



**THE NATIONAL
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*University of Connecticut
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**Nurturing Talent in
Underrepresented Students: A Study
of the Meyerhoff Scholars Program
at the University of Maryland,
Baltimore County**

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New York City, New York

September 2005
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University of Maryland, Baltimore County**

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ABSTRACT

This monograph examines the structural components and theoretical foundations of the Meyerhoff Scholars Program (MSP) at the University of Maryland, Baltimore County; it studies the relationship between specific program components and high academic achievement in talented minority college students. The MSP, which recruits, supports, and provides scholarships for minority college students majoring in mathematics, engineering, and the sciences, is designed to increase the number of underrepresented minorities who pursue research in these fields of study. The monograph evaluates the effectiveness of the program by describing several program components and principles, including recruitment strategies, peer study groups, high academic expectations and motivation, advisement and monitoring, and academic and social integration. The monograph concludes with a series of policy and research recommendations.

Nurturing Talent in Underrepresented Students: A Study of the Meyerhoff Scholars Program at the University of Maryland, Baltimore County

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EXECUTIVE SUMMARY

This monograph examines the structure and principles of the Meyerhoff Scholars Program (MSP) at the University of Maryland, Baltimore County (UMBC); it studies the relationship between specific program components and high academic achievement in talented minority college students. The MSP, which recruits, supports, and provides scholarships for minority college students who excel in mathematics, engineering, and the sciences, is designed to increase the number of underrepresented minorities who pursue research and careers in these fields. This monograph begins with an analysis of achievement trends for minority students and the programs that specifically target improving the intellectual competencies and persistence motivation of talented minority students. The monograph examines (a) key program components; (b) characteristics of students and staff; and (c) institutional policies and resources.

Academic Achievement Factors

The academic achievement gap persists despite ongoing efforts to reduce the differences in performance between racial and ethnic minorities and their White and Asian American peers. This gap affects students at the lowest ends of the achievement spectrum as well as the highest end. The achievement gap is found to affect the post high school performance of even the most competent minority students whose high grades and standardized test scores appear to over-predict similar high performance in college. The report examines the research on this phenomenon, including the work of John Ogbu and Claude Steele.

Program Components

The MSP achieves its goals through a deceptively simple array of integrated program components that include (a) the careful selection of students; (b) the provision of merit financial support to reduce concerns about finances; (c) a mandatory Summer Bridge Program to acclimate students to the rigors of freshman year and faculty expectations; (d) the pivotal role peer study groups play in students' success; (e) the responsibility of each Meyerhoff student to each other and to community service; (f) the importance of taking advice; (g) meaningful and sustained interaction with faculty and mentors; (h) the importance of continued family involvement; (i) the centrality of

academic excellence and scholarship; and (j) the significance of rigorously and systematically documenting and evaluating program processes and outcomes.

Student and Staff Characteristics

The first group of Meyerhoff Scholars included 19 young African American men who enrolled in fall 1989. Now in its 15th year, the Meyerhoff Program is open to all high-achieving high school seniors who have an interest in pursuing doctoral study in the sciences or engineering, and who are interested in the advancement of minorities in the sciences and related fields. The Program currently has a total enrollment of 214, including 65 new Meyerhoff freshmen admitted in Fall 2003 (with average SAT scores of 1,310). The MSP has become one of the nation's leading producers of minority college graduates, particularly African Americans, who go on to postgraduate study and research careers in science, engineering, and other technical fields. The UMBC ranked first in the nation in 1999 in the number of undergraduate biochemistry degrees awarded to African Americans.

Freshmen students in the MSP and in the university at large are taught by full-time, tenure-track faculty. This unusual situation, however, has not always been the case. The UMBC's highly effective approach of genuine faculty involvement and commitment has emerged after systematic and deliberate conversations involving faculty, concerning grades, persistence, and retention in their freshman year of all students, not just minority students.

Institutional Policies

The MSP relies on a set of carefully researched and designed program policies that are rigorously implemented and evaluated. Among these policies are the following:

1. **Financial Aid:** Comprehensive financial support is contingent upon students maintaining a B average in a science, engineering, or math major.
2. **Recruitment:** Selection is rigorous. The program currently receives approximately 1,400 nominations and applications each year; only the top 100-150 applicants are accepted.
3. **Summer Bridge Program:** Once selected for the program, Meyerhoff students attend a mandatory pre-freshman Summer Bridge Program.
4. **Peer Study Groups:** Tutoring and being tutored is required on UMBC's campus for students who excel and for those who aspire to excel.
5. **Advisement and Monitoring:** The program employs full-time academic advisors and other staff members who are required to monitor and advise students on a regular basis.
6. **Administrative Involvement and Public Support:** The Meyerhoff Program is supported at all levels of the university, and championed by the president of the University. Over the years, the program has generated a substantial amount of public recognition.

