PRIMING THE PUMP

Strategies for Increasing the Achievement of Underrepresented Minority Undergraduates

The College Board

Priming the Pump: Strategies for Increasing the Achievement of Underrepresented Minority Undergraduates

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Preface

This report was commissioned by the College Board's National Task Force on Minority High achievement, which has been charged by the Board with developing recommendations for how the number of African-American, Latino, and Native American students who are academically very successful can be increased substantially. These groups remain extremely underrepresented among individuals who earn bachelor's, master's, doctoral, and professional degrees in the United States. They also have a limited presence at all levels of the educational system among top students as measured by such traditional indicators as grades and standardized test scores. As a result, these groups continue to have much less access to selective institutions of higher education and, subsequently, to career tracks in professions that offer promising avenues to leadership positions in many sectors.

Thus, until much higher percentages of students from underrepresented minority groups enjoy very high levels of educational success, it will be virtually impossible to integrate our society's institutions completely, especially at leadership levels. Without such progress, the United States also will continue to be unable to draw on the full range of talent in our population in an era in which the value of an educated citizenry has never been greater.

In *Priming the Pump,* Patricia Gándara, professor of education at the University of California, Davis, reports on the results of her efforts to identify higher education programs and strategies that have the capacity to help many more minority students distinguish themselves academically on the undergraduate level than is now the case. Identifying such strategies is important for two reasons. First, the number of top African-American, Latino, and Native American college-bound high school seniors is still relatively small. Second, there is extensive evidence that underrepresented minority stu-

dents—including many academically well-prepared individuals—tend to earn lower grades, on average, at historically White colleges and universities than do majority students with similar academic backgrounds, such as similar college admission test scores.

During the course of her research, Dr. Gándara found that few of the numerous programs established over the years to improve academic outcomes for underrepresented minority students have undergone extensive external evaluation. She also found that few have been explicitly concerned with helping increase the number of high academic achievers. Nevertheless, Dr. Gándara encountered considerable evidence that, when well implemented, some programs help underrepresented minority students reach their potential in college, and many students achieve at high levels. One of higher education's challenges and opportunities is to make much wider use of these strategies.

On behalf of the members of the National Task Force on Minority High Achievement, we would like to extend our deep appreciation and thanks to Dr. Gándara (and to her research assistant, Julie Maxwell-Jolly). She has produced a report that should be enormously valuable to higher education leaders and faculty members as they seek to improve academic outcomes for underrepresented minority students.

Eugene H. Cota-Robles and Edmund W. Gordon
Co-chairs
National Task Force on Minority High Achievement

Chapter 1

Introduction

In 1986, Edmund Gordon submitted a report entitled "Descriptive Analysis of Programs and Trends in Engineering Education for Ethnic Minority Students" to the Exxon Education Foundation. Among the findings of the report was that few programs which sought to have an impact on minority undergraduate achievement in the field of engineering actually conducted or reported any significant evaluation research that would allow for a judgment of their effectiveness. In fact, Gordon concluded that "one of the most pressing needs in this area is for better information systems" (Gordon, 1986, p. 5). The Gordon report also distinguished between the important tasks of (1) increasing the overall pool of minority engineers and (2) developing the leadership pool of individuals who demonstrate outstanding performance in the field. The report suggested that it may be necessary to employ different strategies to achieve these different goals.

Our report was commissioned by the College Board's National Task Force on Minority High Achievement as a follow up to the Gordon report with the somewhat expanded goal of looking at programs geared toward increasing the pool of high-achieving underrepresented minority students eligible for graduate study *in the full range of academic disciplines*. Thus, one of our charges was to identify and examine programs that had the potential to stimulate the leadership pool to which Gordon had referred. Our review has led us to the conclusion that programs address the leadership challenge in one of two ways. They may target students from a wide range of achievement levels in an attempt to increase the number of high-achieving underrepresented minority students who graduate from college (or complete graduate or professional school), having, for example, a GPA of 3.5 or higher on a 4.0 scale, graduating with honors, or graduating in the top 10 percent of their classes. Alternatively, they may focus on a preselected group of high-achieving underrep-

resented minority students in order to ensure that they continue to perform at very high levels academically through the completion of a bachelor's (or graduate or professional) degree.

In looking for programs that were pursuing a leadership-development agenda, we did not expect to find more than a few that focused on this exclusively. We assumed that most would incorporate a concern for the other important purpose identified by Gordon—increasing the number of underrepresented minority students who graduate from college, without necessarily distinguishing themselves academically. What we found was that most programs did not draw clear distinctions between the two functions—producing survivors and producing leaders—though it appeared to us that in the majority of cases the focus was on survival. Some were clearly developmental in nature, targeting students who were high risk upon entry to college due to inadequate precollege preparation; we discarded these from the pool for this study. However, most programs tended to target a broad range of students, with very high performers among the group, and these we studied. We also found that although we were charged with identifying programs that supported students in all disciplines, the great majority focused on the physical and biological sciences, math, engineering, and technology (SMET); for the most part, the kinds of programs that Gordon had reviewed in 1986. We found that very little of a formal nature is being done by colleges and universities to stimulate the pool of high-achieving underrepresented minorities in the humanities and social sciences. This pattern reflects the fact that external funders—foundations, government agencies, and corporations—have been almost exclusively interested in the SMET fields.

