROAD	MALE	FEMALE	SUBTOTAL
Total	89,389	108,626	198,015
Business	18,017	18,035	36,052
Education Administration and Teaching	7,193	22,274	29,467
Social Sciences	7,568	8,514	16,082
Medical and Health Sciences and Services	2,939	10,567	13,506
Psychology	4,410	7,589	11,999
Engineering	10,211	1,687	11,898
Fine Arts	3,508	3,638	7,146
Criminal Justice and Fire Protection	3,935	3,054	6,989
Communications	2,244	4,320	6,564
Biology and Life Sciences	2,625	3,741	6,366
Public Affairs, Policy, and Social Work	1,518	4,733	6,251
Liberal Arts and Humanities	2,860	2,676	5,536
Interdisciplinary and Multi-Disciplinary Studies	1,420	3,461	4,881
English Language, Literature, and Composition	1,201	3,107	4,308
Physical Sciences	2,676	1,108	3,784
History	2,200	1,476	3,676
Computer and Information Sciences	2,313	1,092	3,405
Mathematics and Statistics	1,267	952	2,219
Family and Consumer Sciences	340	1,878	2,218
Agriculture	1,602	518	2,120
Philosophy and Religious Studies	1,207	759	1,966
Physical Fitness, Parks, Recreation, and Leisure	1,029	917	1,946
Environment and Natural Resources	1,631	131	1,762
Linguistics and Foreign Languages	797	608	1,405
Engineering Technologies	954	260	1,214
Area, Ethnic, and Civilization Studies	387	613	1000
Theology and Religious Vocations	677	265	942
Architecture	766	141	907
Transportation Sciences and Technologies	496	30	526
Communication Technologies	271	195	466
Law	429	0	429
Construction Services	339	75	414
Cosmetology Services and Culinary Arts	216	70	286
Nuclear, Radiology, and Biological Technologies	82	93	175
Electrical and Mechanic Repairs and Technologies	61	0	61
Library Science	0	49	49

Note. The Integrated Public Use Microdata Series (IPUMS) consists of sixty-six high-precision samples of the American population drawn from fifteen federal censuses, from the American Community Surveys of 2000–2009, and from the Puerto Rican Community Surveys of 2005-2009. Data from Integrated Public Use Microdata Series (2009). *Version 4.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor].

UNDERREPRESENTED FIELDS AMONG NATIVE AMERICAN/ALASKA NATIVE MALES. The current census estimates that Native American/Alaska Native males represent 1 percent of all adult males in the United States (U.S. Census Bureau, 2012). However, Native American/Alaska Native males represent only 0.3 percent of all males with at least a bachelor's degree. Accordingly, Native American/Alaska Native males represent less than 0.5 percent of most disciplines. Law was the only degree field in which the representation of Native American/Alaska Native males was consistent with their representation on the general population.

Asian American and Pacific Islanders

According to the ACS, in the United States, 88 percent of Asian American males and 84 percent of Asian American females age 25 and older have completed high school or obtained a GED. Seventy-one percent of Asian American males and 66 percent of Asian American females have attempted college, and 52 percent of Asian American males and 46 percent of Asian American females have completed college. These figures compare favorably to all other racial/ethnic groups, including White males (32 percent of White males have graduated from college). However, several Asian American ethnicities have much lower rates of college completion. Twenty-seven percent of Vietnamese males, 13 percent of Cambodian males, 12 percent of Hmong males, and 11 percent of Laotian males have completed college. Among males of Pacific Islander ethnicities, including Samoan and Tongan, 12 percent have graduated from college (Ruggles et al., 2009).

In 2009, across all disciplines, 120,620 Asian American females and 96,024 Asian American males graduated from a four-year college or university (see Table 1.9). During the same year, 1,692,613 Asian American males and 1,721,971 Asian American females in the U.S. population reported having at least a bachelor's degree (see Table 1.10). When excluding Japanese, Chinese, East Indian, and Korean males from the count, 715,921 Asian and Pacific Islander males had a degree in 2009 in the United States.

MOST POPULAR DEGREES AMONG ASIAN AMERICAN AND PACIFIC ISLANDER MALES AND FEMALES. Among all Asian males in the U.S. population with at least a bachelor's degree, engineering was the number 1 field, and business was number 2. More than 485,000 Asian males have a degree in engineering. However, when excluding Japanese, Chinese, Korean, and Indian males, only 163,221 have a degree in engineering. The top five major selections among Asian and Pacific Islander males, when excluding the above-mentioned ethnicities, are engineering, business, medical and health sciences and services, computer and information sciences, and social sciences. The top five major selections of the corresponding group of females are medical and health sciences and services, business, education administration and teaching, biology and life sciences, and social sciences.

A review of the number of degrees conferred across disciplines by gender among Asian American people at NCES institutions in 2009 indicates some differences in population trends that might affect the future landscape of professional occupations. Most notably, although in the general

TABLE 1.9 **NUMBER OF DEGREES/AWARDS CONFERRED IN 2009 BY GENDER AMONG ASIAN AND PACIFIC ISLANDERS IN THE UNITED STATES**

ACADEMIC DISCIPLINE, BROAD	FEMALE	MALE	SUBTOTAL
Total	120,620	96,024	216,644
Business and Management	23,113	22,346	45,459
Life Sciences	27,632	14,330	41,962
Other Non-sciences or Unknown Disciplines	12,106	12,054	24,160
Social Sciences	8,893	6,983	15,876
Science and Engineering Technologies	9,729	5,794	15,523
Engineering	3,065	9,972	13,037
Math and Computer Sciences	2,542	6,392	8,934
Education	6,627	2,212	8,839
Arts and Music	4,835	2,598	7,433
Psychology	5,368	1,888	7,256
Humanities	3,863	2,342	6,205
Vocational Studies and Home Economics	3,362	2,316	5,678
Communication and Librarianship	2,905	1,240	4,145
Law	2,003	1,724	3,727
Physical Sciences	1,348	1,466	2,814
Interdisciplinary or Other Sciences	972	657	1,629
Architecture and Environmental Design	739	645	1,384
Social Service Professions	1,033	188	1,221
Religion and Theology	383	786	1,169
Geosciences	102	91	193

Note. Data from WebCASPAR database of National Center for Education Statistics (NCES). *Data Sources.* WebCASPAR emphasizes S&E, but its data resources also provide information on non-S&E fields and higher education in general. For more information, visit https://webcaspar.nsf.gov/.

population, more Asian and Pacific Islander males than females have college degrees. In 2009, more than 24,000 more Asian females than males graduated from college. In addition, engineering was no longer the most popular career choice; it was third. Like, other races and ethnicities, business was the number 1 career choice, followed by life sciences. The male-to-female ratios for Asian and Pacific Islanders in academic disciplines were similar to other races. Asian males outnumbered females in engineering and math and computer sciences, but Asian females outnumbered males in the majority of the broad subject areas.

UNDERREPRESENTED FIELDS AMONG ASIAN AMERICAN AND PACIFIC ISLANDER MALES. The current census estimates that Japanese, Chinese, Korean, and Indian males represent 2 percent

TABLE 1.10: **FIELD IN WHICH ASIAN AND PACIFIC ISLANDERS IN THE U.S. POPULATION RECEIVED A BACHELOR'S DEGREE**

ACADEMIC DISCIPLINE, BROAD	MALE	FEMALE	SUBTOTAL
Total	1,692,613	1,721,971	3,414,584
Business	305,904	334,255	640,159
Engineering	485,680	104,374	590,054
Medical and Health Sciences and Services	85,399	284,819	370,218
Computer and Information Sciences	150,346	79,510	229,856
Biology and Life Sciences	103,006	125,679	228,685
Social Sciences	109,410	109,732	219,142
Education Administration and Teaching	41,514	137,028	178,542
Physical Sciences	70,029	50,331	120,360
Fine Arts	31,366	73,637	105,003
Interdisciplinary and Multi-Disciplinary Studies	37,855	56,542	94,397
Psychology	27,534	65,525	93,059
English Language, Literature, and Composition	21,005	55,593	76,598
Mathematics and Statistics	39,760	27,189	66,949
Liberal Arts and Humanities	17,609	40,200	57,809
Communications	19,532	34,134	53,666
History	15,113	20,709	35,822
Engineering Technologies	25,138	5,558	30,696
Linguistics and Foreign Languages	5,875	23,797	29,672
Architecture	15,309	9,862	25,171
Family and Consumer Sciences	1,567	23,509	25,076
Agriculture	16,414	8,454	24,868
Philosophy and Religious Studies	12,520	7,401	19,921
Public Affairs, Policy, and Social Work	5,884	13,444	19,328
Theology and Religious Vocations	12,810	4,888	17,698
Criminal Justice and Fire Protection	8,343	4,979	13,322
Physical Fitness, Parks, Recreation, and Leisure	4,730	4,488	9,218
Area, Ethnic, and Civilization Studies	3,286	5,706	8,992
Transportation Sciences and Technologies	6,567	275	6,842
Environment and Natural Resources	4,440	2,276	6,716
Law	1,933	2,814	4,747
Communication Technologies	1,953	1,249	3,202
Nuclear, Radiology, and Biological Technologies	1,231	798	2,029
Construction Services	1,749	172	1,921
Cosmetology Services and Culinary Arts	251	1,546	1,797
Library Science	58	1,498	1556
Electrical and Mechanic Repairs and Technologies	715	0	715
Military Technologies	639	0	639
Precision Production and Industrial Arts	139	0	139

Note. The Integrated Public Use Microdata Series (IPUMS) consists of sixty-six high-precision samples of the American population drawn from fifteen federal censuses, from the American Community Surveys of 2000–2009, and from the Puerto Rican Community Surveys of 2005–2009. Data from Integrated Public Use Microdata Series (2009). *Version 4.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor].

of all males in the United States, and other Asian and Pacific Islanders represent 1 percent (U.S. Census Bureau, 2012). Asian males represent 5 percent of all adult males, but account for more than 10 percent of 9 degree fields; with 8 of the 9 being Science, Technology, Engineering, and Mathematics (STEM) fields. Asian and Pacific Islander males are adequately represented in academic fields considering their representation in the U.S. population; however the vast number of Asian ethnicities complicates analyses. As previously noted, Vietnamese, Cambodian, Hmong, and Laotian males are far less likely to graduate from college than are other Asian males.

Hispanics

According to the ACS, in the United States, 59 percent of Latino males and 63 percent of Latino females age 25 and older have completed high school or obtained a GED. Thirty-three percent of Latino males and 37 percent of Latino females have attempted college, and 12 percent of Latino males and 14 percent of Latino females have completed college.

In 2009, across all disciplines, 225,821 Latino females and 137,759 Latino males graduated from a four-year college or university (see Table 1.11). During the same year, 1,662,957 Latino males and 1,858,543 Latino females in the U.S. population reported having at least a bachelor's degree (see Table 1.12). Latino males and females reported a wide variation of majors, a fact that has implications for the representation of Latino people in certain fields.

MOST POPULAR DEGREES AMONG LATINO MALES AND FEMALES. Business is the number 1 major selection among Latino males and females. According to the ACS, 25 percent of Latino males and 22 percent of Latino females in the United States who have at least a bachelor's degree, have a degree in business. Business, social sciences, and engineering account for almost half of all degrees conferred on Latino males in the United States. Sixteen percent of Latino males with a bachelor's degree have that degree in engineering, compared to 2.7 percent for Latino females. Eight percent of Latino females with a bachelor's degree have that degree in medical and health sciences, compared to 2.5 percent for Latino males (Ruggles et al., 2009).

A review of the number of degrees conferred across disciplines by gender among Latino people at NCES institutions in 2009 indicates some differences in population trends that might affect the future landscape of professional occupations. Although business remained the top identifiable discipline among Latino males and females, science and engineering technologies ranked in the top three for Latino males and females. Education remains a popular major choice for Latino females. Of the 20 broad discipline areas explored, Latino men received more degrees than Latino women in several discipline areas: engineering, math and computer sciences, architecture and environmental design, and religion and theology.

UNDERREPRESENTED FIELDS AMONG LATINO MALES. The current census estimates that Latino males represent 17 percent of all adult males in the United States and Latino women represent 15 percent of all adult females (U.S. Census Bureau, 2010). Ideally, comparable percentages should

TABLE 1.11: **NUMBER OF DEGREES/AWARDS CONFERRED IN 2009 BY GENDER AMONG HISPANIC PEOPLE IN THE UNITED STATES**

ACADEMIC DISCIPLINE, BROAD	FEMALE	MALE	SUBTOTAL
Total	225,821	137,759	363,580
Other Non-sciences or Unknown Disciplines	37,202	30,618	67,820
Business and Management	36,725	25,277	62,002
Science and Engineering Technologies	36,168	16,658	52,826
Life Sciences	23,565	8,225	31,790
Education	22,267	6,903	29,170
Vocational Studies and Home Economics	15,071	9,383	24,454
Social Sciences	12,347	7,628	19,975
Psychology	9,759	2,669	12,428
Humanities	7,686	4,541	12,227
Arts and Music	6,138	4,695	10,833
Math and Computer Sciences	2,448	7,426	9,874
Engineering	1,728	5,714	7,442
Communication and Librarianship	4,905	2,228	7,133
Social Service Professions	4,273	671	4,944
Law	1,970	1,649	3,619
Interdisciplinary or Other Sciences	1,465	703	2,168
Physical Sciences	813	906	1,719
Architecture and Environmental Design	714	1,005	1,719
Religion and Theology	447	705	1,152
Geosciences	130	155	285

Note. Data from WebCASPAR database of National Center for Education Statistics (NCES) Data Sources. WebCASPAR emphasizes S&E, but its data resources also provide information on non-S&E fields and higher education in general. For more information, visit https://webcaspar.nsf.gov/.

be reflected in the representation of Latino men and women in their selected disciplines. Despite accounting for 17 percent of all males in the United States, Latino men account for only 6 percent of adult males with a bachelor's degree. This figure alone is likely responsible for Latino males being underrepresented in every discipline. Latino males have the strongest representation in electrical and mechanic repairs and technologies and linguistics and foreign languages.

TABLE 1.12: **FIELD IN WHICH HISPANIC PEOPLE IN THE U.S. POPULATION RECEIVED A BACHELOR'S DEGREE**

ACADEMIC DISCIPLINES, BROAD	MALE	FEMALE	SUBTOTAL
Total	1,662,957	1,858,543	3,521,500
Business	406,939	411,614	818,553
Education Administration and Teaching	108,697	315,036	423,733
Engineering	268,664	50,109	318,773
Social Sciences	140,173	136,103	276,276
Medical and Health Sciences and Services	41,279	152,002	193,281
Psychology	54,559	135,103	189,662
Biology and Life Sciences	71,817	66,086	137,903
Fine Arts	57,842	71,255	129,097
Communications	50,650	77,326	127,976
Computer and Information Sciences	69,111	30,581	99,692
Liberal Arts and Humanities	30,701	48,628	79,329
Criminal Justice and Fire Protection	41,173	36,790	77,963
English Language, Literature, and Composition	28,027	49,499	77,526
Interdisciplinary and Multi-Disciplinary Studies	34,401	40,841	75,242
Public Affairs, Policy, and Social Work	13,194	44,223	57,417
Linguistics and Foreign Languages	18,799	37,584	56,383
History	31,678	24,238	55,916
Physical Sciences	34,106	20,491	54,597
Architecture	27,427	14,977	42,404
Mathematics and Statistics	19,213	13,278	32,491
Agriculture	19,001	7,972	26,973
Family and Consumer Sciences	2,513	23,593	26,106
Physical Fitness, Parks, Recreation, and Leisure	13,578	11,743	25,321
Engineering Technologies	18,421	4,072	22,493
Philosophy and Religious Studies	13,456	6,790	20,246
Theology and Religious Vocations	13,286	5,225	18,511
Environment and Natural Resources	7,459	4,694	12,153
Area, Ethnic, and Civilization Studies	4,074	7,618	11,692
Transportation Sciences and Technologies	8,242	831	9,073
Law	3,645	5,123	8,768
Construction Services	3,876	658	4,534
Communication Technologies	2,526	1,840	4,366
Cosmetology Services and Culinary Arts	1,820	1,120	2,940
Library Science	60	1,325	1,385
Electrical and Mechanic Repairs and Technologies	1,182	0	1,182
Nuclear, Radiology, and Biological Technologies	427	175	602
Military Technologies	579	0	579
Precision Production and Industrial Arts	362	0	362

Note. The Integrated Public Use Microdata Series (IPUMS) consists of sixty-six high-precision samples of the American population drawn from fifteen federal censuses, from the American Community Surveys of 2000-2009, and from the Puerto Rican Community Surveys of 2005–2009. Data from Integrated Public Use Microdata Series (2009). *Version 4.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor].

Chapter 2: Explaining Current Trends
STUDENT SURVEY RESULTS

Unique academic, school, family, personal, emotional, and motivational factors are associated with postsecondary educational aspirations of minority males and their expectations to enroll and compete in college in the STEM field.[6] Much of the literature on college aspirations among males suggests that minority males aspire to attend college at rates similar to their White peers (Mahoney & Merritt, 1993; Pitre, 2006; Toldson, 2008), and across races/ethnicities, females aspire to attend college at higher rates than males (Hallinan & Williams, 1990). However, minority students continue to enroll in postsecondary institutions and attain college degrees at significantly lower rates than their White and female counterparts (Wimberly, 2002). Wimberly (2002) suggests that many factors may explain this phenomenon. Research evidence points to many unique school and social barriers that prevent minority males from accessing institutions of higher education (Chavous et al., 2003; Howard, 2003). Moreover, minority males demonstrate distinct patterns in achieving educational goals that have implications for the work of counselors, teachers, families, and educational activists (Jackson & Moore, 2006; Toldson, 2008).