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**The Magnitude of the Academic Achievement Gap Between Minority
and Majority Students**

This monograph describes the structural components and theoretical foundations of the Meyerhoff Scholars Program (MSP) at the University of Maryland, Baltimore County (UMBC) and studies the relationship between specific program components and high academic achievement in talented minority college students. The monograph first addresses problems in student academic development associated with the academic under-productivity of certain ethnic minority populations and the schools that serve them, sometimes referred to as the academic achievement gap. We refer to one of the nation's most critical dilemmas in education: the ubiquitous difference in academic achievement between African American, Hispanic, and Native American students and their peers who have European American and Asian American family backgrounds. These students of color, in addition to some Pacific Islanders, are seriously underrepresented among the students who perform in the top 25th percentile of students in elementary, secondary, and post-secondary education in the United States.

The continuing shortage of African American, Hispanic, and Native American students who achieve at very high levels academically is the issue that guided the work of the National Task Force on Minority High Achievement, organized by the College Board in 1997 and co-chaired by Professor Edmund W. Gordon. The group's report entitled, *Reaching the Top*, (College Board, 1999) concluded that, "until many more underrepresented minority students from disadvantaged, middle-class, and upper middle-class circumstances are very successful educationally, it will be virtually impossible to integrate our society's institutions completely, especially at the leadership levels" (p. 2). Almost 75 years ago, DuBois (1940) warned against the neglect of gifted and talented minority students. Current attention, however, is primarily focused on the overrepresentation of minorities at the lowest end of the academic achievement distribution, neglecting those at the highest end. Continued neglect of talented minority students will lead to an increasing gap between high achieving minority and majority students and the over-prediction of traditional indicators (high Scholastic Achievement Test [SAT] scores and strong high school grade point averages [GPAs]) for minority students entering college. This often ignored phenomenon was first reported by Coleman in *Equality of Educational Opportunity* (1966) and in the 1980s and 1990s by Willingham (1985); Durán (1983); and Ramist, Lewis, and McCamley-Jenkins (1994).

The Over-prediction Phenomenon

According to Willingham (1985), Durán (1983), and Ramist et al. (1994), high standardized test scores (either the SAT or American College Test [ACT]) and strong high school GPAs tend to over-predict the academic performance of some underrepresented minority students. Specifically, underrepresented minority students (including African Americans, Hispanics, and Native Americans) tend not to perform as well as their standardized scores would predict (Ramist et al., 1994). This under-performance is demonstrated in freshman science, engineering, and mathematics courses (Ramist et al., 1994) and is particularly acute at the high end of the achievement distribution. More recently, research from The College Board indicates that African American students, particularly males, with similar college entrance exam scores and high school grades as White students receive lower grades in college classes (Bridgeman, McCamley-Jenkins, & Ervin, 2000).

While some may conclude that the cause of this problem resides solely in the behavior and characteristics of the underachieving minority students, there is evidence of more plausible causal variables. These variables include motivational and performance vulnerability in the face of negative stereotypes and low expectations for performance, academic and cultural isolation, faculty and peers who are not supportive of academic success, and perceived or actual discrimination (Allen, 1992; Gándara, 1999; Garrison, 1987; Maton, Hrabowski, & Schmitt, 2000; Nettles, 1988; Seymour & Hewitt, 1997; Steele & Aronson, 1995). For underrepresented minority students, the perceived threat of being negatively stereotyped is a self-confirming phenomenon. In these instances, students find themselves in situations (i.e., class or exams) where they perceive an external expectation that they will fail or perform poorly based on their minority status. This perception generates anxiety that can subsequently lead to poor performance out of a fear of confirming the stereotype (Steele, 1997). Other explanations include

- Fear of disapproval or rejection by peers, including fears of "acting White" (Fordham & Ogbu, 1986);
- Hostile or unsupportive environments associated with residual racism (Aronson et al., 1999; Steele, 1997);
- Absence of adequate socialization to the attitudinal and behavioral demands of the academy (Ogbu, 2003);
- Academic and social isolation;
- Specific gaps in knowledge and skill development (Hoffman, Llagas, & Snyder, 2003); and
- Limited contact with and exposure to models of academic excellence and exemplars of scholarly practice.

While some of the solutions include changes in student attitudes and behaviors, many of these problems also require changes in institutional interventions. Existing efforts to address specific problems at different achievement levels, however, have largely focused on students who fall in the middle or low end of the achievement distribution to the neglect of those students on the high end.

Current Efforts at Increasing Minority High Academic Achievement

Despite the extensive attention given to the problem of the academic achievement gap, research provides little evidence of intervention strategies that may prove highly effective in reducing this gap (James, Jurich, & Estes, 2001; Miller, 2003). We have identified a few programs that combine rigorous selection criteria with learning environments that are both demanding and supportive. Elementary school programs include the Calvert School in Baltimore, Maryland; the KIPP Academy in the Bronx, New York; the General Electric College Bound program (with programs in elementary, middle, and secondary schools in Alabama, Kentucky, Massachusetts, New Mexico, New York City, North Carolina, Ohio, and Pennsylvania); Project SAGE (Student Achievement Guarantee in Education) in Wisconsin; and Project STAR (Student/Teacher Achievement Ratio) in Tennessee. At the secondary school level, we find a mix of whole school programs (Equity 2000, AVID, High School Puente, and Gateway to Higher Education), and a few special interventions such as A Better Chance and Prep for Prep. These interventions emphasize preparation for high levels of academic achievement and facilitate college access for underrepresented students (low-income, minority students and students with "average" academic performance but who show potential for higher level academic performance) in post-secondary institutions.