College participation among minority males is associated with many developmental factors that cut across various life domains, including the school and family. In addition, many personal and interpersonal attributes influence the decision of minority males to attend college. This report reviews factors associated with a college or university successfully recruiting, retaining, and graduating African American, Latino, Native American, and Southeast Asian and Pacific Islander males. Each section looks specifically at academic and school-related factors, the influence of family factors, and the impact of personal, emotional, and motivational factors on the potential for minority males to fully participate in and complete postsecondary education in STEM disciplines.

MMSI Study Purpose

The purpose of this report is to gather and examine exemplary practices for recruiting, retaining, and graduating postsecondary science, technology, engineering, and mathematics (STEM) students from underrepresented minority (URM) populations, specifically undergraduate minority males (African Americans, Latinos, Native Americans, Pacific Islanders/Alaska Natives,

6 See Appendix E for more information on factors that inhibit minority male student success.

and Southeast Asians). Phase I involved gathering information through an online survey from administrators, faculty, and students at 14 postsecondary institutions. The purpose of the survey was to identify practices and activities that support the enrollment, retention, and graduation of minority men in STEM disciplines and to better understand the perceptions and experiences of students, faculty, and administrators on university campuses.

A task force was appointed to assist with carrying out the work of the initiative. The members of the MMSI Task Force, who were chosen for their expertise and experience, provided insight, advice, and analysis for this report, which is intended to initiate a national dialogue on enhancing the recruitment, retention, and graduation of minority males in STEM disciplines.

An online survey was administered to the three cohort groups: administrators, faculty, and students. The survey was administered at 14 institutions, including five different institutional types: three Predominately White Institutions (PWIs), three Historically Black Colleges and Universities (HBCUs), three Hispanic Serving Institutions (HSIs), two Tribal Colleges and Universities (TCUs), and three institutions with large Asian/Pacific Islander student populations. All participating institutions were A♦P♦L♦U members with robust Louis Stokes Alliance for Minority Participation (LSAMP) programs currently in place. Moreover, all 14 participating institutions had strong undergraduate-through-postgraduate STEM pipelines. In total, 1,443 STEM students of color, 137 STEM faculty, and 71 university administrators responded to the survey.[7]

Monitoring Minority Male STEM Students: Results of the MMSI Campus Survey

Minority STEM Student Demographics

One hundred African American males, 121 Asian and Pacific Islander males, 311 Hispanic males, and 31 Native American males who were STEM majors responded to the Minority Male STEM Initiative (MMSI) campus survey (see Figure 2.1). The participants across all race ethnicities consisted of mostly full-time students who were working toward an undergraduate degree in STEM fields. This includes 92 percent of African Americans, 100 percent of Native Americans, 93 percent of Asians, and 93 percent of Hispanics (see Figures 2.2 and 2.3). The most popular major for African American, Asian, and Latino males was in biological sciences while the of the most popular major for Native American and Alaska Native males was in biological sciences or civil engineering.

The majority of African American male participants had started at their current institution and was in their second year of college (see Figure 2.4). The majority of Latino and Native American and Alaska Native participants had started at their current institution and was in their third year of college (see Figure 2.4). The majority of Asian American male participants had started at their current institution and was in their third or fourth year of college (see Figure 2.4). The most

7 Please see Appendix D for the full methodology used in the study.

FIGURE 2.1: **MMSI MALE STEM SURVEY PARTICIPANTS BY RACE/ETHNICITY, 2012**

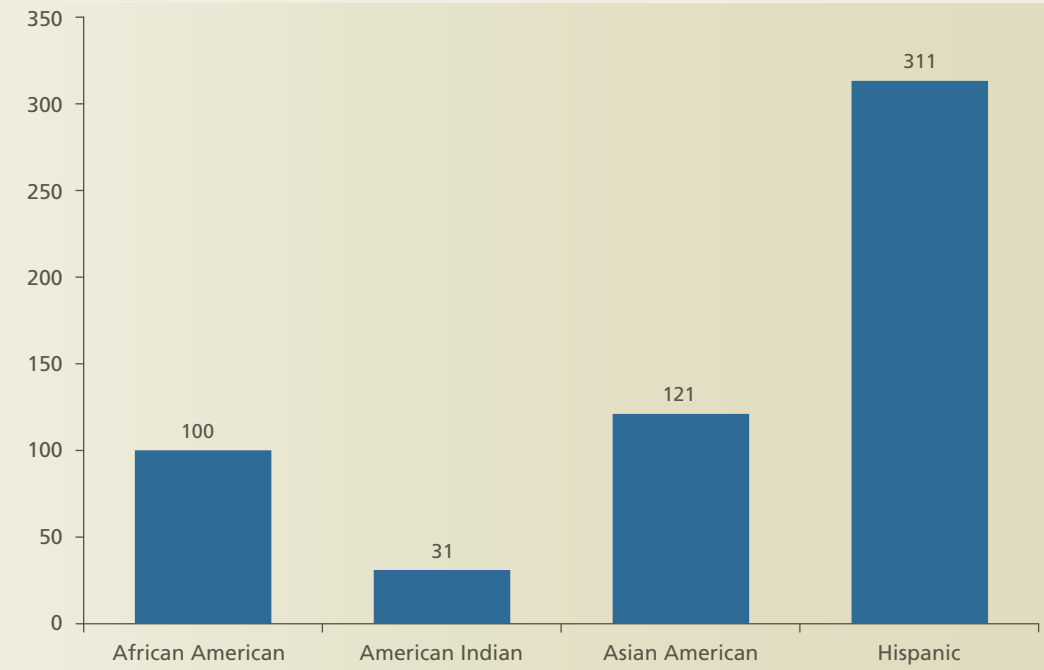


FIGURE 2.2: **FULL-TIME ENROLLMENT STATUS OF MALE STEM STUDENTS BY RACE/ETHNICITY, 2012**

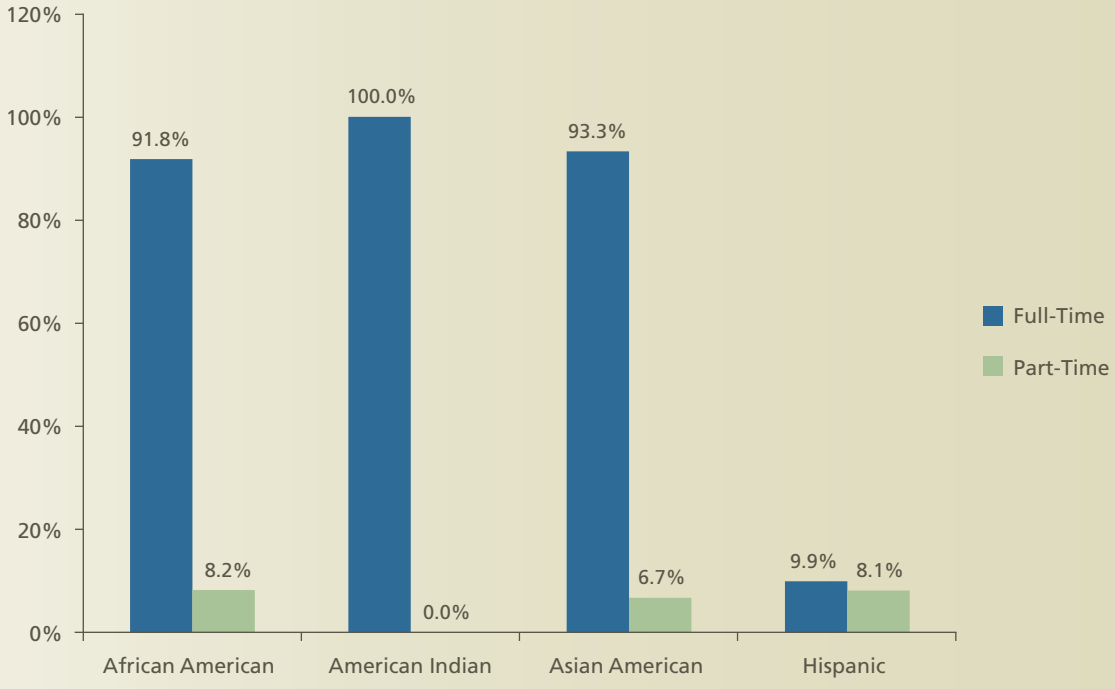


FIGURE 2.3: **LEVEL OF MMSI MALE STEM STUDENTS BY RACE/ETHNICITY, 2012**

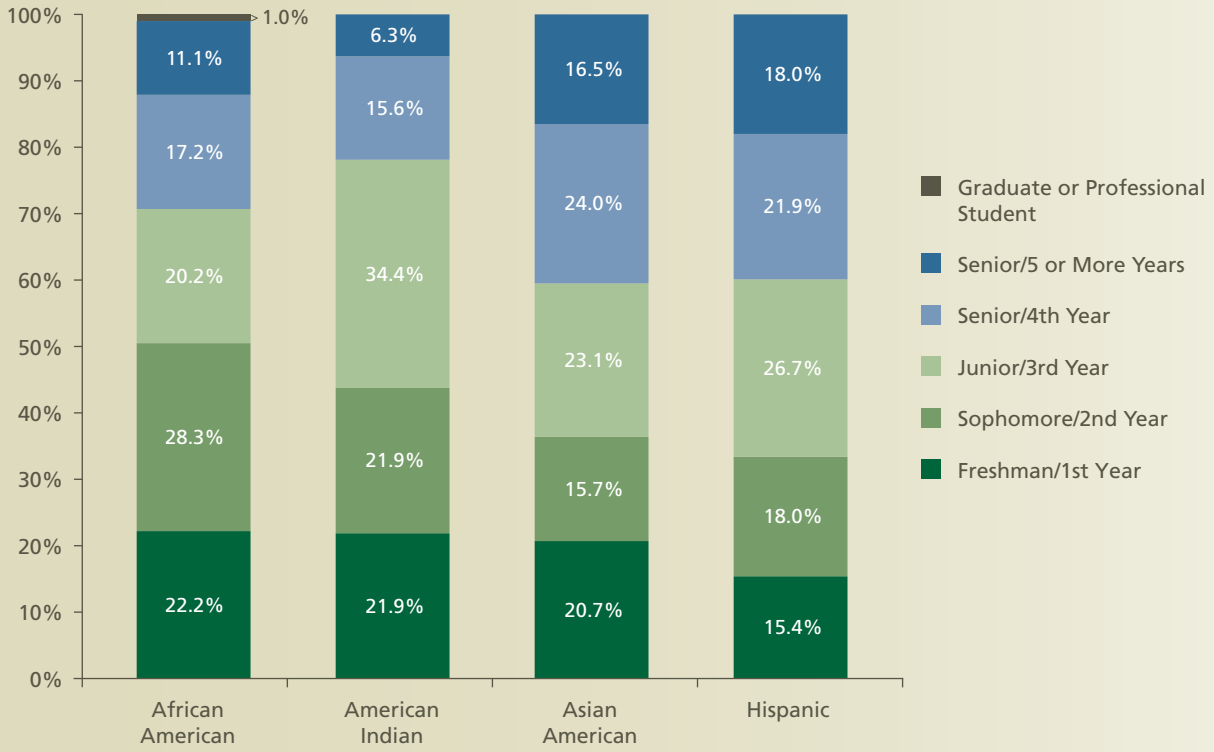


FIGURE 2.4: **ORIGIN OF MMSI MALE STEM STUDENTS BY RACE/ETHNICITY, 2012**

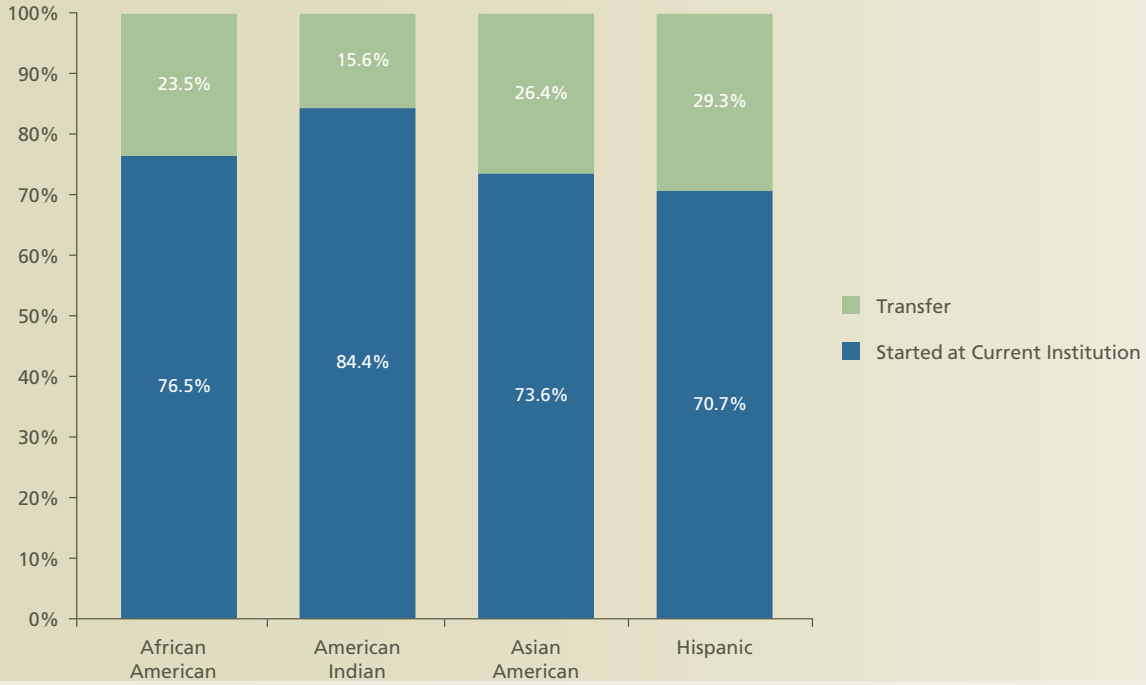
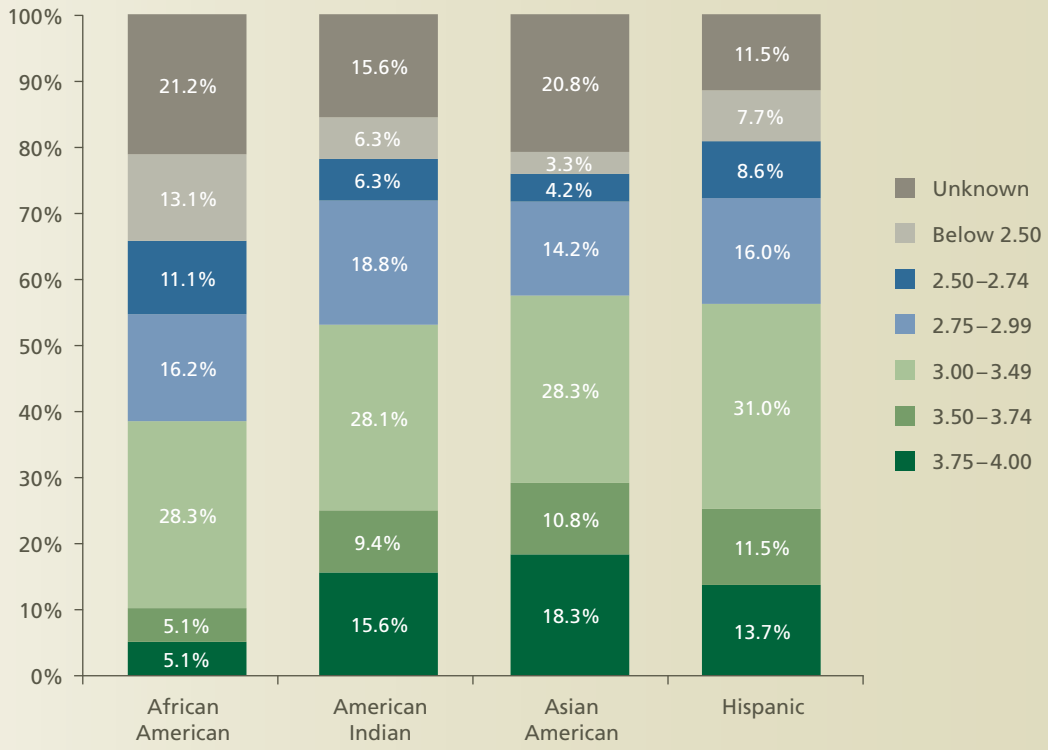


FIGURE 2.5: **COLLEGE GRADE POINT AVERAGE FOR MALE STEM STUDENTS BY RACE/ETHNICITY, 2012**



frequently listed college GPA among all minority males regardless of race/ethnicity fell between 3.00 and 3.49 on a four-point scale (see Figure 2.5).

To finance their college education, the majority of African American male students used student loans, followed by Pell grants; the majority of Hispanic male students used Pell Grants, followed by student loans; the majority of the Native American and Alaska Native male students, used scholarships and grants, followed by student loans; and the majority of the Asian American male students used family resources, followed by Pell grants (see Figure 2.6).

The majority of African American respondents' parents (67 percent) and Native American Alaska Native respondents' parents (97 percent) were born in the United States, yet the majority of Latino respondents' parents (65 percent) and Asian respondent's parents (83 percent) were born outside of the United States (see Figure 2.7).

When questioned about the highest level of education attained by their parents, 36 percent of African American male students indicated that their father had a bachelor's degree or higher (Figure 2.9), and 42 percent indicated that their mother had a bachelor's degree or higher (Figure 2.8). Thirty-two percent of Hispanic male students reported that their father had a bachelor's degree or higher, and 29 percent indicated that their mother had a bachelor's degree or higher

FIGURE 2.6: **SOURCES FOR FINANCING COLLEGE FOR MALE STEM STUDENTS BY RACE/ ETHNICITY, 2012**

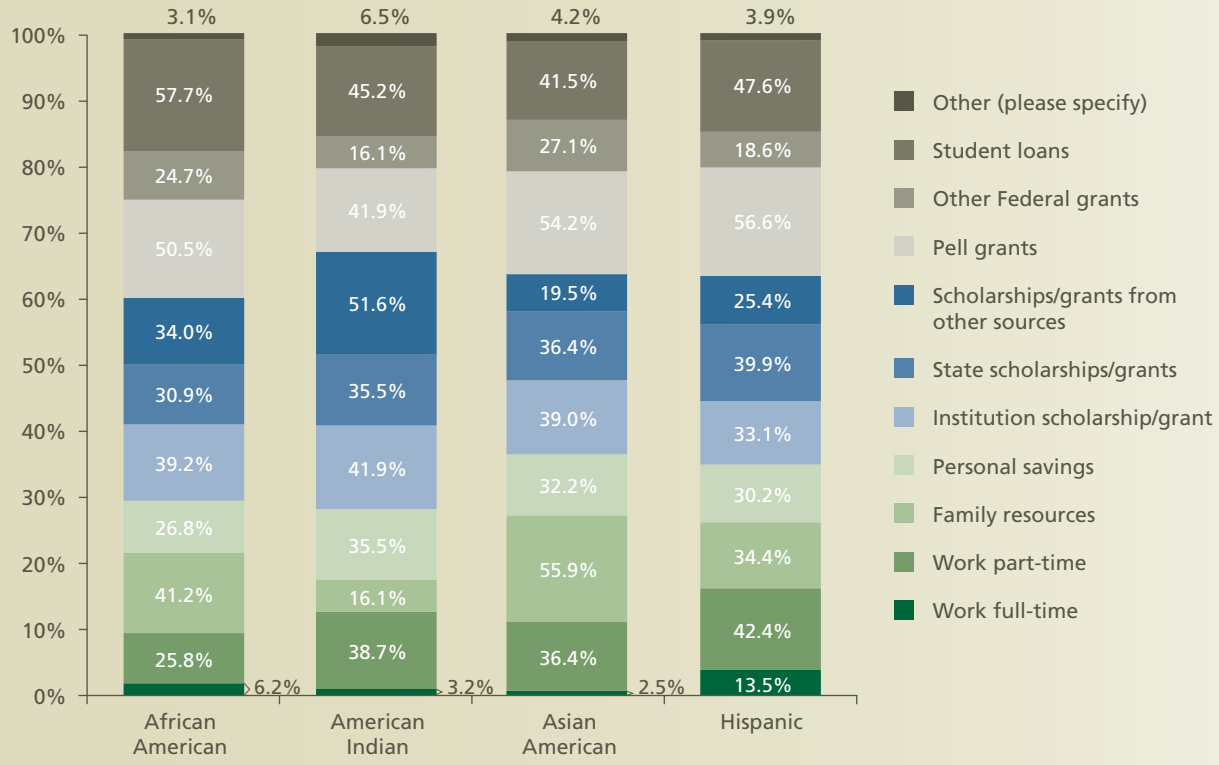
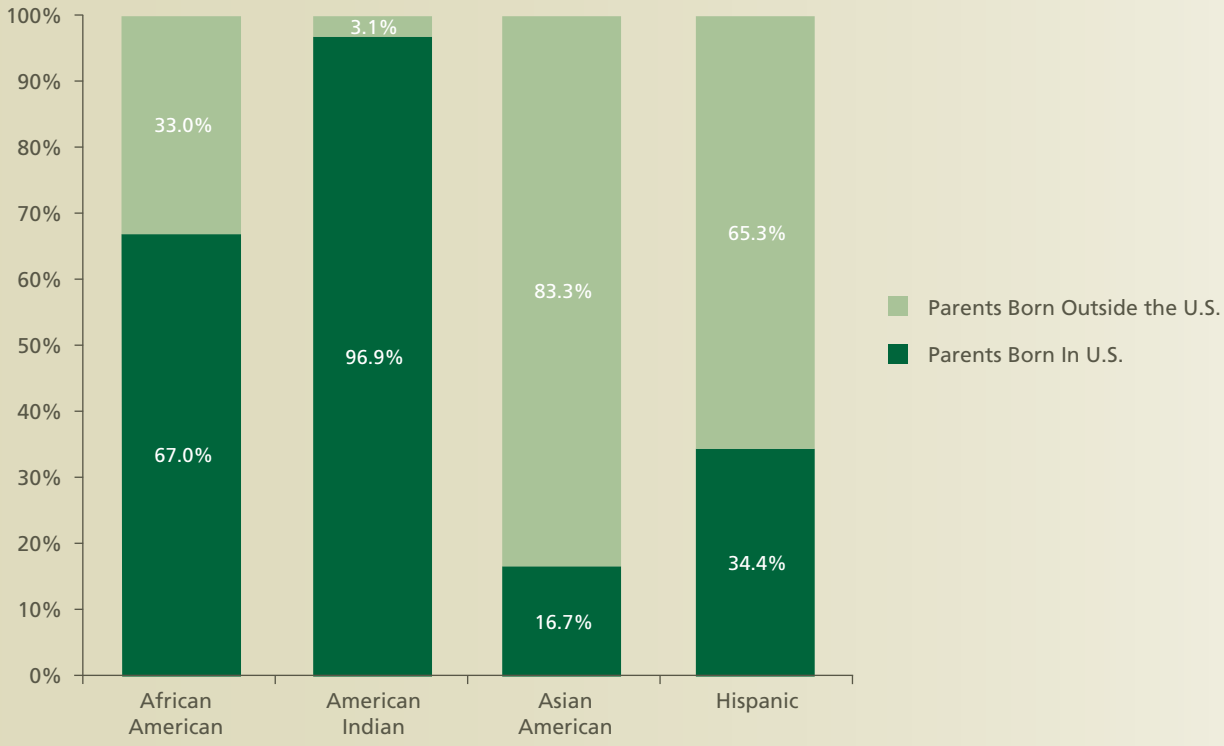


FIGURE 2.7: **COUNTRY OF ORIGIN FOR THE PARENTS OF MALE STEM STUDENTS BY RACE/ETHNICITY, 2012**



(Figure 2.8). The majority of Latino respondents reported that their father had no more than a high school diploma (Figure 2.9) and that their mother did not complete high school (Figure 2.8). The majority of Native American and Alaska Native respondents reported that their father and mother had no more than a high school diploma (Figures 2.8 & 2.9). Only 10 percent of Native American male students reported that their father had at least a bachelor's degree (Figure 2.9), and 37 percent indicated their mother had at least a bachelor's degree (Figure 2.8). Among Asian American males, 46 percent reported that their father had a bachelor's degree or higher (Figure 2.9) and 40 percent reported their mother had a bachelor's degree or higher (Figure 2.8).

When asked about their family's estimated annual income, most African American students did not know or preferred not to answer (Figure 2.10). Most Native American and Alaska Native, Asian, and Latino students estimated their family's annual income to be $30,000 or below (Figure 2.10).

FIGURE 2.8: **MOTHER'S EDUCATIONAL ATTAINMENT OF MALE STEM STUDENTS BY RACE/ETHNICITY, 2012**

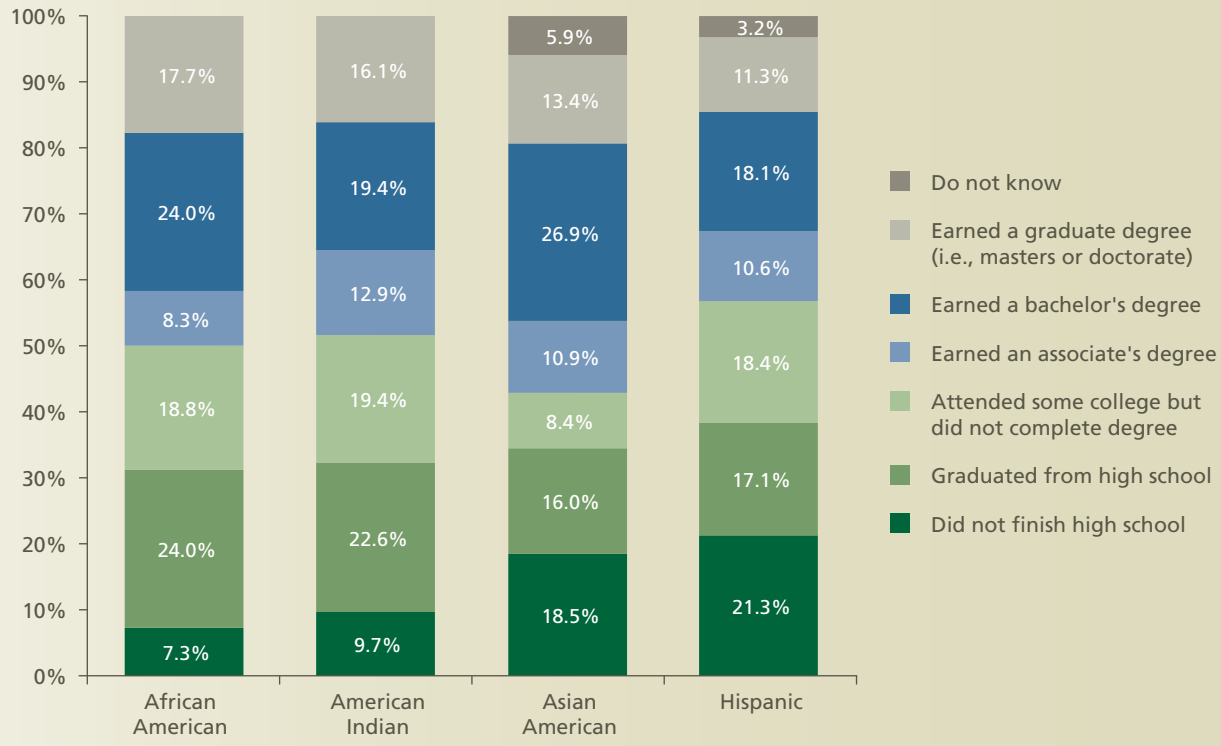


FIGURE 2.9: **FATHER'S EDUCATIONAL ATTAINMENT OF MALE STEM STUDENTS BY RACE/ETHNICITY, 2012**

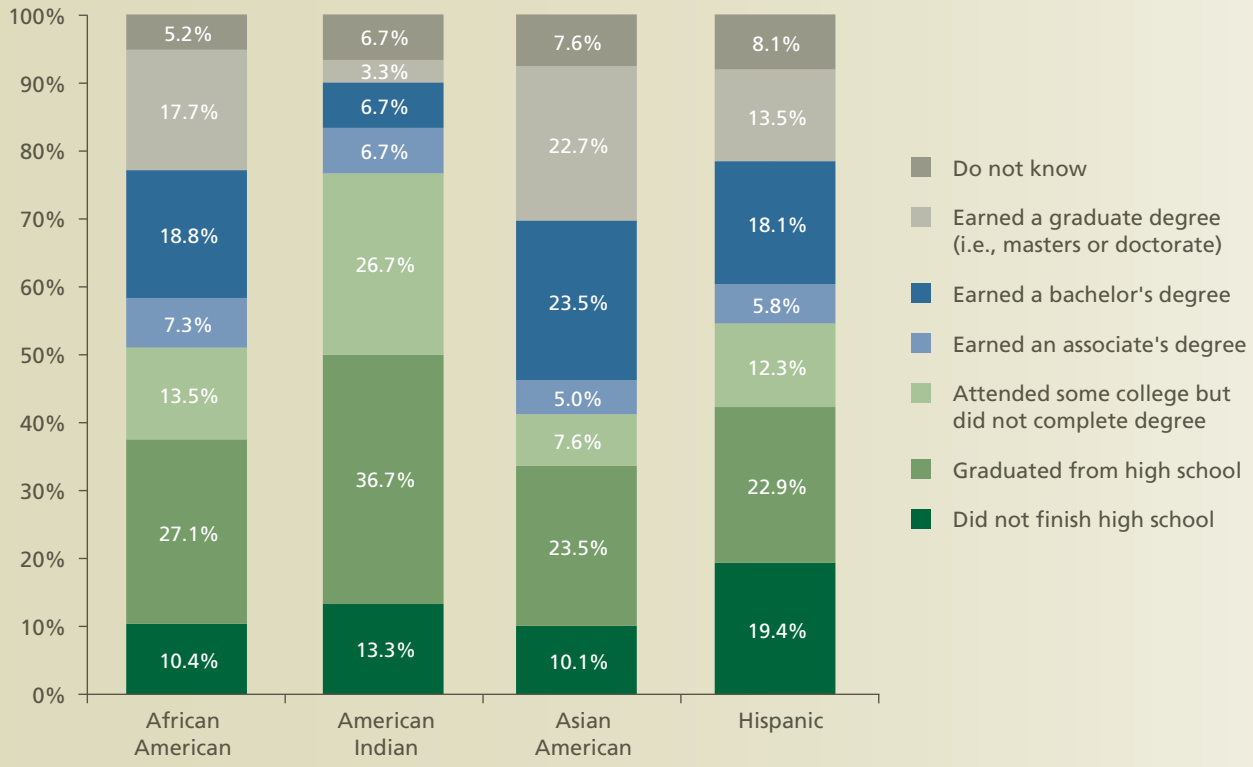
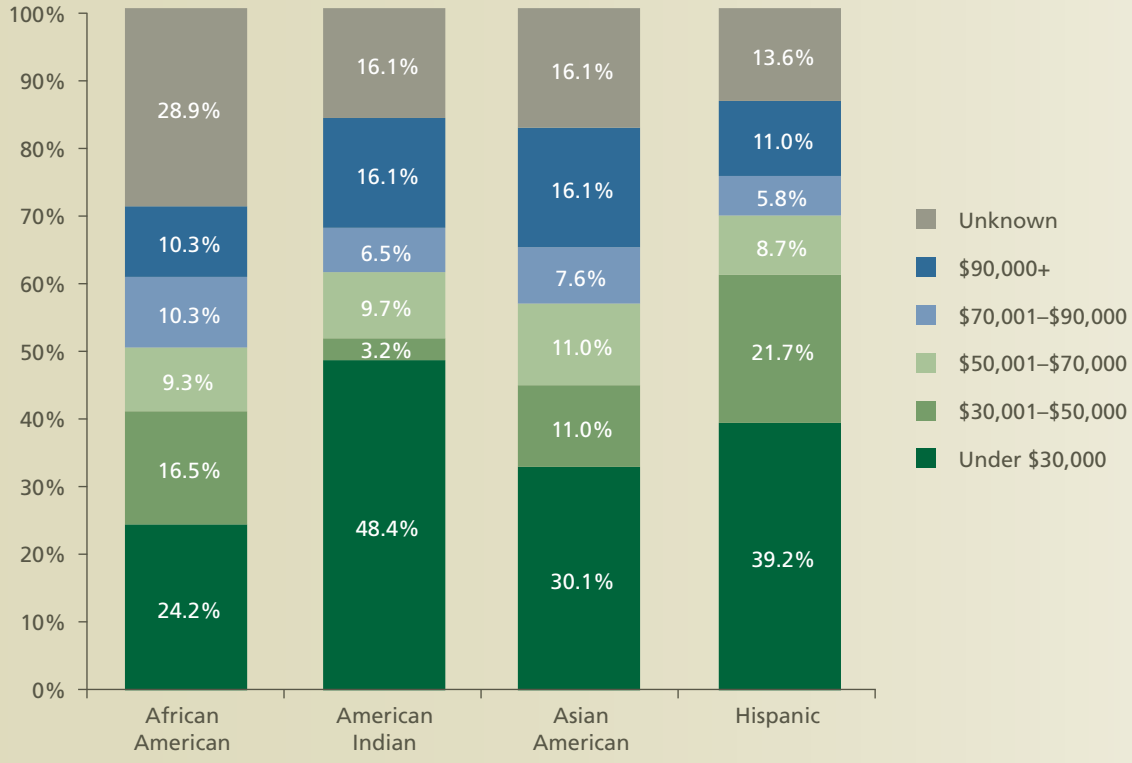


FIGURE 2.10: **PARENTAL INCOME OF MALE STEM STUDENTS BY RACE/ETHNICITY, 2012**



Minority STEM Students' Background and Preparation

The majority of African American males attended public high schools (75 percent), 17 percent attended private schools, and the remaining attended charter and magnet schools (Figure 2.11). The majority of Hispanic males attended public high schools (85 percent), 9 percent attended private schools, and the remaining attended charter and magnet schools (see Figure 2.11). The majority of Native American and Alaska Native males attended public high schools (91 percent), 5 percent attended private schools, and the remaining 4 percent attended Native American boarding schools, were home-schooled, or received their Graduate Equivalent Degree (Figure 2.11). The majority of Asian American males attended public high schools (81 percent), 15 percent attended private schools, and the remaining attended charter and magnet schools (Figure 2.11).

The majority of African American, Asian, and Latino males achieved high school grade point averages between a 3.0 and 3.75. The majority of Native American and Alaska Native males achieved high school grade point averages between a 3.0 and 3.5 (see Figure 2.12). The most frequently listed high school activities for African American, Asian, Native American and Alaska Native, and Latino males were extracurricular activities, volunteer/community service, and Advanced Placement (AP) courses.