Although these and other efforts exist to increase the level of academic learning in K-12 education, we still find few comprehensive efforts/specific interventions designed to develop, nurture, and accelerate the intellectual competencies of able and gifted ethnic minority students. At the undergraduate level, the early work of professors Uri Triesman and Robert Fullilove at the University of California at Berkeley resulted in the Emerging Scholars Program. For more than 20 years, J. W. Carmichael has labored with this problem in the Biomedical Honor Corps at Xavier University. Additionally, Gándara (1999) has identified the following programs that focus on the sciences, engineering, mathematics, and technology: Alliance for Minority Participation; Biology Undergraduate Scholars Program at the University of California (UC), Davis; the Challenge Program at Georgia Tech; the Chemistry Learning Center at the University of Wisconsin; Exxon Stevens at the Stevens Institute of Technology; Minority Access to Research Careers (MARC U* STAR); Minority Biomedical Research Support (MBRS); Minority Engineering Program; Minority International Research Training; Minority Medical Education Program; MURALS at UC Davis; Mentor Connection at the University of Connecticut, and Spend a Summer with a Scientist at Rice University. The most impressive of these efforts, however, may be the Meyerhoff Scholars Program (MSP), begun in 1988 by the president of the University of Maryland, Baltimore County (UMBC), Dr. Freeman Hrabowski.

The Meyerhoff Scholars Program

The Meyerhoff Scholars Program (MSP) at the University of Maryland, Baltimore County (UMBC) is a multi-component program that fosters academic excellence in freshman students majoring in the sciences, engineering, and mathematics.

Our study of the MSP is based on a connoissuerial evaluation and an ethnographic analysis of (a) key program components; (b) characteristics of students and staff; (c) institutional policies and resources; and (d) the structural arrangements and climates that appear to be associated with high academic achievement in ethnic minority populations. In this study, we examine, describe, and codify the conditions and factors unique to the MSP. From our prior investigations, it is clear that while some of the specific interventions that appear to be effective have been developed on college campuses, the actual strategies are by no means college-campus or age-group limited. For example, features such as personalization, community building, curricular integration, student/faculty research, and *in loco parentis* emerge as being appropriate to several levels of intervention. The MSP effectively addresses students' need for academic and social integration, the development of specific knowledge and skills, various forms of support and motivation, and monitoring and advising over the course of their undergraduate careers at the UMBC.

The first group of Meyerhoff Scholars included 19 young African American men who enrolled in fall 1989. Now in its 15th year, the Meyerhoff Program is open to all high-achieving high school seniors who have an interest in pursuing doctoral study in the sciences or engineering, and who are interested in the advancement of minorities in the sciences and related fields. The program currently has a total enrollment of 214, including 65 new Meyerhoff freshmen admitted in Fall 2003 (with average SAT scores of 1,310). In 1996, the MSP was recognized nationally with the Presidential Award for Excellence in Science, Math, and Engineering Mentoring.

With approximately 12,000 students, more than 50% of UMBC's undergraduates and 60% of the doctoral students pursue engineering and science degrees. UMBC's student population is roughly 15% African American, 17% Asian, and 3% Hispanic and Native American. According to UMBC data, although the university had been successful in producing a number of Asian and European American students in engineering and the sciences, few African American students had succeeded in these disciplines until the creation of the MSP.

The MSP achieves its goals through a deceptively simple array of integrated program components and principles that include (a) the careful selection of students; (b) the provision of merit financial support to reduce concerns about finances; (c) a mandatory Summer Bridge Program to acclimate students to the rigors of freshman year and faculty expectations; (d) the pivotal role peer study groups play in students' success; (e) the responsibility of each Meyerhoff student to each other and to community service; (f) the importance of taking advice; (g) meaningful and sustained interaction with faculty and mentors; (h) the importance of continued family involvement; (i) the centrality of academic excellence and scholarship; and (j) the significance of rigorously and systematically documenting and evaluating program processes and outcomes. The MSP operates on the assumption that every student selected has the ability to excel in engineering and the sciences if he/she is provided with appropriate challenges, resources, and opportunities.

Several evaluations demonstrate that the MSP has become one of the nation's leading producers of minority graduates, particularly African Americans, who go on to postgraduate study and research careers in science, engineering, and other technical fields (Maton et al., 2000). UMBC ranked first in the nation in 1999 in the number of undergraduate biochemistry degrees awarded to African Americans, representing nearly one-third of the nation's total. It also ranked second in the number of undergraduate biochemistry degrees awarded to minority students in general, and fourth (tied with Yale) in the number of undergraduate biochemistry degrees awarded overall. Approximately 550 undergraduates (including 214 current students) have enrolled since the first class of 19 Meyerhoff Scholars launched the program in the fall of 1989. Since the first group of graduates in 1993, nearly 350 Meyerhoff students have earned degrees in the sciences and engineering, with 85% matriculating in graduate and professional programs at institutions nationwide. These graduates are now part of a pipeline that has begun to produce a steady stream of minority and female PhDs, MDs, and MD/PhDs.