FIGURE 2.11: **SCHOOL TYPE ATTENDANCE FOR MALE STEM STUDENTS BY RACE/ETHNICITY, 2012**

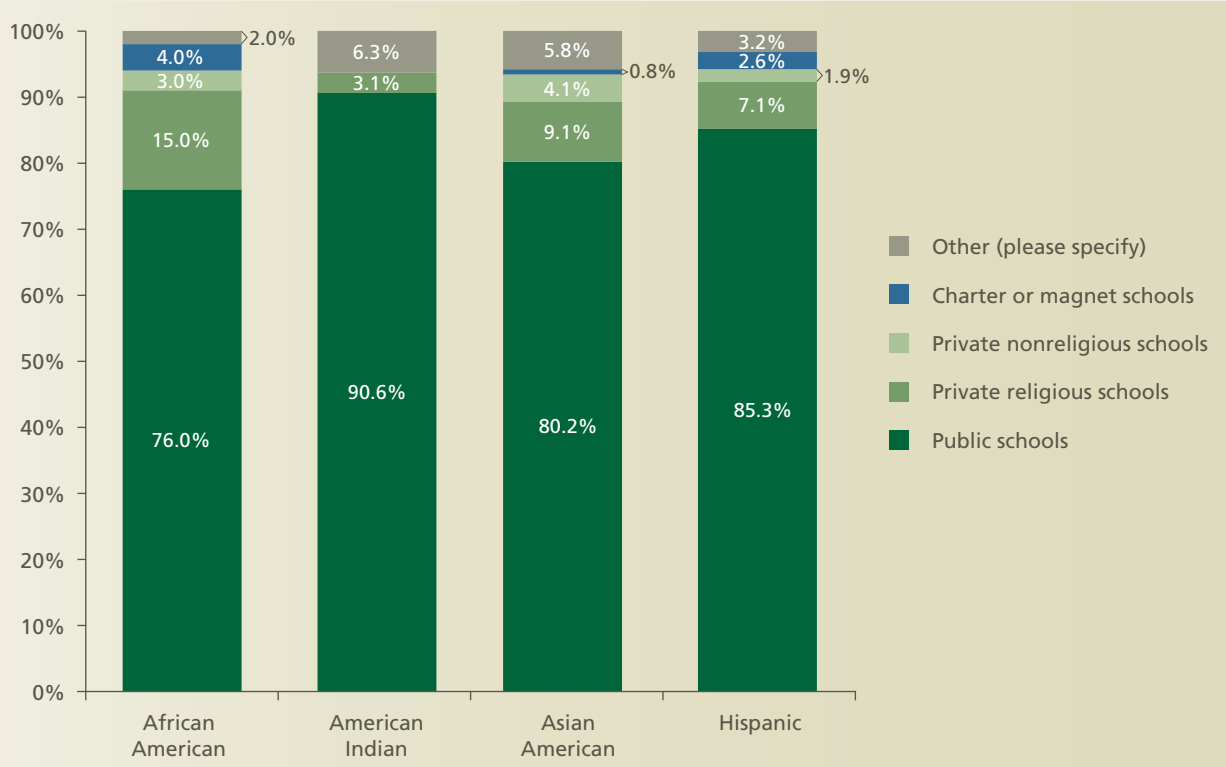
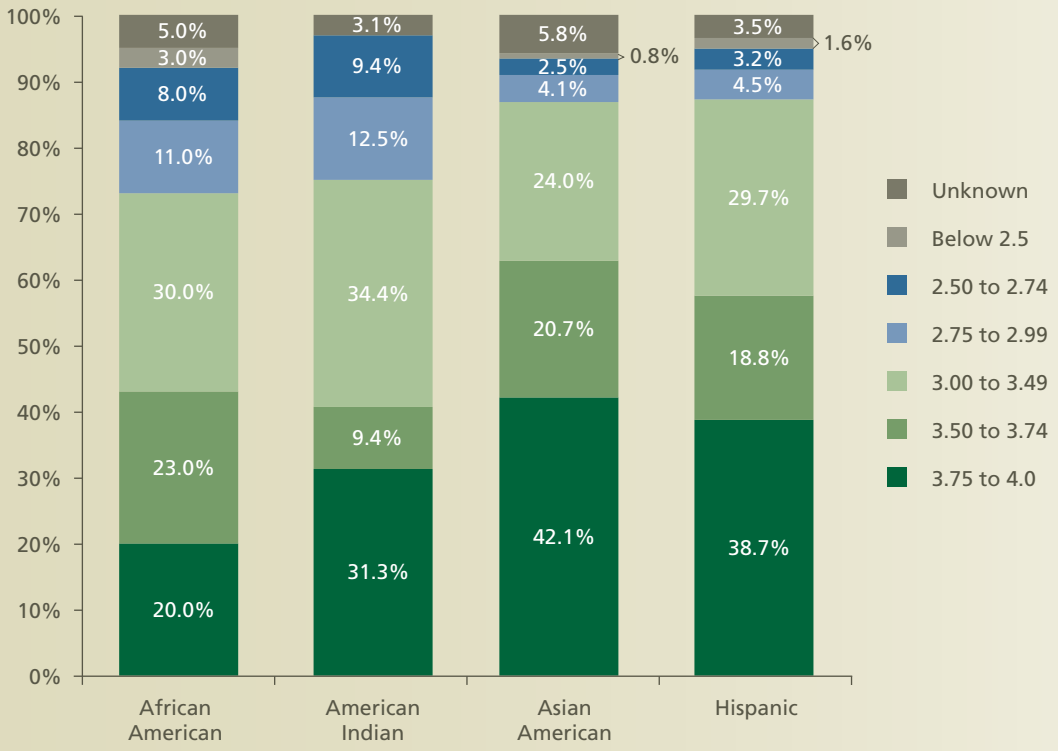


FIGURE 2.12: **HIGH SCHOOL GRADE POINT AVERAGE FOR MALE STEM STUDENTS BY RACE/ETHNICITY, 2012**



For African American, Native American and Alaska Native, and Latino males, the top three reasons for choosing a STEM major were an interest in STEM fields of study, employment goals, and their own educational aspirations. For Asian American males, the top three reasons for choosing a STEM major were their own educational aspirations, an interest in STEM fields of study, and success in courses and subject matter.

"I remember many of the teachers that I had through middle school would always comment that math is a great subject because it's everywhere and always with you. I guess that idea made me a bit more interested and encouraged me to learn because I realized that I would need it throughout life."

—AFRICAN AMERICAN MALE

When asked their reasons for choosing their current college/university, the most frequently chosen reasons for African American males were the university's/college's good academic reputation, the cost/affordability, and a campus visit; the most common reasons for Native American and Alaska Native, Asian, and Latino males were cost/affordability, wanting to live near home, and the institute's good academic reputation.

Respondents were asked to describe grade school experiences that fostered their interest and development in math and science. Among African American males, themes found within

the responses were family support, particularly from parents, and participation in extracurricular activities such as the National Society of African American Engineers (NSBE). Many noted key teachers that had motivated and influenced them. One participant responded, "No one in particular sparked my interest in computers, I just fell into that, but a few professors in high school and one in community college really piqued my interest in school enough to get me to show up to class and 'play the game.'"

Many other African American males also responded that they had a natural inclination for math and/or science and had previously done well in those classes. One student noted, "I remember many of the teachers that I had through middle school would always comment that math is a great subject because it's everywhere and always with you. I guess that idea made me a bit more interested and encouraged me to learn because I realized that I would need it throughout life."

"I came to the U.S. when I was eight years old. The only language I had in common with the teacher I was placed with was the language of mathematics. Ever since, I developed a passion for mathematics."
—LATINO STUDENT

Among Latino students, grade school experiences that fostered their interest and development in math and science included a natural curiosity for how things work, extracurricular activities such as the Science National Honor Society, and pre-freshmen engineering programs. The responses also showed that teachers played an influential role in developing their interest.

One Latino student recounted, "I came to the U.S. when I was eight years old. The only language I had in common with the teacher I was placed with was the language of mathematics. Ever since, I developed a passion for mathematics." Many other responses included having mentors and hands-on experience that fostered their interests. Several students also credited being placed in advanced courses as an important factor, with one student describing how "the gifted program gave me broader access to tools and information that stimulated me, and sparked my curiosity. This, no doubt, resulted in a science-oriented perspective and a thirst for answers."

"…mainly the current issues that we see in our politics, environment, and economic areas of life are what motivated me to try and do something about it, and ideally resolve or eliminate these issues."
—NATIVE AMERICAN STUDENT

Among Native American and Alaska Native students, the responses indicated that teachers and family played a large role in sparking their interest in math and science. Furthermore, many responded that they were drawn to math and science, and they naturally excelled in these subjects. One student described how he became interested in these subjects after connecting math and science to societal issues. He went on to say: "…mainly the current issues that we see in our politics, environment, and economic areas of life are what motivated me to try and do something about it, and ideally resolve or eliminate these issues."

> **"I realized that math and science play a huge role in society, and I wanted to take part in it to be an effective community contributor."**
>
> **— ASIAN STUDENT**

Among Asian students, the responses indicated that parents' careers influenced their development in these subjects, as well as having the past experience of shadowing those in related or current fields of interest. Many students reported that they pursued math- or science-related majors because they had previously done well in those classes and had the opportunity to explore these subjects outside of a classroom setting. One student commented, "I realized that math and science play a huge role in society, and I wanted to take part in it to be an effective community contributor."

Respondents were asked to reflect on the role of their family and/or legal guardians on their education. African American males listed a wide range of responses about how their parents influenced them. Many responded that their family motivated them, inspired them, and supported them in their academic aspirations. Several stated that their parents regularly monitored their academic progress and placed high expectations on attaining an education.

One African American student answered, "My parents always expected my homework done the moment I got back from school and to study sometimes. They would follow up on us to find out how school [was]...going, to which I never lied. If I needed help, she would always step in to talk with a teacher for more guidance, since she couldn't teach me herself." Some parents in particular pointed out the relationship between education and personal income.

Latino males also listed a wide range of responses of how their parents or guardians influenced them. Many responded that their parents provided motivation and encouragement to do well in school. Many responded that their parents showed support by sending them to good schools, by allowing them to participate in organizations and activities that interested them, and by offering financial support. A few noted that they were self-motivated and self-directed and that their parents provided moral support. Several students described how their siblings inspired them and that their parents' own educational background inspired or motivated them to do well in school.

Native American and Alaska Native respondents reported that their parents were integral to their educational development. Many responded that their parents supported and motivated them and encouraged them to pursue higher education. Many described their parents as being supportive because they wanted a better life for their kids.

Asian American respondents gave a wide range of responses on how their parents influenced them regarding their education. Many responded that their parents' careers in the STEM field influenced them to pursue a career in the STEM field. Parents were described as supportive and encouraging, and many students many noted they were able to independently choose their career

field. Several students indicated that their parents instilled and reinforced work ethics. Many reported that within their household, a great emphasis was placed on succeeding academically.

Minority STEM Students' Experiences at the University

In the survey, minority male students rated the extent to which they agreed or disagreed with statements about their current college or university. Survey results indicated that minority male students generally had positive perceptions of their university experiences. On average, minority males agreed that the campus environment was welcoming and that they had a sense of belonging on the campus and felt support from their peers in STEM courses. These students also rated their interactions within the classroom as generally positive. Minority students indicated that interactions with STEM faculty members have been positive, that their professors were approachable, and that their professors encouraged them to seek help when needed.

"I would say that the faculty in my major are somewhat supportive. I feel more like a number and that there is no personal guidance from ANYONE. More should be done to help students feel welcome and at home within their major."

—LATINO STUDENT

One African American student characterized his interactions as being "similar to that of a family. If I ever have a question, I can just ask for their advice and they will try their best to ensure that any decision that I make will help with my major and my GPA. They are always someone I can talk to in a time of need."

One Latino male student described his interactions as "very personal and welcoming. I feel I can express my needs as if they were close relatives." However, open-ended responses also revealed that at some universities, students felt that faculty research took precedence over student support. Others mentioned how often the size of the university or classes affected their opportunity for interactions. One student explained, "The faculty seem to want their best for all their students, but it gets difficult because of the large amount of students."

Another Latino student explained, "I would say that the faculty in my major are somewhat supportive. I feel more like a number and that there is no personal guidance from ANYONE. More should be done to help students feel welcome and at home within their major."

"I think it varies from person to person. I've had some faculty that [were]…cold towards people. Making it seem like we would be wasting their time if we went to their office. I've also had faculty that [were]…very open, encouraging students to stop by when they need help."

—NATIVE AMERICAN STUDENT

One Native American and Alaska Native male student responded that his experience within his program has been positive. He explained that, "nearly all the teachers I've worked with have been competent and all have been friendly and approachable. I've always felt comfortable interacting with these professors and have always received support for my ideas." One response pointed out the variability of

> **"They are very supportive in the upper-level classes and it allows one-on-one time with students. As for the lower-level courses, there was not too much support with 200 to 300 students in one class."**
>
> **— ASIAN STUDENT**

> **I feel a close connection with my major's professors because I admire them and one way or another, we are connected through science and research."**
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interactions with professors. This student explained, "I think it varies from person to person. I've had some faculty that [were]…cold towards people. Making it seem like we would be wasting their time if we went to their office. I've also had faculty that [were]…very open, encouraging students to stop by when they need help."

One Asian male responded, "I feel a close connection with my major's professors because I admire them and one way or another, we are connected through science and research." Students also note that sometimes establishing a relationship with faculty can be difficult in extremely large classes. Other Asian male students noted the difficulty of establishing relationships at large universities. Another Asian male student explained, "They are very supportive in the upper-level classes and it allows one-on-one time with students. As for the lower-level courses, there was not too much support with 200 to 300 students in one class."

University Services

When asked to rate how well their current institution was recruiting, retaining, and graduating students of color, minority males—on average—agreed that their current institution was doing a good job, was allocating adequate resources, and had top leadership that was committed to this objective. Among the respondents, 64 percent of African American males, 48 percent of Native American males, 49 percent of Asian American males, and 57 percent of Hispanic males agreed or strongly agreed that they have appropriate opportunities to work with faculty on research teams or projects.

Some 67 percent of African American, 70 percent of Native American, 49 percent of Asian American and 67 percent of Hispanic males in STEM also felt that they had appropriate exposure to science internship information. The majority of minority male respondents agreed that they receive support from faculty to attend conferences and that they know faculty members who would write a recommendation for an internship or graduate school.

The majority of minority male respondents in STEM—74 percent of African Americans, 65 percent of Native Americans 58 percent of Asian Americans, and 69 percent of Hispanics—felt that if they were overwhelmed or had doubts about their current major, they knew at least one faculty or staff member who could help them. Further, the majority of minority male respondents in STEM—75 percent of African Americans, 71 percent of Native Americans, 62 percent of Asian Americans, and 65 percent of Hispanics—have been advised on the specific requirements needed to succeed as a STEM major.

Minority STEM Students' Personal and Motivational Factors

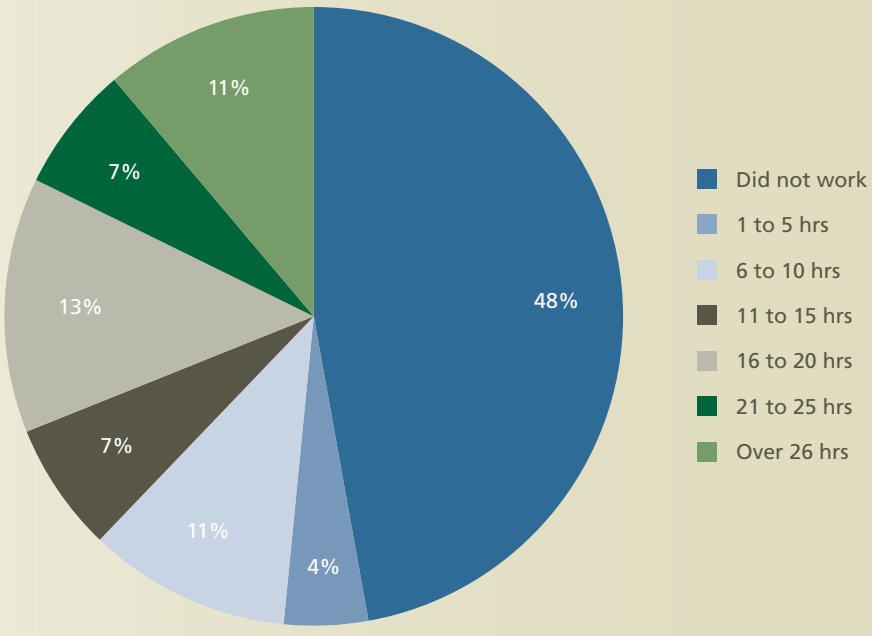
The majority of African American, Asian and Latino males estimated that they spent six to ten hours a week studying or preparing for their STEM classes and one to five hours engaging in social/recreation activities, allotting no time for participating in co-curricular activities. The majority of Native American males estimated that they spent 11 to 15 hours a week studying or preparing for their STEM classes, six to ten hours a week engaging in social/recreational activities, and one to five hours participating in co-curricular activities.

About half (48 percent) of African American, Asian, Native American and Alaska Native, and Latino students also responded that they did not work for pay. (See Figure 2.13.)

On average, Asian, African American, Native American and Alaska Native, and Latino students responded that they were aware of academic requirements to graduate with a degree in STEM and that they had control over the period within which they graduate.

African American, Native American and Alaska Native, Asian, and Latino males agreed that they know what it takes to succeed, and that they are prepared to do whatever it takes. The average

FIGURE 2.13: **HOURS WORKED PER WEEK BY MINORITY MALE STEM STUDENTS (ON OR OFF CAMPUS)**



response for all minority males was that they generally made good use of available campus resources and that they were generally self-directed and self-motivated, and the majority of participants agreed that they were attentive to their physical, mental, and spiritual health. On average, African American, Native American and Alaska Native, Asian, and Latino male students found it easy to understand educational expectations, to interact with peers, to be away from family and friends, and to manage their own schedules.

In each minority group, a majority planned to attend graduate school in a STEM discipline or pursue a career in a stem discipline. Among African American males, 43 percent planned to attend graduate school in a STEM discipline and 35 percent planned to pursue a career in STEM; among Hispanic males, 43 percent planned to pursue a career in STEM and 37 percent planned to attend graduate school in a STEM discipline; among Native American males, 42 percent planned to pursue a career in STEM and 36 percent planned to attend graduate school in a STEM discipline; and among Asian American male 42 percent planned to attend graduate school in a STEM discipline and 40 percent planned pursue a career in STEM.

Fifty-percent of African American and Latino male students, 45 percent of Native American and Alaska Native male students, and 59 percent of Asian male students responded that they aspire to attain a doctoral degree in their lifetime. Further, another 45 percent of Indian and Alaska Native students indicated they aspire to attain a master's degree.