Structural Components of the Meyerhoff Scholars Program

As we crafted accurate descriptions of the components from our non-participatory observations, site visits, and analyses of written materials, we gained a growing appreciation of the complexity of these processes, inputs, and contexts. Perhaps this is because the essential elements of the Meyerhoff Program model coalesce and re-combine in very distinct ways, depending on the purpose and context of a given activity, the involvement of faculty, program staff, university leadership, and student peers and the explicit and implicit meanings of these elements.

Financial Aid: Comprehensive financial support is contingent upon students maintaining a B average in a science, engineering, or math (SEM) major. In-state Meyerhoff Scholars receive full tuition (an average of about \$18,000 annually; students from out of state receive an average of \$25,000). These figures represent tuition, fees, room, board, and books. Meyerhoff finalists receive partial tuition, in addition to the many support services and activities the program offers. Student test scores are one of the determinations of who gets a full or partial scholarship. For any two consecutive semesters that students' GPA falls below 3.0, funding is taken away completely. Students regain their funding when their grades meet MSP's standards. Program staff members do not make any exceptions to this rule.

Recruitment: Recruitment is a labor-intensive activity. Program staff members share information about the program in high schools, on higher education campuses, and with various educators, advisors, and counselors. Program staff members view these professional networks as some of their most effective ways of locating potential students. This initial identification is followed by recruitment visits, letters, phone calls, and conversations with students and parents. The program currently receives approximately 1,400 nominations and applications each year. The top 100-150 applicants and their families are invited to one of two recruitment weekends on UMBC's campus. The first selection weekend, scheduled at the end of February, is for in-state students. The second selection weekend, held in the first weekend in March, is for out-of-state students. These

two weekends provide an opportunity for faculty, university leadership, program staff, and current students to meet the applicants under both formal and informal situations, expose students to the expectations that MSP scholars will enroll in PhD programs in the sciences, and give incoming students opportunities for interaction with these various stakeholders.

The recruitment process is both selective and competitive. Students have to complete a written test and participate in a personal interview. With respect to the written tests, all students applying to UMBC, including those applying to the Meyerhoff Program, need to take math and English placement exams. These exams are used to plan course registration for the fall. UMBC students take the exams in the summer; those students applying to the MSP take the exams during the selections weekend. A selected faculty member from the mathematics, science, or engineering department, a senior Meyerhoff student, and an administrator interview prospective students collectively. This team approach to interviewing provides the selections committee three different, but interrelated perspectives concerning the students' academic strengths and weaknesses, students' willingness to take advice, and the likelihood of students' becoming a part of the Meyerhoff community of high performance learners.

Summer Bridge Program: Once selected for the program, Meyerhoff students attend a mandatory pre-freshman Summer Bridge Program. During the 6 weeks of Summer Bridge, students take courses in math, science, African American studies, and the humanities. They also learn how to study as part of a peer group and participate in rigorous and systematic problem solving. Students are exposed to relevant social and cultural events that enable them to value the diversity as well as commonalities of their peers. A particular strength of the Summer Bridge Program is committed faculty from different departments who not only work intensively with these high achieving students, but also explicitly prepare students for the new expectations and requirements of rigorous college courses. Program staff consider the 6 weeks with pre-freshmen students as an opportunity to reduce such bad habits as writing a paper overnight or cramming for tests. According to the MSP's director, "Aside from molding them and exposing students to the Meyerhoff way, the greatest things they (the program staff) can give students is compassion and empathy" (Toliver, personal communication, 2003). The program staff members express "unconditional faith and belief" in the Meyerhoff Scholars. It is important to program staff members that they know their students' strengths and weaknesses, "with whom they click, their background, their pet peeves, and their fears."

Peer Study Groups: University leadership, faculty and program staff members expect Meyerhoff Scholars to participate in peer study groups. Peer study groups are regarded as an essential part of succeeding in the sciences and engineering. The research literature is replete with findings that support the idea that peer study groups create opportunities for academic and social support, which lead to minority high academic achievement (Treisman, 1992). In the MSP, peer study groups start during the Summer Bridge Program and continue throughout students' undergraduate careers. One of the assumptions under-girding this idea is that regular peer study group meetings with 2 to 4

peers enable students to better manage their time, improve their study skills, master concepts, practice problem solving, and complete assignments.

Program Values: The MSP demonstrates peer, faculty, university leadership, and program staff support for high academic achievement; illustrates the importance of seeking help from a variety of sources; importance of peer support; high academic goals (with emphasis on PhD attainment and the pursuit of research careers); and the relevance of meaningful community service. The shortage of African American science PhDs is discussed at the recruitment phase and the importance of achieving a PhD is emphasized during selections weekend and throughout students' undergraduate careers in the program. Settling for an MD degree is considered a disappointment in this climate, given the program's focus on producing PhD-level researchers.

These consistently ubiquitous values serve to reinforce the MSP emphasis on academic and personal excellence. According to program staff, community service is an inherent part of this "value-based program." Indeed, Meyerhoff Scholars are consistently reminded that "to whom much is given, much is expected" and that "with great privilege comes great responsibility." With regards to community service, students are grouped into cohorts (each containing approximately 50 students) that commit a certain number of hours and resources to the community. Program staff may make suggestions about where cohorts can contribute their time, but if the group is already committed to an organization, they are encouraged to follow through. For example, in recent years, MSP sophomores adopted an elementary school and decided that they would go in groups of 5 students to tutor students. While Meyerhoff Scholars are expected to provide approximately 10 hours of community service each semester, students' actual time and effort depend on the project or organization with which they are involved.

Sense of Community: Similar to program values, community is operationalized both implicitly and explicitly. The infrastructure supporting this component is the family-like academic and social support system available for students. Students are required to live in the same residence hall during their first year and on campus during subsequent years. Students are also in continual contact with staff members, who are highly accessible and involved in practically all aspects of student life. University leadership, students, and program staff participate in large "family" meetings at the beginning and end of each semester. During these meetings, the president of the university is present and interacts with the students. During the course of a family meeting, for example, the president will ask students getting As in physics or biochemistry to identify themselves. Next, he asks those students who are not doing well to identify themselves. Then he asks those who are doing well, usually upperclassmen, to take responsibility for tutoring their peers. The essence of these meetings is reflected in their dual celebration of student achievements and reciprocal support for talent development.

Personal Advisement and Counseling: The program employs full-time academic advisors and other staff members who monitor and advise students on a regular basis. Advising includes the formal task of helping students get scheduled into the

appropriate complement of courses. One of the most important tasks for advisors of incoming freshmen is to help them avoid the pattern of scheduling five solid courses. This means working with students so that they initially register for fewer courses. This strategy enables students to focus more intensively on the solid mastery of the course content. Passing these foundational courses with a grade of C is considered inadequate. Earning a grade of C results in students' repeating the course to achieve a grade of B or higher, since the experience of program designers suggests that a grade of C does not reflect solid mastery. At the informal level, advising means constantly "checking in" and connecting students to opportunities (summer programs, graduate school, future career opportunities, and access to faculty) that will benefit students' academic careers. Additionally, program academic advisors meet with freshmen and sophomores to discuss how students manage their time, apply their study skills, and function in study group meetings. Students are advised to talk with their professors during office hours and are expected to ask faculty about their professional experiences and their perceptions of the field's or discipline's future. Thus, students are socialized not only on how to access time with faculty, but also on the kinds of conversations that need to occur.

Counselors are not only concerned with the students' academic planning and performance, but also with any personal problems. They focus on getting a sense of what is happening in students' personal lives to minimize the influence of potential psychosocial problems on students' academic work. The MSP academic advisors try to help students balance the pressures from their families and/or their development as young adults. Advisors also seem to be aware of the self-esteem issues students face and advise students that it is not a weakness to be humble.

Tutoring: MSP students are not only responsible for their own academic success, but for each other's as well. They are expected and advised to seek out the resources and opportunities that will support them toward this end. Tutoring and being tutored is required on the UMBC campus for students who excel and for those who aspire to excel. The assumption guiding this program component is that students learn by doing; this includes being exposed to systematic tutoring and coaching. MSP's emphasis on tutoring explicitly holds students to high standards by providing both the resources and support students need to achieve those standards. The effect of this component is evident in the high expectations students, program staff, faculty, and the university leadership set for each other and themselves. Tutors are regularly identified from within and outside the program. Program staff members are aware of those students who do very well in upper level courses and usually ask them to volunteer to tutor those students who need assistance. The academic advisors report that students are usually open to these requests. UMBC has a campus-wide tutorial center that provides chemistry, physics, math, and English tutorials. Meyerhoff students are expected to both access these tutorials and volunteer as tutors in these tutorial centers.

The MSP tutoring component is not only anchored in the research, but also in the national context of reducing the gap between minority and majority students. As suggested in our introduction, many underrepresented minority students are not well-prepared for the academic demands of universities. Even for those high achieving

minority students with high SAT scores and strong high school grade point averages, research suggests that variables other than intellectual ability and experiences in the K-12 continuum explain low minority persistence, retention, and achievement (Bridgman, McCamley-Jenkins & Ervin, 2000; Young, 2001). These variables include low academic expectations for intellectual competence, cultural isolation, perceived vulnerability in the face of negative stereotypes, and inadequate knowledge and skill development.

Summer Research Internships: If students are not graduating, they are required to participate in summer research internships. These internships are especially important for students to experience the practice of science and engineering while creating venues for mentoring relationships. Program staff emphasize these research internships as opportunities that can be translated as strengths on student résumés. Students are advised of the importance of research and publications that can result from summer research internships.

The MSP has an internship coordinator who identifies research internship information for students and helps students to complete relevant applications for these internships. The coordinator is meticulous about seeking out summer mentors, who are not usually the students' Meyerhoff mentors. At this time, she has two binders containing approximately 160 current research opportunities in which students can participate. Most of these internships are renewable, but some end as a result of limited funding. The MSP has networked with companies, researchers, and universities to create internship experiences. For example, at least 8-10 students have completed internships with Dr. Thomas Cech, Nobel Laureate and president of the Howard Hughes Medical Institute. The MSP also has an agreement with Lancaster University in England and sends select students for this internship. The staff have approximately 20 internships that they regard as "high profile" and are proud of the ongoing relationships that they have with these contacts. Some students start research during their summer internships and continue throughout the school year.