When asked if they felt prepared to enter their occupation of choice after receiving a STEM degree, the majority of African American, Native American and Alaska Native, Asian, and Latino males felt that they were adequately equipped with the necessary tools and requirements needed to be competitive in the field and to succeed.

Chapter 3: Faculty and Administrators Serving Minority Males in STEM

IN ADDITION TO students, the MMSI survey captured the responses of STEM faculty and administrators. Survey results revealed a variety of characteristics and practices of the institutions, faculty, and administrators that prepare minority males for STEM fields. Content analysis methods were used to summarize the open-ended comments of faculty members and administrators regarding the commitment of their universities to recruiting, retaining, and graduating minority males in STEM fields. Specifically, the number of unique comments made about university practices were identified and then manually sorted into three broad categories: proactive practices, ambivalence or indifference, or obstructive practices. SPSS Text Analysis for Surveys was used to facilitate manual coding and sorting of the comments into more discrete categories.

First, faculty and administrators were asked to describe any recruitment or outreach activities by their institution specifically designed to encourage men of color to consider a major and a career in the STEM disciplines. Of the more than 200 faculty members and administrators who took the survey, 33 provided a response to this question. Institutions with proactive practices were able to list specific programs and initiatives that bolstered outreach efforts. Specific programs listed included the National Science Foundation's (NSF) Bridge to the Doctorate Program, the Louis Stokes Alliance for Minority Participation (LSAMP), Upward Bound, and university-initiated minority male programs. Many other university representatives gave statements that reiterated their commitment, listing specific programs. Several respondents noted that they were not aware of any university initiatives to recruit men of color in STEM disciplines.

Next, faculty and administrators were asked how their institution evaluates the success of its efforts to attract, recruit, retain, and graduate students of color in STEM fields. In total, 43 participating faculty members and administrators responded to the inquiry. Most of the respondents who indicated that they have a formal evaluation process were mandated to collect data to maintain external funding. Only six respondents explicitly stated that their institution collects data on graduation rates by race and gender. Other respondents use anecdotal evidence of program effectiveness, such as using success stories of individual students. Four institutional representatives indicated that their school did not have a formal mechanism to evaluate their success in graduating males of color in STEM fields.

Faculty and administrators were asked, "What are the next critical steps for your institution in recruiting, retaining, and graduating students of color in the STEM fields?" Forty-four faculty members and administrators responded Only one respondent listed specific steps: (1) Continue to support statewide dissemination of STEM curriculum in public schools through "Project Lead the Way," (2) continue to strengthen articulation agreements with community colleges, (3) commit funding to support student success in math courses at community colleges (boot camps) and university to address underprepared students who want to enter STEM, and (4) continue to support the "Integrated Learning Community" model for entering freshman.

More participants responded to the inquiry by stating institutional needs, which can be summarized as follows: (1) more funding to hire diverse faculty members and engage students in research, (2) formal programs to prepare students for STEM education, (3) better marketing and support of existing programs, and (4) better community outreach. One administrator suggested asking minority male students to go back to their high schools to help recruit. Many also mentioned issues of faculty diversity and engagement. One participant stated, "We need to shift faculty culture to one that is more learning-focused and one in which faculty efforts to support retention are rewarded through the tenure/promotion process." Funding was an overarching theme when respondents noted obstacles to recruiting, retaining, and graduating males of color. An example of this sentiment was reflected in the statement: "Our taxpayers have decided that they can no longer afford our educational system. Our institution's budget is down 17 percent from its peak, while enrollment keeps climbing. The most important step is to convince our taxpayers that STEM education is a worthwhile effort and the benefits will pay back their investments."

When asked to describe programs at their institution specifically designed to support the success of men of color in the STEM disciplines, 22 faculty and administrators responded. Specific programs included, the Student African American Brotherhood, tutoring, "B-MEN," National Society of Black Engineers, National Society of Professional Engineers, Men on the Move, AMP, and an unspecified African American Male Initiative. Seven of the 22 who responded indicated that their institution did not have specific programs to support the success of men of color. Faculty and administrators also mentioned some of the major challenges their institutions face in recruiting, retaining, and graduating students of color in the STEM fields. The 43 challenges identified can be summarized as follows: (1) budget cuts, (2) lack of institutional commitment, (3) lack of scholarships, (4) lack of diversity in faculty, (5) small pool of interested and qualified applicants, and (6) inadequate college preparation in high school.

University administrators responded to a series of likert-scale items about their attitudes and beliefs about their institutions' commitment to diversity. Most administrators strongly agreed that diversity enriches teaching and learning and that their institution is generally committed to achieving racial/ethnic diversity on campus. Among the 12 items rated, the administrators rated four items as less than "4," indicating that the majority did not "agree" with the statement. These statements included: (1) Diverse experiences and views are included in the curriculum; (2) there are opportunities for cultural competence and sensitivity training; (3) my institution does a good

job of recruiting, retaining, and graduating men of color in STEM; and (4) adequate resources are dedicated to recruiting, retaining, and graduating men of color in STEM.

Faculty members rated a similar set of items, and their responses were similar to those of the administrators. Generally, they strongly agreed that diversity enriches the teaching environment and that there is support for diversity among faculty and administrators. The mean rating of faculty participants was less than 4 (agree) for four items: (1) My department is tolerant of different views and experiences; (2) adequate resources are dedicated to recruiting, retaining, and graduating men of color in STEM; (3) faculty in my department work to include diverse experiences and views within the curriculum; and (4) my department does a good job of recruiting, retaining, and graduating men of color in STEM.

Role of Institutions

The minority males participating in this study attended the following types of institutions: Predominately White Institutions (PWIs), Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), Tribal Colleges and Universities (TCUs), and institutions with large student populations of Asians/Pacific Islanders. Table 3.1 displays the percentage of students attending the various institution types across race/ethnicity.

TABLE 3.1: **PERCENT OF STUDENTS ATTENDING THE VARIOUS INSTITUTION TYPES ACROSS RACE/ETHNICITY**

	AMERICAN INDIAN/ ALASKAN NATIVE	ASIAN	BLACK	HISPANIC
PWI	10.6%	38.6%	28.7%	9.4%
HBCU	.0%	.4%	35.4%	1.2%
TCU	31.9%	.9%	9.9%	2.1%
Asian	23.4%	48.5%	8.8%	9.6%
HSI	34.0%	11.6%	17.1%	77.7%

Note: Three Predominately White Institutions (PWIs); 3 Historically Black Colleges and Universities (HBCUs); 3 Hispanic Serving Institutions (HSIs); 2 Tribal Colleges and Universities (TCUs); 3 institution with large native Alaskan student populations and/or large percentages of Pacific Islanders (Asian).

To examine any common underlying dimensions of the 18 continuous items on the survey questionnaire that measured the university experiences, principal components analysis (PCA) was used to reduce the data. Factor structure was explored with principal components analysis with varimax rotation and Kaiser normalization. Three factors were accepted based on their eigenvalue that exceeded 1, and the logical arrangement of items. The three-factor solution explained

TABLE 3.2: **F-RATIOS AND P VALUES OF UNIVERSITY EXPERIENCES ITEMS AND FACTORS ACROSS INSTITUTION TYPE***

FACTORS	UNIVERSITY EXPERIENCE	F-RATIO (DF=4)	P VALUE
Factor 1 Faculty Relationships** (F = 7.5, df = 4, p < .01)	My professors are sensitive to my academic needs	5.1	.00
	My professors are supportive of my academic aspirations	5.7	.00
	My professors are available/approachable when I have questions	6.1	.00**
	Overall, my interactions with STEM faculty members have been positive	4.6	.00
	I feel supported by faculty in my major department/ program	6.8	.00
	My professors encourage me to seek help when needed	2.5	.04
	My professors are sensitive to my cultural background	6.1	.00**
	I feel supported by the administrators/staff in my major school/college	6.4	.00
	Faculty includes diverse experiences and views in course readings, assignments, or discussions	2.8	.02
	Overall, I enjoy my STEM courses		
Factor 2 Belonging** (F = 2.7, df = 4, p < .05)	I feel a sense of belonging on campus	3.7	.01
	In general, the campus environment is welcoming to me and people like me	5.4	.00
	I would choose this same college/university again	0.5	.77 (ns)
	I feel someone on campus would miss me if I left the institution	8.8	.00
	I feel support from my peers in STEM courses	7.2	.00**
Factor 3 Academic Pressure (F = 1.5, df = 4, ns)	I feel the need to "prove myself" to professors	4.6	.00
	I feel the need to "prove myself" to classmates	1.2	.33 (ns)
	My STEM classes are very competitive as compared with my non-major classes	0.6	.63 (ns)

Note: ns = non-significant difference.

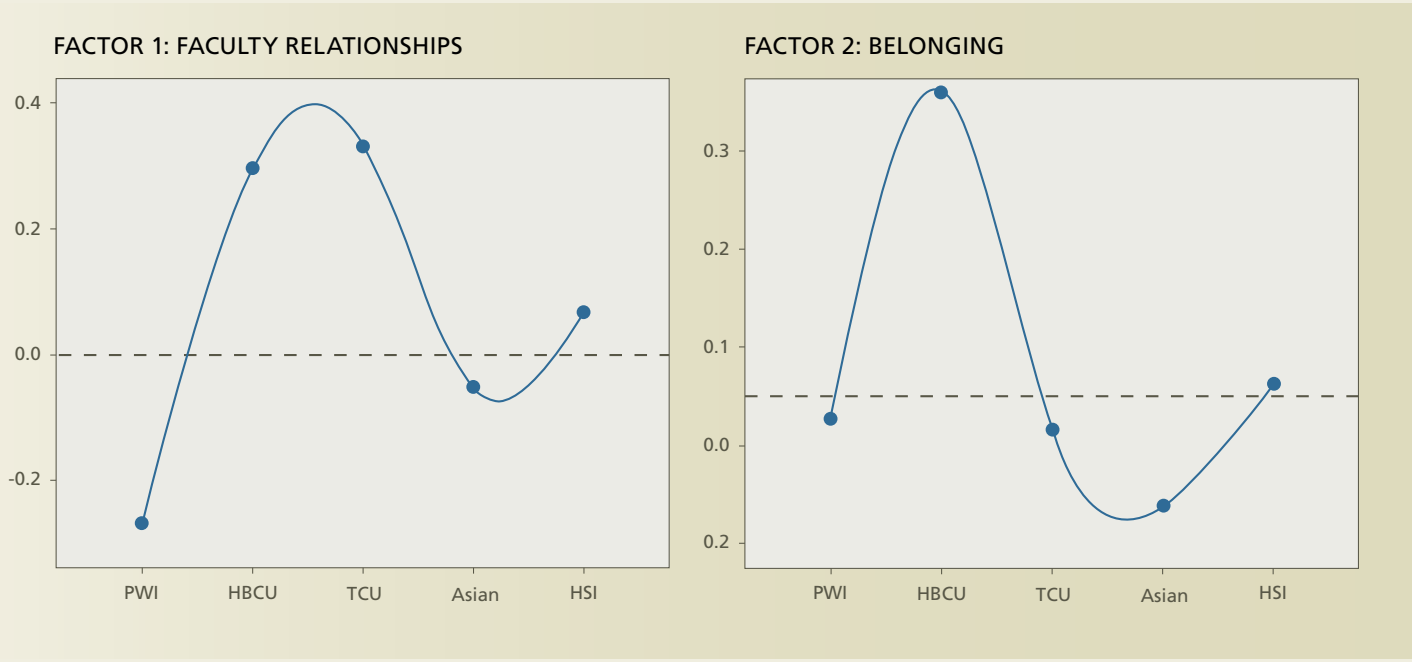
* Three Predominately White Institutions (PWIs); 3 Historically Black Colleges and Universities (HBCUs); 3 Hispanic Serving Institutions (HSIs); 2 Tribal Colleges and Universities (TCUs); 3 institution with large native Alaskan student populations and/or large percentages of Pacific Islanders (Asian)

** A visual depiction of this item/factor is displayed in the corresponding figure.

59.8 percent of the total variance. Based on the arrangement of items, as presented in Table 3.2, the names given to the three factors were (1) faculty relationships, (2) belonging, and (3) academic pressure. Using regression estimates, a factor score was assigned to each student survey respondent and then averaged by institution type in order to compare means across institution types. Results indicated that students at HBCUs, TCUs, and HSIs were significantly more likely to have better relationships with faculty and to have a greater sense of "belonging." Students at PWIs rated their relationships with faculty significantly less satisfactorily (see Figure 3.1a and 3.1b). Academic pressures were not significantly different across institution types.

Table 3.2 also displays the F-ratios and p values for the university experiences items across institution for minority male STEM students. The table marks variables that are significant by institution type. Of the 18 items analyzed, 15 university experience items had a significant relationship with institution type. Visual depictions of selected university experiences items are displayed in Figures 3.2a, 3.2b, 3.3a, and 3.3b.

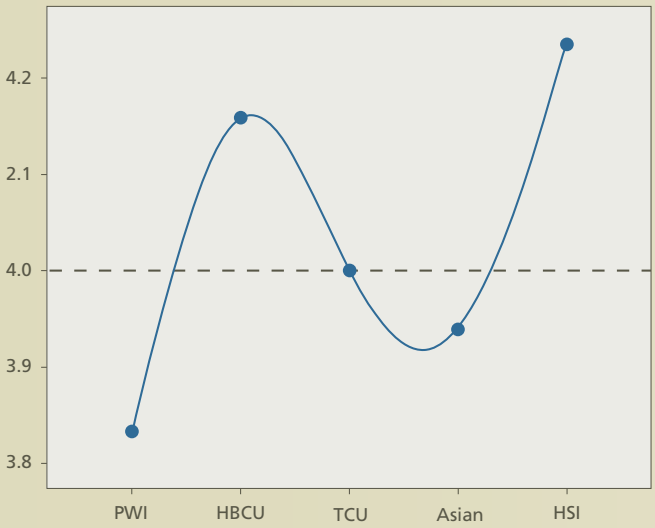
FIGURES 3.1A & 3.1B: **MEANS PLOTS OF UNIVERSITY EXPERIENCE FACTORS (X AXIS) ON INSTITUTION TYPE (Y AXES) AMONG MINORITY MALE STUDENTS**



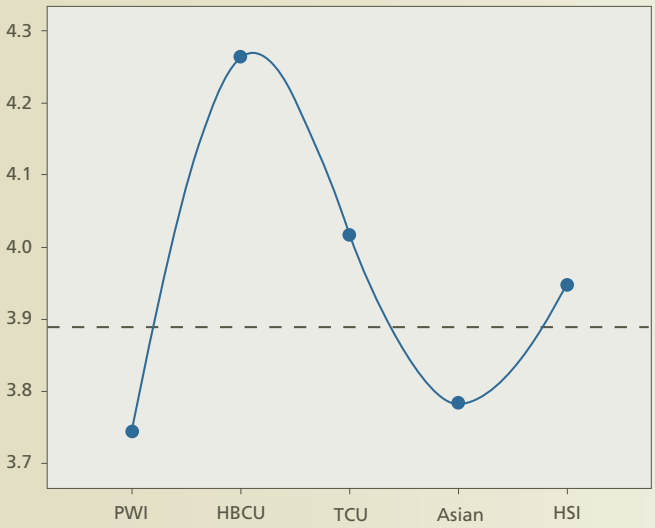
Note: Three Predominately White Institutions (PWIs); 3 Historically Black Colleges and Universities (HBCUs); 3 Hispanic Serving Institutions (HSIs); 2 Tribal Colleges and Universities (TCUs); 3 institution with large native Alaskan student populations and/or large percentages of Pacific Islanders (Asian). The dashed reference line on the Y-axis marks the estimated mean of the dependent variable.

FIGURES 3.2A & 3.2B: **MEANS PLOTS OF PERCEPTION OF STEM COURSES (X AXIS) ON INSTITUTION TYPE (Y AXES) AMONG MINORITY MALE STUDENTS**

OVERALL, I ENJOY MY STEM COURSES



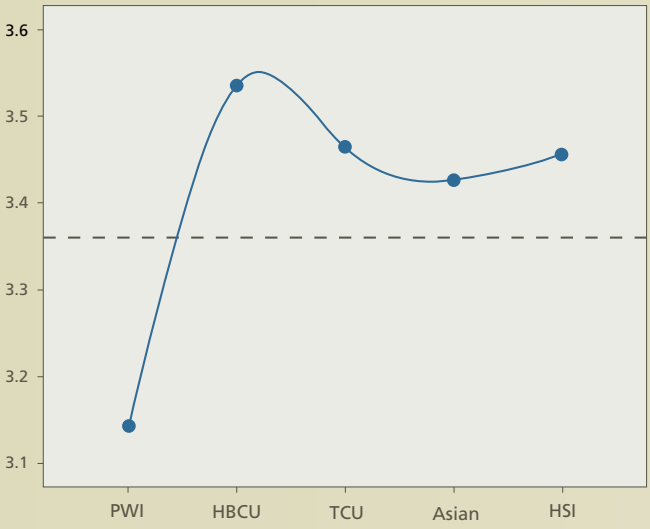
I FEEL SUPPORT FROM MY PEERS IN STEM COURSES



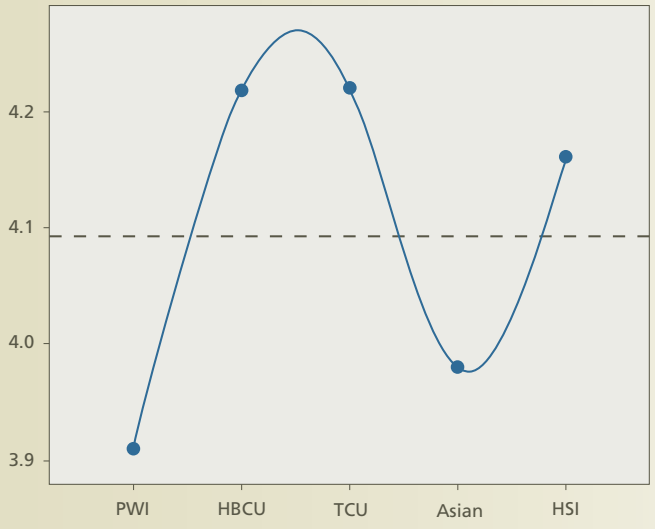
Note: Three Predominately White Institutions (PWIs); 3 Historically Black Colleges and Universities (HBCUs); 3 Hispanic Serving Institutions (HSIs); 2 Tribal Colleges and Universities (TCUs); 3 institution with large native Alaskan student populations and/or large percentages of Pacific Islanders (Asian). The dashed reference line on the Y-axis marks the estimated mean of the dependent variable.

FIGURES 3.3A & 3.3B: **MEANS PLOTS OF PERCEPTION OF STEM FACULTY (X AXIS) ON INSTITUTION TYPE (Y AXES) AMONG MINORITY MALE STUDENTS**

MY PROFESSORS ARE SENSITIVE TO MY CULTURAL BACKGROUND



MY PROFESSORS ARE AVAILABLE/APPROACHABLE WHEN I HAVE QUESTIONS



Note: Three Predominately White Institutions (PWIs); 3 Historically Black Colleges and Universities (HBCUs); 3 Hispanic Serving Institutions (HSIs); 2 Tribal Colleges and Universities (TCUs); 3 institution with large native Alaskan student populations and/or large percentages of Pacific Islanders (Asian). The dashed reference line on the Y-axis marks the estimated mean of the dependent variable.

Summary of Findings

Overall, the findings suggest that few institutions have formal programs to recruit minority males in STEM. Only about 10 percent of the faculty and administrators who responded to the survey items were able to identify specific outreach programs to recruit minority males in STEM fields. Most of those who identified specific initiatives described national programs, which were tied to external funding. Three institutional representatives indicated that their institution designed a program to fit their unique recruitment and retention needs, suggesting a deeper level of investment by their university. Faculty and administrators noted that successful recruitment initiatives include having minority scholarships, mentoring, faculty participation, community outreach, research experiences, and strategies to build learning communities.

Another factor that impedes institutions' best efforts to recruit, retain, and graduate minority males in STEM is the lack of formal processes to evaluate university efforts, which impedes institutions' best efforts to recruit, retain and graduate minority males in STEM. Similar to outreach efforts, many institutions with formal evaluation processes were mandated to evaluate programs for external funders. Institutional representatives had difficulty articulating the steps they were taking to recruit and retain minority males in STEM fields. Among the survey respondents, only one university administrator was able to list specific steps his/her university was taking to recruit and retain minority males in STEM fields. Most respondents answered the inquiry about steps their university was taking by loosely stating their university's needs. Most respondents felt that their best chance of recruiting, retaining, and graduating minority males in STEM would be to diversify their faculty and staff and have specific programs for minority males in STEM, better support for existing programs, and stronger community outreach efforts.

Overall, faculty and administrators had clear ideas about their challenges in recruiting, retaining, and graduating minority males in STEM but very vague ideas about how to respond to the challenges. The six identified threats were budget cuts, lack of institutional commitment, lack of scholarships, lack of diversity in faculty, small pool of interested and qualified applicants, and inadequate college preparation in high school.

Generally, faculty and administrators were steadfast in their view that cultural and gender diversity enriches the university experience and that their universities were committed to achieving diversity on campus. However, survey respondents were less confident about their ability to achieve diversity. Specifically, faculty and administrators were less confident that diverse experiences were included in the curriculum, that university personnel had adequate opportunities for cultural competence, or that the university had adequate resources to recruit, retain, and graduate males of color.

Summary of Strengths

Most university faculty and administrators understood the importance of achieving racial and gender diversity on campus. They understood that important segments of society lack adequate

representation on their campus, and they desired an inclusive environment. Most understood that achieving diversity in STEM will not occur through happenstance or business-as-usual practices and that some internal and external resources are required to create a representative environment.

Summary of Weaknesses

Faculty and administrators had difficulty articulating specific programs or action steps they were taking to create a more diverse environment. Very few had formal mechanisms in place to evaluate their progress in recruiting, retaining and graduating minority males in STEM. Formal programs and evaluation measures seemed to be tied only to external funding, with little initiative to leverage internal financial or intellectual capital to achieve racial and gender diversity. Universities stated many barriers to achieving diversity, including budget cuts, lack of scholarships, lack of diversity in faculty, disconnect with the community, and lack of institutional commitment.

Chapter 4: Moving Forward

RECOMMENDATIONS AND STRATEGIES TO IMPROVE MINORITY MALE STEM OUTCOMES[8]

The Current Policy Environment for Minority Males in STEM

In his first two years in office, President Obama—with his Secretary of Education, Arne Duncan—has taken steps toward making STEM education a national priority. Momentum has been accomplished by (1) prioritizing STEM education interventions for underrepresented groups via national competitive grant programs and (2) spearheading new national STEM initiatives with the business community and others. The first of these steps includes encouragement of interventions in STEM education in the Race to the Top, Investing in Innovation (I3), and the Fund for Improvement of Postsecondary Education (FIPSE) competitive grant programs; the second step includes the establishment of Change the Equation, a nonprofit, nonpartisan CEO-led initiative that seeks to improve U.S. education, and thus, innovation in STEM fields (Sabochik, 2010). Prior to Change the Equation, the nation saw another initiative established in January of 2010 called Educate to Innovate. Part of this initiative is the White House Science Fair, which celebrates the winners of a broad range of STEM competitions (Obama, 2010).

President Obama is not the only government official who has touted the importance of STEM over the last two years. Democratic and Republican representatives have hosted major meetings on STEM education and the workforce and have introduced legislation to improve math and science education, some of which has been directed at STEM diversity efforts. Recent examples (under the 112th Congress) include a March 2011 forum hosted by Congresswoman Donna F. Edwards (D-MD) to discuss how stakeholders can work together to build STEM talent. This convening highlighted Congresswoman Edwards' role in the STEM Education Coordination Act of 2009 (H.R.1709), which mandated a committee to create an inventory of participation by underrepresented minorities (URMs) in federally sponsored STEM programs and activities (work on the inventory is currently underway).

Congresswoman Eddie Bernice Johnson (D-TX) is also a staunch supporter of diversity in STEM as a 15-year member of the House Committee on Science and Technology and as the founder of the House Diversity and Innovation Caucus. Congresswoman Johnson was the force behind

8 The "Moving Forward" section was written by Lorelle Espinosa, Director of Policy and Strategic Initiatives, Institute for Higher Education Policy.

stopping the consolidation of NSF's Broadening Participation programming via the American Competes Act Reauthorization. Other lawmakers focused on STEM include Dan Lipinski (D-IL), co-chair of the STEM Education Caucus, and Congressman Ralph Hall (R-TX), Chairman of the House Committee on Science, Space, and Technology.

Recent Legislative Activity

The most important current piece of education-related legislation is the Elementary and Secondary Education Act (ESEA), also known as No Child Left Behind. ESEA has been up for reauthorization for months, with related bills introduced in both the House and the Senate. The Obama administration has produced its own "blueprint," which addresses strengthening STEM education, as well as targeted funds for high-needs schools.

Also of interest to the higher education STEM community is the recent reauthorization of the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act (H.R.5116). The America COMPETES Act was first signed into law by President Bush in 2007. Its purpose was, and still is, to strengthen America's talent, innovation, and competitiveness in STEM on a global scale. Of particular interest to the minority males in STEM conversation is Section 406 of the recently reauthorized bill entitled "Broadening Participation." This portion amends the National Institute of Standards and Technology [NIST] Act (15 U.S.C. 278g–1) by asking the director of NIST to consider the goal of "promoting the participation of underrepresented minorities in research areas supported by the Institute" when considering postdoctoral fellowship applications.

A final piece of legislation of interest is reauthorization of the Workforce Investment Act (WIA). While WIA is not focused on higher education, its programs serve low-income communities and displaced workers, and it is the only federal source of funding for worker training and retraining. There is opportunity to train new STEM workers via the community college sector, which further means job training opportunities for minority males.

Federal Resources

While there are no national efforts focused specifically on increasing the success of minority males in STEM, there are several programs and policies that have potential impact, including:

- **LONG-TERM SUSTAINABILITY OF THE PELL GRANT PROGRAM—**an important federal policy lever for higher education and a key source of support for low-income minority males pursuing STEM degrees.
- **CONTINUED FUNDING OF TRIO—**The academic and social supports provided by these programs have implications for minority males seeking to access and succeed in higher education. In fact, two of the eight TRIO programs are specifically focused on STEM. The Ronald E. McNair Post-baccalaureate Achievement Program provides funds to institutions of higher

education to prepare underrepresented students for doctoral studies through involvement in research and other scholarly activities (U.S. Department of Education, 2011). Another of the eight TRIO programs, Upward Bound Math-Science, provides avenues for secondary students to develop their math and science skills and seek entry to postsecondary degree programs, and ultimately careers, in these fields.

- **SUPPORT FOR K–12 INITIATIVES—**As other reports have pointed out, one of the largest barriers—if not *the* largest— barrier to STEM degree completion for minority males is inadequate preparation for higher education. Therefore, the progress of K–12 initiatives such as the Common Core State Standards (CCSS) and Assessments in English and Mathematics should be supported and monitored.

Implications for Higher Education Institutions

Much of the groundbreaking work to increase the recruitment, retention and graduation of the minority males in STEM population takes place on individual university campuses. Unfortunately, such work is often done in isolation. It is possible for successful practices to become more widespread if higher education leaders, advocates, and stakeholders share the evidence that targeted approaches result in more STEM graduates. There is great opportunity to build political will to support broader minority male participation in STEM. As discussed, the president has created space for new, exciting initiatives in innovation and STEM education, and the federal agency community is poised to respond in kind, particularly when it comes to ensuring a diverse STEM pipeline.

Also responding are nonprofit groups focused on raising awareness about minority males, in general. For example, the Student African American Brotherhood (SAAB) was founded in 1990, and has served all promising young men, regardless of race or ethnicity. The organization specifically seeks to increase "the number of African American and Latino men who graduate from college by creating a positive peer community based on a spirit of caring" through the creation of SAAB chapters all over the country (Student African American Brotherhood, 2011).

Washington-based policy groups doing national work on minority males include the Center for Law and Social Policy (CLASP, 2011) and the College Board. In addition to A♦P♦L♦U, another association with resources on minority males is the American Association of Community Colleges (AACC). AACC has developed a database of practitioner-submitted interventions used on community college campuses across the country to improve minority male outcomes (American Association of Community Colleges, 2011). This data could serve as a touch stone for collaboration with community college partners, particularly for those campuses that have large transfer populations.

The College Board's Advocacy and Policy Center recently launched the "Educational Experience of Young Men of Color" campaign, which focuses on shedding important light on this population

and "seeks to identify existing—and needed—research around this issue, understand the "why" and provide an overview of the legal landscape within which solutions must be developed" (The College Board Advocacy and Policy Center , 2011).

A partner in this work includes Education Counsel, a legal policy firm in Washington, D.C. Institutions can tap into these efforts, take advantage of their resources, and be part of a national voice demanding more attention be paid to men of color (EducationCounsel LLC, 2011). National efforts can further be complemented by state networks and initiatives on STEM education and workforce.

Data Use

A key recommendation for advancing the success of minority men in STEM disciplines is the more widespread collection, reporting and use of education progress and outcome data on university campuses. The results of the MMSI survey indicated that few administrators were using such data to evaluate the effectiveness of their efforts to increase the recruitment, retention, and graduation of minority men. Without detailed data broken out by gender, race/ethnicity and program on measures such as retention, graduation, time-to-degrees, and course pass rates it is difficult to determine success or failure of institution or department efforts. Concrete evidence of which program components or strategies are having the desired impact, in which context, and at what cost are necessary to make decisions about the program and to justify the investment of campus resources. A solid and complete understanding of "what works" also allows programs, practices, and strategies to be more easily transferred to other departments on campus or to other institutions that have similar goals.

Building partnerships with institutional research offices is a first step to gaining access to a wide range of student information that is typically collected within student information systems and can form a basis for an evaluation system. A standard set of metrics should be developed to track student progress over a suitable time period, likely four to six years. The use of national datasets such as the Integrated Postsecondary Education Data System (IPEDS) allows campus results to be compared with other institutions across the country. Other data sources such as the National Student Clearinghouse provides information on students' educational progress across the entire postsecondary system—data that can be particularly helpful in understanding the movement of transfer students.

From a policy perspective, data is also critical to support changes and reforms to support student success at the national level, for example Pell grant or student loan eligibility requirements. As detailed national data by race/ethnicity and gender is often limited, institutional leaders may also want become familiar with efforts to expand the data and measurement tools available to track and compare the progress of students across institutions and systems, including attainment by racial and ethnic groups (Complete College America, 2011; Data Quality Campaign, 2011).

For example, national initiatives like the Institute for Higher Education Policy's National Coalition for College Completion and the A♦P♦L♦U and AASCU Voluntary System of Accountability (VSA) advocate the use of alternative attainment rates that go beyond the federally-mandated graduation rate, which only includes first-time, full-time students at their first institution. Alterative measures such as the VSA Success and Progress Rate would expand the tracking to include transfer students, part-time students, and returning students across multiple institutions—all of which are likely profiles of minority male college students. Such expanded definitions and tools are critical for institutions and researchers to more fully understand the movement of minority men within the higher education system and how to create more effective pathways for their success.

The Role of Minority Serving Institutions

As previous reports have noted, minority serving institutions (MSIs) play a large role in training the next generation of STEM professionals. From a policy perspective, it is therefore critical that federal MSI funds target minority males as comprehensively and completely as possible. It is also important that institutions put pressure on national MSI membership associations like the National Association for Equal Opportunity in Higher Education (NAFEO), Hispanic Association of Colleges and Universities (HACU), and American Indian Higher Education Consortium (AIHEC), to take up the minority males in STEM agenda as part of their advocacy work (AIHEC, 2011; National Association for Equal Opportunity in Higher Education; HACU, 2011).

An important and much-anticipated move to expand the MSI community came in May of 2010, when the U.S. Department of Education formally recognized institutions serving a critical mass of Asian American Pacific Islander (AAPI) students and opened the door for Asian American and Native American Pacific Islander-Serving Institutions (AANAPISIs) to receive federal resources. The AAPI population is the second fastest growing group in our nation, after the Latino population. Unfortunately, many AAPI groups (e.g., Cambodian, Laotian, Hmong, and Vietnamese) also have some of the nation's lowest educational attainment rates, live in poor urban areas, and attend schools with high dropout and low achievement rates.

Indeed, the move by the Department of Education is seen by many as a critical one for ensuring the advancement of all AAPI students. Indeed, not all AAPI students are excelling academically or receiving the same opportunity to enter STEM fields—a notion that is still foreign to many educators and policymakers, who continue to view AAPI students as unaffected by social, economic, or academic barriers. Again, there is an important data consideration here as national higher education statistics fail to account for the numerous subpopulations that lie within the overarching AAPI racial/ethnic category. According to U.S. Census data, the AAPI population includes 48 different ethnic groups speaking more than 300 languages. Institutions are wise to disaggregate their AAPI ethnic data to ensure all groups are being served and are excelling academically.

Another important consideration is the number of AAPI students that attend two-year colleges. Like other students of color, half of all AAPI students are enrolled in two-year colleges. Thus, effective transfer and articulation agreements are needed to widen the STEM pipeline. Four-year institutions have just as great a role in the transfer/articulation conversation as do two-year colleges. And both should engage state education commissions, as well as national associations, in helping them meet this need.

National Science Foundation Funding

In accordance with the president's directive on STEM, pressure has already been placed on agencies such as the National Science Foundation (NSF) to be accountable for greater results— namely, degree production by underrepresented students—in the coming years. However, the results have been mixed. As part of his 2011 budget proposal, President Obama made a recommendation to eliminate three NSF Broadening Participation programs: the Historically Black Colleges and Universities Undergraduate Program (HBCU-UP), the Tribal Colleges and Universities Program (TCUP), and the Louis Stokes Alliances for Minority Participation (LSAMP). The proposal instead outlined the formation of a competitive grant program that calls for applicants from MSIs as well as predominantly White colleges and universities (as long as they have an MSI partner).

In addition, the new Comprehensive Broadening Participation program would allow Hispanic-Serving institutions (HSIs) to compete for funds, thus satisfying an America COMPETES Act provision under which NSF serves as the would-be grantor for programs directed at improving the quality of STEM education at HSIs. However, instead of creating a stand-alone HSI grant program, the proposal placed HSIs—the largest MSI community with 268 institutions in 2006— in direct competition with all U.S. institutions of higher education (but only increased the budget by 14 percent).

At the end of the day, the comprehensive program was shelved, in part due to the aforementioned American COMPETES Act amendment by Congresswoman Johnson. Regardless of the pros, cons, or opinions of higher education as it concerns NSF's Broadening Participation (BP) funding, stakeholders are wise to pay close attention to NSF's next move on this front. Just as important, institutions can showcase their efforts in serving minority males and draw upon their individual and collective voice to place pressure on NSF to keep this population in mind when designing whatever will become their ultimate next model for distributing BP funds.

Fortunately, for the higher education community, NSF has sought external expertise to gain insight on just how the BP funds *should* be used. For example, the American Institutes of Research and Institute for Higher Education Policy have brought together STEM higher education stakeholders—of which only a portion are NSF grantees—convening provosts, deans, faculty, student affairs staff, social science researchers, industry, and national thought leaders. The focus of the meetings has been to create a national dialogue on what it truly means to broaden participation in STEM fields and what it will take. In addition to this dialogue, AIR has conducted trend analy-

sis of STEM graduates over the past 20, broken down by gender, race/ethnicity, and STEM field (Broadening Stem, 2011).