Faculty Involvement and Commitment: Freshmen students in the MSP and in the university at large are taught by full-time, tenure-track faculty. This situation, however, has not always been the case. Hrabowski's highly effective approach of genuine faculty involvement and commitment has emerged after systematic and deliberate conversations involving faculty with university leadership, various departments, and other administrators concerning not just minority, but all students' grades, persistence, and retention in their freshman year. These discussions were not held to embarrass those involved, but rather to distill a critical understanding of how students perform by course, section, and faculty member so that the necessary resources and supports could be harnessed for student academic improvement.

The result is that faculty are committed to (a) giving students more constructive feedback in the form of graded homework, quizzes, and tutoring earlier rather than later in the semester; (b) requiring students to study in groups; (c) emphasizing the amount of study time necessary to excel in rigorous science, engineering, and mathematics courses and the integral relationship between students' homework, graded quizzes, exams and

lectures; and (d) encouraging students to actively use the university's tutorial center. Additionally, UMBC's faculty collaborates in improving student performance and retention in freshman courses by using a team-teaching approach and by relating the course content to their research. Now in its 15th year, the MSP's success has influenced UMBC's faculty to think and talk about minority high achievement. The students working in their research laboratories have opportunities to relate theory and practice and engage in research in increasingly sophisticated ways. These successes are clearly the result of visionary leadership and continuous collaboration among faculty, administration, staff, and students.

Administrative Involvement and Public Support: The Meyerhoff Program is supported at all levels of the university, including dedicated support from the president of the University. Over the years, the program has generated a substantial amount of public recognition and support. The program's overarching administrative structure maintains an academic and a socially nurturing environment for students and reflects a widely acknowledged finding in the research literature on student retention: The more complex and the higher the number of relationships that students have in the university environment (the more people they care about and who care about them), the more likely they are to remain and to succeed at the university (Astin, 1993; Tinto, 1993). The MSP program administrators have the primary responsibility for building community and for student advising. By all accounts, they seem to understand their students' needs and appear to be knowledgeable about and connected to the broader campus community. Program administrators have formal responsibility for recruiting, advising, and registering students. They are also charged with monitoring students and making sure that they are not derailed by issues such as financial aid, housing, or personal concerns. Together, the university leadership, program staff members, and faculty serve as a safety net that prevents problems and identifies and provides resources not only to students having academic or personal difficulties, but also to those who excel.

Mentors: Meyerhoff students are paired with mentors who are professional role models (PhD, MD) in the sciences, engineering and mathematics. Mentors are recruited from a variety of settings including universities, private laboratories, government facilities, and corporations within the science disciplines. MSP matches students with mentors in their fields of study. These assignments last throughout students' undergraduate careers. Program staff members advise Meyerhoff mentors to consult with students on educational and career issues, as well as on topics such as class scheduling, internship experiences, graduate school placements, career choices, and personal concerns. Mentor and mentee relationships are expressed formally by lab visits, lectures, business meetings, and a Mentors' Reception held annually by the MSP on the UMBC campus. The program staff, the Meyerhoff Parents Association, and the Meyerhoff students coordinate the Mentors' Reception jointly. During the Mentors' Reception, students present an award to the Mentor of the Year and are addressed by various mentors at the top of their field. The mentor relationship also is expressed informally through social outings, letter writing, and recreational activities. These facets of the Meyerhoff mentoring component facilitate educational and professional growth before and after graduation.

Family Involvement: Parents of students in the Meyerhoff Program are included in social events and are kept advised of their children's progress. For the active classes, MSP students enrolled in program year 11 through 15, approximately 85 to 100% of the parents participate in the MPA. Some alumni parents have remained with the association and assist with different functions. The MPA plans and implements two major events in the academic year: the family reception and the reception for graduating seniors. They are also involved with raising money for a scholarship fund (this is done through dues, donations from other parents, matching funds from employers, etc.). The Parents Association is involved in the selections weekends and assists in starting and closing the Summer Bridge Program. During selections weekend, for instance, there is a meeting Saturday evening between existing parents and potential parents. This meeting is informal and none of the program staff members are present. While the agenda is to exchange information, longer-term members of the MPA can be depended upon to reflect the values of the program and answer the questions of new members.

The Meyerhoff Scholars Program provides a nurturing environment, minority students with high potential are honing their abilities and embarking on scholarly careers in some of the most demanding technical fields.

Conclusion

The developers of the Meyerhoff Scholars Program reviewed extant research and several structural practices to develop a model that includes the following components

- Creating a critical mass of underrepresented, academically motivated students of color;
- Mandating a pre-freshman Summer Bridge Program;
- Making the curriculum components, processes, and standards explicit;
- Assigning the best faculty to teach the foundational courses;
- Providing institutional structural support for developing cumulative knowledge, understanding, and skills;
- Constructing supportive groups at varying levels for students' academic and social lives;
- Providing comprehensive financial support; and
- Comprehensively monitoring, mentoring, and advising students throughout their undergraduate careers.

Each of the 8 components is described below.