It is also worth paying close attention to NSF's plans for the "Transforming Broadening Participation through STEM" initiative, a proposed $20 million pilot program in the 2012 budget proposal. According to the NSF's budget overview, "[t]his new program will seek innovative solutions for broadening participation in STEM at the undergraduate level in anticipation of tomorrow's changing demographics, including increased engagement with Hispanic-serving institutions" (National Science Foundation, p. 3). There are a number of plans in the works at NSF. Future NSF funding priorities should demonstrate a commitment to closing participation gaps for all Americans, including the gaps in achievement between minority males and minority females in STEM and other learners, through the use of research-based, innovative, and exemplary practices.

Opportunities for Federal Diversity Funds

There are five major federal funding streams—including those coming out of NSF—that institutions can take advantage of when planning and executing minority male in STEM initiatives. These are (1) basic research funds, (2) programmatic funds, (3) scholarship funds, (4) partnership funds, and (5) workforce training funds. Regarding the basic research funding pool, there are ways to build upon research monies in order to secure minority male undergraduate and graduate research assistants and postdoctoral fellows. For example, NSF provides diversity supplements out of its various directorates that can be used for recruiting and hiring diverse students for research positions.

While programmatic funds are perhaps the most straightforward in their use, institutions can do three important things. First, when working with NSF, Energy, and other federal agency program officers, campus leaders and PIs can seek opportunities to apply such funds (if awarded) to work on improving minority male in STEM outcomes. Second, institutional leadership can make known the crisis facing minority males in STEM, again, via existing and newly formed relationships with federal agency education staff, and ask that requests for proposals include language that places a priority or additional weight to applicants seeking to elevate the minority male in STEM population. Third, individual faculty and students affairs champions can apply to sit on selection committees.

As for scholarship funding, there is the opportunity for such funding to be directed at minority male students if political pressure is applied by institutions and their partners—especially if the issue of minority males in STEM is continuously highlighted by institutions as well as national associations, foundations, and think tanks. The fourth funding opportunity—partnership funds— exists due to a current national emphasis by the administration, state government officials, national foundations, and prominent think tanks on cross-sector collaboration. Change the Equation and Innovate Educate are examples of this, as is the National Governors Association's

work on STEM and the state-specific networks previously discussed. Higher education should indeed capitalize on this momentum and seek funds aimed at cross-sector collaboration, as well as work to build such partnerships into other grant opportunities.

Finally, it is important to keep track of the workforce training funds being granted to community colleges and through forthcoming legislation such as the Workforce Investment Act (WIA). There may be opportunities for learning and collaboration that can ultimately serve as a catalyst for additional pipelines of minority males into four-year institutions. At a time like this, when resources are tight and yet degree completion is a must, institutions need to think creatively.

Recruiting, Retaining, and Graduating Minority Males in STEM

Other sections of this report underscore the unique circumstances and experiences of minority males across race and ethnicity. However, many common themes emerged that have implications for universities' strategies to recruit, retain, and graduate minority males in STEM regardless of institution type, size or demographics. This section uses common key findings from the MMSI survey to provide "action steps" for universities to follow to enhance recruiting and retention efforts for minority males in STEM.

Recruiting

PROTECT AND STRENGTHEN PUBLIC HIGH SCHOOLS. The majority of the participants in this study reported that they were educated within the public school system in their respective hometowns. This finding suggests that there is a great need to protect and strengthen public education in America. Despite the profound and unrelenting imperfections that characterize the system, public schools maintain their historical place in society. The reality is that, particularly within the urban sectors of the country, the majority of our nation's students continue to be served by these institutions (Noguera, 2003a). Protecting the promise of public education is vital to the well-being of our children, families, and society. The extent to which our public school system can be strengthened determines the future of higher education in America. Actions are needed at the local, state, and federal levels that abandon commonly employed temporary "fix-it" strategies for more viable alternatives that allow for more meaningful sustainability in public education.

PROVIDE QUALITY COUNSELING AND ADVISEMENT FOR COLLEGE-BOUND STUDENTS IN GRADE SCHOOLS. Students also expressed the need for better counseling and advisement in predominantly minority grade schools. Many traditionally underserved students (i.e., minorities, low-income, and first-generation college students) depend heavily on their schools' guidance counselors to assist them in plotting the path to college and careers. However, in some instances, the guidance provided in their respective school systems is inadequate, severely limiting the opportunities of these students (George & Aronson, 2003). Concerted efforts must be made on the part of counselors, particularly those in predominantly minority grade schools, to ensure that

these students are being steered in the direction necessary for successful entry into and completion of postsecondary education. School-based programs are needed that provide training to school guidance counselors on how to appropriately respond to the needs of underserved populations. In addition, educational policies are needed that monitor the school guidance process to ensure that the curriculum exposure of minority students is equitable and that these students are permitted equal access to information, the most rigorous courses, and the most enriching academic experiences that their respective schools have to offer.

IMPLEMENT A COLLEGE-BOUND CURRICULUM AND ADVANCED PLACEMENT CLASSES IN ALL HIGH SCHOOLS. Many of the respondents also reported that they benefited greatly from exposure to a rigorous curriculum through the advanced placement program at their schools. However, not every school offers a rigorous curriculum to its students. There is great variation in the high school course offerings that satisfy the requirements of college admissions nationwide. This is largely a function of resource deprivation and geographic location. A report by *Education Week* recently found that many schools in rural areas fail to provide their students with honors and Advanced Placement curricula (Linn, 2008). Educational policies are needed that ensure that every school, regardless of its resources and geographic location, has an Advanced Placement or college preparatory program, thereby providing all students with equal access to the higher education.

PROVIDE OPPORTUNITIES FOR MINORITY MALES TO PARTICIPATE IN COLLEGE TOURS. Students also reported that they greatly benefited from opportunities provided through their schools or local communities to participate in college tours. For many students, seeing is believing. Thus, visiting an institution of interest is often a major step in the college decision- making process and can assist a student in sorting through details important to the college experience such as the size of school, college major, course offerings, social activities available on campus, and the like. In addition, inherent in any college tour is the opportunity to raise with admissions representatives, financial aid counselors, and current students any questions or concerns that make students anxious about the college process. This exchange of information helps to mitigate feelings of fear or intimidation that may contribute to delayed entry into postsecondary education (Mallette, 2011). Educational policies and programs are needed that provide funding for college tours to schools and local community-based organizations such as churches.

PROVIDE RESOURCES FOR STUDENTS FROM LOWER SOCIOECONOMIC BACKGROUNDS. The majority of the respondents were of working class and lower socioeconomic status. Low-income students are less likely to have access to information regarding financial aid procedures and are more likely to be intimidated by the college admissions process. There is a great need to demystify the college admissions and financial aid process for this unique group of students. College admissions counselors should be supported in their efforts to target this group of students in their strategic recruitment plans. These plans should include strategies for making the information necessary for entrance into their respective institutions more user-friendly. The processes associated with the system tend to be rather daunting and anxiety-driven, particularly for low-income

students whose parents often lack the knowledge necessary to successfully navigate the system. Thus, policies are needed that support simplification and streamlining of the financial aid and admissions process in a manner that encourages low-income students and their families to take the steps necessary for pursuing higher education (Lederman, 2007).

Retaining

PROTECT AND EXPAND PELL GRANTS AND NEEDS-BASED SCHOLARSHIPS. Respondents also expressed the need for greater access to Pell Grants and need-based scholarship programs. These programs address many of the socioeconomic challenges underrepresented populations face and are essential to the recruitment and retention of low-income students. For many students, federally based financial aid is the primary means by which they finance their postsecondary education. Thus, these programs are critical to their ability to access institutions of higher education. Programs are needed at the secondary and postsecondary levels that promote universal access to and success in institutions of higher education (Heller, 2006). In addition, federal policies are needed to protect these programs so that every student that qualifies can attend college.

REDUCE FEELINGS OF ISOLATION AMONG MINORITY MALES ON COLLEGE CAMPUSES. The higher education experiences of some of the minority males in this study were associated with feelings of being "just a number" on campus. Such feelings can often lead to disengagement and eventual withdrawal from the postsecondary educational process. Strategies are needed to assist minority males in developing a sense of belonging and fully integrating them into the academic and social fabric of higher education institutions. One such strategy is the implementation of learning communities. Tinto (1998) describes learning communities as "Gateways to Student Success." Although these communities can take many forms, they are generally designed to provide a structure and space wherein students can engage in supportive networking, shared learning activities, and interpersonal and interdisciplinary exchanges with faculty and fellow students. These communities create valuable experiences that are vital to the academic success of minority students. While they are often funded and supported by higher education institutions, their activities often extend beyond the academic context in ways that promote persistence and positively shape the educational trajectories of minority students (Tinto, 1998). Furthermore, Torres and Bitsoi (2011) found that, when Native Americans learned that parallels existed between Native Americans and other racial or ethnic groups, this knowledge that they had more in common with others allowed them to feel less isolated.

PROVIDE RESOURCES FOR FIRST-GENERATION COLLEGE STUDENTS. Respondents also reported being first-generation college students. Given the absence of family members from whom they can seek guidance, many of these students are not exposed to the academic programs necessary for preparing them for their postsecondary educational careers, such as college preparatory and Advanced Placement programs, Upward Bound, and others. In addition, these students are more likely to postpone enrollment in college well beyond their high school years and to lack knowledge of the college admissions and financial aid process (Tym, McMillion, Barone, & Webster,

2004). In addition, for those that do successfully navigate the process, many still have difficulties adjusting to the college environment. Programs are needed at the secondary education level that target prospective first-generation college students and provide them with the guidance needed for successful college admissions. In addition, support is needed for these students at the post-secondary level to ensure their persistence through graduation from college.

PROVIDE MEANS AND MECHANISMS FOR MINORITY MALES IN STEM TO FOSTER MORE PERSONAL AND MEANINGFUL RELATIONSHIPS WITH FACULTY MEMBERS. Some of the study participants reported experiencing aloofness from faculty members. Faculty members, particularly those that are of color, play an integral role in the academic success of minority students. Many students in this study indicated that they greatly benefited from having close-knit relationships with faculty as these interactions contributed much to their academic growth and development. They also expressed the need to have faculty members who "understand their culture." Over the years, institutions of higher education have expressed a commitment to supporting and promoting diversity on their campuses, among both the student body and the faculty (Thompson, 2008). Yet, people of color are still largely underrepresented on the faculty at most colleges and universities. Programs are needed within higher education that recruit and retain an adequate representation of faculty of color at every institution as this is necessary to keep pace with a rapidly changing multicultural and pluralistic student body. In addition, programs are needed that foster a culture of student-faculty mentorship and offer incentives to faculty to build closer relationships with their students.

PROVIDE SUPPORT FOR MINORITY MALES IN STEM TO DEVELOP TIME MANAGEMENT AND STUDY SKILLS. Study respondents also reported a great need for study skills training and for instruction in time management. Many students avoid studying because they lack the skills necessary for doing so. In addition, unlike in high school, students have greater flexibility in their schedules and spend less time in class. Thus, many find themselves needing to develop time management skills in order to use their time constructively. Such skills are essential for survival in postsecondary contexts and vital to the academic success of college students. Programs are needed at the postsecondary level to assist students in these areas.

PROVIDE MECHANISMS FOR MINORITY MALES IN STEM TO ATTEND TO THEIR PHYSICAL, MENTAL, AND SPIRITUAL HEALTH. Study findings also suggest the need for mechanisms that promote the physical, mental, and spiritual health of students. As noted in a study conducted by the UCLA Higher Education Research Institute, students experience a significant decline in physical and mental health during the college years. However, participation in religious activity has been associated with better mental health outcomes (Astin, Astin, & Lindholm, 2010). Thus, programs are needed at all postsecondary institutions that can provide a means for students to meet their physical, mental and spiritual needs as the availability of these services is critical to their academic success and overall well-being.

Graduating

ENSURE THAT THERE IS COMMITMENT FROM THE HIGHEST LEVEL OF THE INSTITUTION. Many of the STEM faculty reported limited financial resources and the lack of clear accountability from the highest level of the administration for supporting the academic success of minority males in STEM. Improving the academic outcomes for minority males in STEM will require a focused commitment from the president of the university and from the chief academic officer. This expectation for accountability must then be communicated to those at the dean and faculty level.

GATHER THE DATA NEEDED TO MAKE INFORMED DECISIONS TOWARD CHANGE. The MMSI survey results indicated that many institutions do not have processes in place for monitoring the academic success of students by race, gender, and academic discipline. Institutions must work with their institutional research office to create appropriate metrics for measuring outcomes. The measurement and evaluation strategies must be in place before any plan toward improvement can be developed. Gathering baseline data to better understand the current state of affairs is a required first step.

ACT TO INITIATE CHANGES IN THE ACADEMIC PROCESSES. Campus and middle level administrators must be prepared to develop new academic processes based on what is learned from the data and monitor the effects of the new process over time. Often changes must be made that more clearly put student success as a priority. For example, individual departments may develop trend data on the retention and success rates of its students and determine where the bottlenecks are—in what courses do students generally not succeed, at what levels are early interventions needed, etc.

HOLD MID-LEVEL ADMINISTRATORS ACCOUNTABLE FOR THE TRACKING OF OUTCOMES BY RACE, GENDER AND ACADEMIC DISCIPLINE AT THE DEAN AND DEPARTMENT LEVEL. Many of the administrators responded that their institution does not track outcomes for STEM students by race, gender, and academic discipline. Commitment and responsibility for improving student success must be present at all levels of the institution. Leadership at the dean and department level must drive the process for accountability once it is communicated from the university leadership. Mid-level administrators must have direct access to both the human and financial resources required to implement any needed changes. A culture of accountability through the use of disaggregated data must be built among the faculty and staff as well.

SUPPORT AND ENHANCE MINORITY SERVING COLLEGES AND UNIVERSITIES. Findings from this study also indicated a need to emphasize the importance of minority serving institutions. By definition, these institutions serve a large proportion of students that identify as minorities (Li, 2007). Historically, these institutions have played a large role in providing educational opportunities for traditionally underrepresented groups. As a result, they have been instrumental in preparing minorities to make significant contributions to the workforce and their respective disciplines. Despite their persistent commitments to serving the underserved, many of these institutions suffer financially. Thus, federal investment in minority serving institutions is critical

(Wolanin, 1998). In order for them to realize their respective missions, it is necessary that they continue to receive the funding needed to achieve long-term financial stability and to develop programs, policies, and practices that promote recruitment, retention, and graduation among the minority students they so diligently serve.

PROVIDE STUDENTS WITH STRUCTURAL AND EMOTIONAL SUPPORT TO PURSUE POST-BACCALAUREATE STUDY. Study participants also expressed the need for assistance in preparing for post-baccalaureate study. Following their baccalaureate studies, most students are at a key point of transition in their lives and need additional assistance in taking the next step in their postsecondary career. Faculty members play a key role in providing students with opportunities that will aid in preparing them for graduate studies. One such mechanism for doing this is through student participation on research teams or projects and institutional support to attend conferences to present their research. At the postsecondary level, programs are needed that identify, as early as possible in their academic career, those students who are interested in pursuing post-baccalaureate study. Through these programs, students can be assisted in exploring their options for graduate study and provided with information on internship programs and the graduate school admissions process. In addition, they can be linked to faculty mentors and academic advisors who can assist them in developing a plan for entry into the post-baccalaureate program of their choice.

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APPENDIX A
A·P·L·U MINORITY MALE STEM INITIATIVE TASK FORCE MEMBERS

Task Force Members

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Elliott Hirshman, *President, San Diego State University*

Harold Martin, Sr., *Chancellor, North Carolina A&T State University*

James L. Moore, III, *Professor, Todd A. Bell National Resource Center on the African American Male, The Ohio State University*

Michael Nettles, *Senior Vice President and Edmund W. Gordon Chair of Policy Evaluation and Research Center, Educational Testing Service*

Mac A. Stewart, *Interim Provost and Vice President for Academic Affairs, Kentucky State University*

Malcolm Taylor (STUDENT REPRESENTATIVE), *Ph.D. student, Carnegie Mellon University*

Robert Teranishi, *Associate Professor, New York University*

Lionel Tiger, *Professor of Anthropology, Rutgers University*

Aileen Walter, *Vice President, National Action Council for Minorities in Engineering*

Ronald Williams, *Vice President, The College Board*

Association of Public and Land-grant Universities Staff

Lorenzo L. Esters, *MMSI Project Director and Vice President, A•P•L•U Office for Access and the Advancement of Public Black Universities*

Wendell Hall, *Director of Student Success and Research, A•P•L•U*

Jame'l Hodges, *Staff Associate, A•P•L•U* (from July 2011)

Christine Keller, *Director of Research and Policy Analysis, A•P•L•U*

Irelene Ricks, *Director of Strategic Development, A•P•L•U*

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Nadya Foaud, *Distinguished Professor and Chair, Department of Educational Psychology, University of Wisconsin-Milwaukee* (through March 2011)

Emorcia Hill, *Director of Research and Evaluation, Harvard University*

John Michael Lee, Jr., *Policy Director, The College Board*

Terrell Strayhorn, *Associate Professor, The Ohio State University* (through June 2011)

Ivory Toldson, *Associate Professor, Counseling and Psychology Program, Howard University*

APPENDIX B
TASK FORCE CHARGE AND CONTRIBUTIONS

The Minority Males STEM Initiative (MMSI) Task Force was appointed to assist in carrying out the work of the initiative. The members of the MMSI Task Force, who were chosen for their expertise and experience, provided insight, advice, and analysis for this report, which is intended to initiate a national dialogue on enhancing the recruitment, retention, and graduation of minority males in STEM disciplines. Most of the task force's time and effort involved carrying out fact-finding activities and analyzing the collected information. The main fact-finding activity was a two-day workshop described below.

During 2011, the task force held one full face-to-face meeting, and working groups held several teleconferences. A full task force meeting was held in Columbus, Ohio on January 10–11, 2011. During this meeting, participants were asked to:

1. Review what is known about access and success of minority males in STEM and identify gaps in knowledge and other resources that may need to be considered.
2. Outline a process to identify, collect, and evaluate programs, practices, and models currently underway that improve the access and success of minority males in STEM.
3. Identify the challenges and barriers to minority male access and success in STEM that the initiative action plan will need to address.

During the workshop, several presentations were given on topics including (1) the state of minority participation in STEM, (2) a review of a market analysis of minority participation in STEM at A♦P♦L♦U-member institutions, and (3) minority male progress in STEM disciplines, based on Research by the Higher Education Research Institute (HERI). After this meeting, task force members were organized in three key working groups:

1. Data and Qualitative Working Group—This group was charged with assisting the A♦P♦L♦U staff with the development of the survey instrument that would be distributed to universities participating in the study and providing the project with new data research and analysis of existing data surveys.
2. Men and Masculinity Working Group—The role of this group was to offer prescriptive solutions (based on existing psychoeducational literature) on how to develop healthy minority male identities in higher education STEM environments and the workforce.
3. Policy Working Group—This group was asked to address issues impacting minority males in STEM fields and careers, looking specifically for policies that support minority males and policies that impede them from attaining STEM degrees in higher education, STEM employment, STEM positions in academe, and STEM positions in the private sector.

APPENDIX C
MMSI SURVEY: PARTICIPATING INSTITUTIONS AND CAMPUS LIAISONS

Delaware State University
Alton Thompson
Office of the Provost

Florida A&M University
Decatur Rogers
FAMU-FSU College of Engineering

Florida International University
Amir Mirmiran
College of Engineering and Computing

New Mexico State University
Wendy K. Wilkins
Provost

Purdue University
G. Christine Taylor
Office of the Provost

Salish Kootenai College
Tim Olson
Division of Sciences

Southern University System
Walter Tillman, Jr.
Office of the President

Stony Brook University (SUNY)
Peter M. Baigent
Office of Student Affairs

The University of Alabama at Birmingham
Louis Dale
Office of the Vice President for Equity and Diversity

University of Alaska, Anchorage
Renee Carter-Chapman
Institutional Effectiveness, Engagement, and Academic Support

University of Hawaii at Hilo
Daniel E. Brown
Research Office

University of Illinois, Chicago
Lisa Troyer
Office of the President

University of North Carolina, Pembroke
Meredith Storms
College of Arts and Sciences

University of Texas at El Paso
Donna Ekal
Office of Undergraduate Studies

APPENDIX D
MMSI CAMPUS SURVEY METHODOLOGY

The Minority Male STEM Initiative (MMSI) Campus Survey results described in this report are based on a survey designed to describe minority male students' perceptions of their academic orientations and academic experiences at four-year institutions. Accordingly, the mixed methods approach (Tashakkori & Teddlie, 1998) used to conduct this study was designed to identify practices, activities, behaviors, and attitudes that support the enrollment, retention, and graduation of minority men in STEM disciplines. Additionally, the research design sought to yield descriptive-level data such as means and percentage distributions (Creswell, 2005) regarding the perceptions and experiences of students, faculty, and administrators on university campuses. Data analysis took place in a two-stage process. In the first stage, participants' responses from the MMSI Campus Survey were coded, tabulated, and reported in aggregate form utilizing descriptive statistical procedures (Jaccard & Becker, 1990) by racial group and institutional type. In the second stage, data obtained from the qualitative protocol were transcribed, coded, and analyzed to identify patterns and themes (Lincoln & Guba, 1985; Miles & Huberman, 1984). Viewed collectively, the information will be used to support institutions in their efforts to increase the numbers of minority males who enter and successfully complete a degree program in science, technology, engineering, and math disciplines.

Institutional Sample

The survey was administered at selected institutions, and although the institutions represent a variety of institutional types, missions, and sizes, the reader should be aware that the results might not be representative of the entire population of STEM students at public four-year institutions. Moreover, institutions were chosen using a modified qualitative approach (Upcraft & Schuh, 1996) in which confirming cases were selected for inclusion in the institutional sample based on their distinguishable record of supporting minority students in STEM disciplines. In total, 14 postsecondary institutions were chosen to participate in this study, based on their proven track records of matriculating and graduating undergraduate students of color in STEM disciplines as evidenced by their participation in nationally recognized programs such as the Louis Stokes Alliance for Minority Participation. The size of the institutional sample was further constrained by available funding and staff support. The institutional sample included Hispanic Serving Institutions (3), Historically Black Colleges and Universities (3), institutions with large native Alaskan student populations and/or large percentages of Pacific Islanders (3), Predominately White Institutions (3), and Tribal Colleges and Universities (2).

Survey Sample

Each institution was asked to identify all undergraduate students of color who were STEM majors and invite them to participate. Based on student enrollment and STEM degree institutional data, it was estimated that six institutions would invite 50 to 100 students, two institutions would invite 150 to 200 students, and six universities would invite 300 to 400 students for a total of approximately 3,000 survey participation invitations. The estimated response rate was 35 percent to produce at least 1,200 student responses. Institutions were also asked to invite between five and ten STEM faculty and between five and ten senior administrators to complete the survey. The targeted goal was to collect at least 100 faculty and administrator responses (i.e., approximately 35 percent of the invitations sent).

Instrumentation

The development of the MMSI Campus Survey was based on a comprehensive review of the research literature regarding the effects of college on STEM student development and issues impacting minority males in schools. Items for the MMSI Campus Survey were constructed—using previous research, broadening participation programs, and best practices information—to obtain critical data regarding students' perceptions of their academic experiences and students' views of the campus climate. During the item development process, a concerted effort was made to generate items that were representative of the issues, challenges, and opportunities experienced by minority male students in STEM disciplines. The MMSI Campus Survey included 28 *Demographic and Background Information* items (e.g., Why did you choose to major in STEM? What individuals and/or experiences during your PreK-12 school years fostered your interest and development in math and science), 26 *Perceptions of the Classroom and University* items (e.g., In general, the campus environment is welcoming to me and people like me; I feel supported by faculty in my major department/program), and 38 *Participation in Programs, Services, and Academic Support Opportunities* items (e.g., I have appropriate opportunities to work with faculty on research teams or projects; I have appropriate exposure to science internship information). Also, three qualitative items were constructed for the MMSI Campus Survey to examine minority male students' perceptions and experiences in STEM degree programs (i.e., How would you characterize your relationships and interactions with the faculty in your STEM major? What role are your parents or legal guardians playing in your college education? After graduation, to what extent do you believe that you will have the prerequisite skills and needed academic preparation to competitively enter your occupation of choice after completing your STEM degree?).

Survey Administration

Following the approval of the survey protocol and questionnaire by the Institutional Review Board at The Ohio State University, 14 institutional liaisons were selected and asked to identify potential survey participants based on the parameters outlined above and to send a link to an online survey. This process helped to ensure that the information gathered was anonymous and

could not be linked to individual respondents. Although students, faculty, and administrators accessed the survey through a common link, survey branching was utilized so that each targeted group responded to an appropriate set of questions based on their role at the university. The survey was strictly voluntary, and all respondents had the opportunity to end their participation at any time without the risk of reprisal. Students had the opportunity to participate in a drawing for a $250 Best Buy gift card. The contact information for the lottery was collected through a separate process and not linked to individual survey responses. The survey data were collected over a six-week period during the fall of 2011.

Response Rates

Invitations with a link to the survey were distributed by the campus liaisons to approximately 24,000 STEM students of color, 620 STEM faculty, and 100 university administrators, well above the initial sample size estimates. Table 1 provides details on the racial and ethnic distribution of the final student sample by type of institution.

APPENDIX TABLE 1: **RACIAL AND ETHNIC DISTRIBUTION OF THE STUDENT SAMPLE, BY INSTITUTIONAL TYPE**

	NATIVE AMERICAN OR ALASKA NATIVE	ASIAN OR PACIFIC ISLANDER	BLACK OR AFRICAN AMERICAN	HISPANIC OR LATINA/O	OTHER RACE AND ETHNICITY
Hispanic Serving Institutions	221	610	1,199	11,494	0
Historically Black Colleges and Universities	2	12	1,799	34	0
Large Asian/Pacific Islander Institutions	228	524	60	191	289
Predominantly White Institution	64	2,983	893	936	139
Tribal Colleges and Universities	330	28	217	26	0

The response rate for students was lower than expected (less 10 percent) but still yielded 1,443 responses. Student response rates varied by campus; the lowest response rate was 1 percent, while the highest was 23 percent. Overall, response counts and response rates were 137 (22 percent) for faculty and 71 (67 percent) for administrators. Table 2 shows response rates for all three groups by institutional type

APPENDIX TABLE 2: **SURVEY RESPONSE RATES, BY INSTITUTIONAL TYPE**

	STUDENT RESPONSE RATES	FACULTY RESPONSE RATES	ADMINISTRATOR RESPONSE RATES
Hispanic Serving Institutions	7%	17%	65%
Historically Black Colleges and Universities	6%	19%	48%
Large Asian/Pacific Islander Institutions	9%	46%	37%
Predominantly White Institution	7%	31%	100%
Tribal Colleges and Universities	12%	28%	100%

Of the 1,793 responses, 1,443 usable responses were gathered from STEM students of color (563 from male STEM students of color). Table 3 displays the racial and ethnic distribution of the respondents by group.

APPENDIX TABLE 3: **RACIAL AND ETHNIC DISTRIBUTION OF THE RESPONDENTS**

	STEM STUDENTS	STEM FACULTY	ADMINISTRATORS
Native American or Alaska Native	35	1	3
Asian or Pacific Islander	200	11	3
Black or African American	159	14	19
Hispanic or Latina/o	426	7	1
White	13	67	26
Other race and ethnicity	24	7	2
More than one race	166	8	5
Not reported	420	22	12

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APPENDIX E
REVIEW OF RELEVANT LITERATURE

The literature in this section provides an overview of concepts relevant to providing a university environment that is conducive to recruiting, retaining, and graduating minority males. Specifically, this section will discuss (1) concepts related to cultural development in a university context and (2) concepts relevant to men and masculinity in a university setting.

Relevance of Culture

Culturally competent universities invite open and honest dialogue about race and ethnicity subsequent to confronting their own biases, assumptions, and prejudices about diverse racial or ethnic groups. In addition, they use professional resources and activities to develop specific skills to accommodate racially and ethnically diverse faculty and students (Arredondo, 1999; Helms & Cook, 1999). Accordingly, a university exhibits multicultural competence when administrators (1) make intentional efforts to accommodate culturally diverse students, faculty and staff, (2) enhance faculty and staff training experiences with cultural content, and (3) are self-reflective and are comfortable exploring and disclosing biased policies and practices.

Key Concepts in Cross-Cultural Supervision

RACIAL IDENTITY DEVELOPMENT. The racial identity of students, faculty, and administrators will influence the cultural dynamics in a university setting. In theory, White people at lower levels of racial identity tend to lack interest in and awareness of other cultures, deny the existence of racism, and often have stereotypes about other races (Toldson & Utsey, 2008). In contrast, White people with higher levels of racial identity actively seek accurate information about other races, are able to perceive overt and institutionalized racism, as well as *White privilege*, and value cross-cultural experiences. Students who attend school at a predominately White university with high levels of immersion and autonomy will benefit from faculty, staff, and administrators who are more sensitive to their cultural needs. Racial identity can also influence the way minority students relate to the university experience. In the early stages of racial identity (i.e., *conformity* and *dissonance)*, members of minority cultures often passively accept majority culture values.

CULTURAL ENCAPSULATION. This is the practice of disregarding the influence of culture (Estrada, Frame, & Williams, 2004; Leuwerke, 2005). Pedersen (2002) identified five aspects of cultural encapsulation. An encapsulated university system may (1) define the experiences of students with one set of cultural assumptions and stereotypes, (2) be insensitive to cultural variation and view only one culture as legitimate, (3) have unfounded and unreasoned assumptions about minority cultures, (4) overemphasize a limited range of strategies to promote diversity, which they

apply rigidly across cultures, and (5) interpret behaviors from the majority culture framework (Pedersen, 2002). Universities that are culturally encapsulated have difficulty recruiting, retaining, and graduating minority students and are likely to attribute their lack of diversity to the maladaptive patterns of minority students.

COLORBLINDNESS. Neville et al. (2001) noted that racism is reflected in colorblind racial attitudes typified by ignorance, denial, and a distortion of the reality that race plays a role in people's lived experiences. In the context of the university, White faculty and administrators' colorblind racial attitudes are often manifested in the attitude that racial minority students are no different from racial majority group students. When using colorblind attitudes, predominately White universities may overlook the role of racism and discrimination in relation to difficulties with recruiting, retaining, and graduating minority students.

Relevance of Gender[9]

A growing number of research studies and reports aim to disrupt the discourse on minority males as the "problem" and how to "fix" them. These studies turn the focus to educational environments and their role in student engagement and achievement outcomes (Livingston & Nahimana, 2006). In addition, it is important to consider the evidence about gender and its relevance for males of color in postsecondary settings, namely its link to understanding pre-college factors (Ferguson, 2003; Noguera, 2003b). Research on manhood and masculinity, particularly for men of color, is traced to conceptions of how and to what extent they fulfill traditional gender roles as men in the broader society (Abreu, Goodyear, Campos, & Newcomb, 2000; Cazenave, 1979; Hunter & Davis, 1994). This recent work is valuable in understanding how the constructions of manhood and the performance of masculinity relate to academic success.

Manhood and Masculinity

Throughout the pipeline, the ways in which minority males identify with education are related to how they make meaning of academic experiences and outcomes (Davis, 2003; Osborne, 1995). Some researchers argue that at the core of minority underachievement is an identity mismatch or a dis-identification with education and what happens in school settings and interactions (Osborne, 1995). There are also tensions between how these young men feel about education and how they feel about themselves (Davis, 2006; Osborne, 1995; Saez, Casado, & Wade, 2009). This struggle is enacted in the classrooms with teachers, in hallways with peers, and in the principal's office as students try to be authentic (i.e., "keeping it real") to who they are and how these perceived themselves (Harris, Palmer, & Struve, 2011). Although all students are experiencing some identity development issues related to school, minority males, due to their unique experience,

9 The "Relevance of Gender" section was written by James Earl Davis, Ph.D. Interim Dean, College of Education, and Professor, Department of Educational Leadership and Policy Studies, Temple University.

may manifest higher levels of identity disenfranchisement than their peers (Polite & Davis, 2002; Saez et al., 2009).

In many cases, only a narrow conception of manhood is readily available to minority males. Alternative conceptions and behaviors are generally considered inappropriate and carry negative social consequences for those who dare push against traditional convention (Mutua, 2006). These social constructions may produce a culture of masculinity that can devalue the role of academic engagement. Czopp, Lasane, Sweigard, Bradshaw, and Hammer (1998) observed that males who presented themselves as being aloof to academic performance (e.g., results on an exam) were evaluated by peers to be more socially attractive and masculine than males who were more concerned and conscientious about academic performance (Czopp, Lasane, Sweigard, Bradshaw, & Hammer, 1998). In a related study, Lasane, Sweigard, Czopp, Howard, and Burns (2000) found that college students perceived an academically organized, studious student as less masculine and less socially attractive than a disorganized and less academically minded student.

Furthermore, study participants described the more disorganized and less serious academic self-presentation style as being more closely related to their views of what it means to be a man in college. An atmosphere that regulates "acceptable" academic beliefs and behaviors requires some gender "know-how" by minority males in order to survive socially and academically in various education settings (Dancy, 2011; Davis, 2006).

Gender Role Socialization

Previous research has shown that, in educational settings, traditional hegemonic gender roles may create a reward-punishment structure that undermines academic engagement and achievement (Dancy, 2011; Davis, 1999; Torres, 1998). Through gender role socialization, boys learn early on the expected codes of conduct and deportment that support orthodox notions of masculine behaviors (Anderson, 2005; Davis, 2003). Unfortunately, in some settings, these messages result in activities that are in opposition to academic behaviors that lead to school success. For the most part, minority males conform to the social expectations of their gender groups where social rewards and status originate (Dancy, 2011; Harris & Struve, 2009). The literature also suggests that minority males, specifically African American and Latino males, reject academic dispositions because they are equated to be being soft, effeminate, and associated with girls and women (Abreu et al., 2000).

By the time these young men reach college age, they have perfected gender roles that clearly rub against academic engagement dispositions for success in college (Cuyjet, 1997; Dancy, 2011). Research supports the notion that college settings influence how manhood and masculinity are constructed and acted out. According to Czopp, Lasane, Sweigard, Bradshaw, and Hammer (1998) and Davis (2005), gender roles matter and take on different meaning based on the racial/ethnic composition (e.g., HBCU, PWI, HIS, or TC) of the college campus (Czopp et al., 1998; Davis, 2006).

Conclusion

The recent expansion of education and social science research that centers on minority males has brought needed attention to this population. This recent research attempts to move the discussion away from stereotypical problem-based themes to broader conceptions and considerations of the experience of minority males in college (Dancy, 2010; Davis, 1999). Much of the postsecondary research has been significantly influenced by the emergence of topics related to men and masculinity that reflect researchers' increased engagement in gender-based scholarship related to minority males.

Similar to their male peers of other races/ethnicities, African American, Latino, and Native American males clearly understand and generally embrace traditional gender roles (Abreu et al., 2000). Certainly, a broader and more expansive definition of manhood and more acceptable behavioral manifestations of masculinity are needed across all educational settings.

Valuing the presence and perspectives of minority males on campus and supporting these students as they learn to negotiate their identities in these environments is the responsibility of the colleges and universities (Cuyjet, 1997). The absence of a research base that is grounded in what we know about the experiences of minority males and the meaning of these experiences is costly. The cost of not knowing how to support the academic and social development of these students is too expensive for institutions, minority males, and STEM fields to bear.

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