1. Creating a critical mass of underrepresented, academically motivated students of color

The research suggests that being one of a few students of color on a campus or in a program can be psychologically, academically, and socially isolating. The absence of academically and socially supportive peers with whom a student can share his or her self-doubts and/or seek academic help without fear of reinforcing stereotypes about ethnic

inferiority can place students at risk of marginalization. Research suggests that these students are much more likely to under-perform academically or leave the university system. Alternatively, systematic and deliberate creation of a critical mass of like-minded, underrepresented students who have access to and substantive contact with faculty outside of the classroom and who have mentoring relationships with faculty (including with minority faculty) increases the likelihood of minority student academic achievement.

2. Mandating a pre-freshman Summer Bridge Program

The requirement that students attend a pre-freshman Summer Bridge Program can serve as a venue for socializing students to the explicit and implicit academic and social expectations of the university and enable them to forge positive connections with their peers, program staff, and faculty. This approach provides students with the requisite motivation and self-efficacy required for high levels of academic performance. One of the practical advantages of the Summer Bridge Program for students includes the establishment of the expectation for high GPAs in freshman year.

3. Making the curriculum components, processes, and standards explicit

The MSP has been and continues to be engaged in systematic study of their science, mathematics, engineering and technology curricula in deliberate attempts to identify (a) its weaknesses; (b) whether and how it should be taught differentially; and (c) what aspects require more time and concentrated study to internalize. Additionally, the curriculum is supplemented with peer study groups and tutoring to ensure that difficult concepts are mastered and applied.

4. Assigning the best faculty to teach freshman courses

Given that the greatest attrition of underrepresented minority students occurs between the freshman and sophomore years, the MSP is aware that underrepresented minority students are more sensitive to teaching quality than majority students from more advantaged backgrounds. Thus, they ensure that Meyerhoff students' freshman year is a successful experience both socially and academically by providing faculty who are effective, who interact substantively with students and can play vitally important roles in (a) engaging and encouraging students, and (b) guiding them in identifying and making use of supportive resources both on the university and departmental level.

5. Providing institutional structural support for developing cumulative knowledge, understanding, and skills

The MSP is structured on academic excellence with an emphasis on students that are intellectually competent (Gordon, 2001), motivated, and self-confident. However, the MSP also recognizes that even among these high performing students, there are often gaps in knowledge or understanding that result from inadequate high school preparation. Thus, the program is systematic in its approach to helping these students to identify where they have gaps and to expect faculty and student peers to reinforce fundamental concepts while simultaneously exposing students to rigorous material.

6. Constructing supportive groups at varying levels for students' academic and social lives

Peer study groups and tutors in the MSP provide academic and social support that is integrated into students' entire undergraduate lives. The institutionalization of rigorous courses, faculty, mentors, upper classmen, and peers as consistent structural supports has enabled the MSP's effectiveness in increasing the pool of high achieving minority students in the sciences, engineering, mathematics, and technology.

7. Providing comprehensive financial support

In a deliberate attempt to reduce the negative impact that inadequate finances play on underrepresented students' academic achievement and to increase student retention, achievement, and graduation, MSP students are provided with full or partial scholarships that are contingent on consistently high GPAs.

8. Comprehensively monitoring, mentoring, and advising students throughout their undergraduate careers

The MSP does not focus exclusively on the freshman year as the critical point in time to ensure that students make a successful transition to college, but rather has continuous monitoring and the provision of services to students throughout their undergraduate careers. The overarching assumption is that given the referenced support and resources, competitively selected underrepresented minority students are capable of succeeding in science, engineering, mathematics, and technology disciplines. Hrabowski combined the referenced approaches to address the over-prediction phenomenon with the following research-based approaches that focus not only on motivating but also expecting excellence in academic achievement among underrepresented students of color (Allen, 1992; Fullilove & Treisman, 1990; Nettles, 1988; Tinto, 1993; Treisman, 1990 & 1992).

Recommendation for a National Agenda

Gordon's (2001) idea of the affirmative development of academic ability posits that academic ability is not inherited but rather can be developed through targeted pedagogical and social interventions. This requires that universities honestly examine how faculty teach, advise, support, and interact with minority students. This strategy should lead to higher academic expectations and creative ways of academically and socially supporting and absorbing minority students in classrooms, tutorials, peer study groups, laboratories, and other significant university settings.

1. The UMBC leadership has long recognized that the integration of the hegemonic culture with students' ethnic culture is vital for fostering minority high academic achievement. This cultural integration tempers stereotypical threat and fears of "acting White," which are documented barriers to academic excellence and achievement for underrepresented students. Thus, it is important to associate students' eagerness for learning with their studies, their experiences on campus, their future in society, and a commitment to high academic achievement and service to others.

2. The nation's K-12, post-secondary and supplementary education institutions need to clearly focus on relevant, education-related capital as a foundation for intellectual and social competencies. The literature is replete with findings that middle and high socioeconomic status European and Asian American students with access to financial, health, educational, personal, human, polity, and cultural capital consistently outdistance ethnic minority students academically.
3. Hrabowski and his colleagues (Hrabowski, Maton, & Grief, 1998; Hrabowski, Maton, Grief, & Greene, 2002) discovered that continuous family involvement is crucial for the academic success of the young men and women in their studies. Continuous family involvement includes (a) parents reading to their sons and daughters at young ages; (b) parents' perception that education is both necessary and extremely valuable; (c) parents' active encouragement toward academic success; (d) close interaction between parents and their children's teachers; (e) strong parental interest in homework; (f) frequent verbal praise; and (g) parents having calm and thoughtful conversations with their sons and daughters to help them understand that even when they face prejudice or racism, they will not succeed if they see themselves as victims.
4. Our analysis of the MSP descriptions and our site visits including interviews with students, faculty, and program staff suggest that several psycho-social processes are embedded in the MSP. These processes include
 - Organized and committed leadership: guidance, inspiration, and supervision from the institutional leadership who understand the purposes and processes of the program, and who protect and support it.
 - Academic, cultural, and social integration: breaking down the tendency for minority students to be excluded from the mainstream of academic engagement and to be culturally and socially isolated (i.e., being in the institution but not a functional part of the institution; getting a university degree but not an university education).
 - Explication of the behaviors students need to cultivate: making explicit the tacit and procedural knowledge, skills and strategies from lived experience, rather than didactic instruction (e.g., engagement with others who are experts or who are reflexively and actively engaged and thinking about Jardine's *Ingenious Pursuits* [1999]).
 - Inspiration: moral support, advocacy, examples and models, preaching, exhortation, expectations, caring, and trust.
 - Internalization of knowledge and understanding of skills and concepts; appreciation of the connection between the academic and

personal views of self. Desensitization to contextual distraction or threat (Steele, 1997).

- Moral support: encouragement and support of all participants (students and staff) and authenticating and sanctioning of activities. Moral support is even more effective when it comes from high status persons in the institution.
- Spirituality: reflexivity, connection, purpose, reverence—all in the context of something bigger and more important than the person.
- Celebration: fun, recognition, fellowship, and acclaim.
- High expectations: exemplary performance is the generally accepted and expected standard that all participants will meet. In high performance communities, the expectations are that all members of the community will meet standards of academic excellence.
- Cooperation: group learning and study. Reciprocal responsibility of individuals for self, each other, and the group, studying and working together. Carrying one's weight and giving back to the community.

5. A commitment to nurturing students' spiritual and moral selves: In addition to mastery at a high level of the knowledge, skills, and understandings of the academy, students are socialized to moral values in the context of respect for the spiritual forces that flow between participants as well as from the objects of their beliefs.

These processes produce students who have an agentic perspective, are highly and purposely motivated, and are intellectually and socially competent. These psycho-social processes are not particular to college campuses and can be cultivated in K-12 school systems to increase the academic skills of young students, ensure the appropriateness of school curricula, and increase the pool of well-prepared college-bound students.

6. At this point in the 21st century, we clearly know a great deal concerning the nurturance of talent as evidenced by the commitment and success of the talent development programs (UMBC, Georgia Tech, Cal Tech, Washington University at St. Louis, and Xavier University). We advocate a consortium among these institutions to share lessons learned, further refine practical knowledge, and codify best practices for others to emulate. The unwavering commitment of UMBC's leadership, faculty, and staff to minority student academic excellence and achievement prompts them to consistently consider how they can enable their students to become "more competitive on traditional academic measures (e.g., grades, standardized test scores, representation in gifted and talented classes, the ability to compete successfully for admission to college and to prepare for productive careers)" (Hrabowski, 2003, p. 5); and "develop and implement strategies to increase the presence of minorities at the highest levels of

achievement in society, e.g., research scientists and university professors" (Hrabowski, 2003, p. 5). This commitment is especially significant and relevant given the moderate success of various programs at increasing minority science, engineering, and mathematics achievement at the undergraduate level and relatively little success at the graduate level. Hrabowski believes that only by creating and supporting a larger pool of high-achieving minority students can they ultimately increase the number of faculty of color in the nation's colleges and universities and the number who become leading professionals.

7. A research agenda that is committed to the bidirectional nature of theory and praxis (i.e., producing knowledge and pursuing understanding [Gordon, 2001]). We have developed sufficient models and practices to begin controlled comparative studies to determine empirically which practices produce specific results. Such studies could help us to identify patterns of intervention as the treatments of choice for specific developmental ends. The range of achievements in these high achieving minority students is quite broad. The study of outliers in this population of highly successful persons could contribute to our understanding of personal, process, and situational correlates of success and failure for minorities in the sciences, engineering, mathematics, and technology. We have reported isolated efforts at bridging curriculum and teaching, social science, and cognitive science to more effectively apply this knowledge to the problems of nurturing talent in underrepresented students. Such work should be encouraged and could form the scientific basis for pedagogy, just as comparable expansions in our knowledge of the biological and social sciences, the physical sciences, and public health were integrated to form the scientific basis for medicine. Conceptual studies that build upon the existing empirical findings from cognitive science might inform the next generation of interventions in the educational development of populations at risk of underdevelopment. Examples to consider include differential approaches to tutoring, application of instrumental intellectual enhancement strategies, peer tutoring and team learning, instruction through computer simulation, and computer managed adaptive and interactive instruction.

Collectively, scholars, educators, and parents can begin to make progress at reducing the loss to our society that is reflected in the under-productivity of certain populations and the schools that serve them. Tests of academic ability certainly can under-predict achievement, but it is with the complicity of educators that these tests over-predict. If students can demonstrate high levels of academic ability on our tests, we have a moral responsibility to enable them to demonstrate that ability in academic excellence and achievement.

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