Gordon made another observation in his 1986 paper. He found it disconcerting that so little attention had been paid to developing programs that were based on existing research on cognitive and learning theory. There is a substantial and growing knowledge base about how students learn, and Gordon reasoned that it would make sense to incorporate this knowledge into programs that aim to stimulate the pool of high-achieving minority students. Taking this cue, we looked for evidence of incorporation of this knowledge base in the programs we reviewed. We found very little evidence to suggest that this has been an important concern of most program developers, however, we describe in detail those few programs that made this a centerpiece of their efforts. Other programs may have also endeavored to incorporate a cognitive science research base into their interventions, but we could not find evidence of this in the published material.

Although the pace of demographic change has accelerated in the years since 1986, and underrepresented minorities are a substantially larger percentage of the college-age population, not a great deal has changed in the overall approach to educating these students since that time. Moreover, as affirmative action has come under fire and there is continuing debate over the legitimacy of targeting resources to specific groups of students to help ensure their academic success, many institutions are uncertain of the methods they may use to increase the numbers of underrepresented students eligible for admission to their

campuses or to the special programs they offer. The problem of achieving parity in higher education among the major ethnic groups in the United States, and of developing the leadership pool within these ranks, has become more intractable while the necessity of doing so has become increasingly urgent. It is in this context that the current study was undertaken.

Chapter 2

The Challenge

Trends in Minority Achievement

The United States is undergoing a major demographic shift: The White population is shrinking relative to non-White groups and the dramatic increase in ethnic minorities is felt disproportionately among the school-age population. As such, the most pressing issues associated with this demographic change are those involving the education of an increasingly diverse student body. In 1998, only 72 percent of Americans were classified as White, non-Hispanic, and this population is older than all others, with a median age of 37 years. Nationwide, the Latino population is the fastest growing, accounting for 11.4 percent of all Americans in 1998. The youthfulness of the Latino population (a median age of 26 years) and its fertility rate, which is the highest of all major groups, combined with sustained immigration, means that the Latino population will continue to grow at a disproportionately high rate in the coming years (del Pinal and Singer, 1997) and that shortly after the turn of the millennium, Latinos will become the nation's largest minority group. Asian Americans have also registered a significant increase in their numbers over the last four decades, from only .5 percent of the population in 1960 to 3.7 percent in 1998. Most of this growth can be attributed to immigration since the late 1960s, which was made possible by the liberalization of the U.S. immigration laws in 1965. African Americans and Native Americans have maintained a relatively stable proportion of the population, with 12 and .7 percent, respectively.

Nationwide trends are amplified considerably in the states with the highest immigration rates. For example, in California, which receives about 40 percent of the nation's immigrants, White students are a minority among school-age children, representing only

39 percent of public school students. Latinos, at 40 percent, are now the largest single population group in California's public schools, and Asians, with more than 11 percent of the state's K–12 students, are the second largest non-White group. African Americans represent fewer than 9 percent of students (California Department of Education, 1998).

As the numbers of African Americans, Latinos, and Native Americans come to comprise a larger and larger percentage of the population, students from these backgrounds remain seriously underrepresented at the higher academic achievement levels. They form the largest portion of students who drop out of high school and who are, therefore, unprepared to continue their education beyond the secondary level. This phenomenon is often referred to as a "pipeline" problem and is operationalized as "leakage" in the pipeline.

The loss of minority students to the educational system begins in the secondary schools, as disproportionate numbers of African Americans, Latinos, and Native Americans abandon school before graduation. The highest dropout rates, however, are registered among Latino students, and more specifically among Mexican American and mainland Puerto Rican youth. The National Center for Education Statistics (NCES) reports that the high school dropout rate in 1995 was just 8.6 percent for White students, but it was 12.1 percent for African Americans and 30 percent for Latinos in the 16-to-24-year-old age cohort (NCES, 1997b). The Native American dropout rate appears to be about 30 percent as well, although these data are estimates and accurate counts for this population are notoriously difficult to obtain (Swisher and Hoisch, 1992). African Americans, however, appear to close the gap with Whites quite substantially over the ensuing years after high school, since African Americans in the 25-to-29-year-old age group have high school completion rates similar to those of Whites—85.6 percent versus 87.5 for White Americans. Researchers conclude that this results from a large number of African Americans pursuing high school equivalency certificates. For Hispanics, however, the gap remains large, with only 61.1 percent completing high school by age 29 (Wilds and Wilson, 1998). (The discrepancies in the Hispanic dropout rate with high school completion rates are believed to result from immigration and the fact that many young Latinos do not ever enter into the American education system; therefore, they are not counted as dropping out. For example, about 70 percent of the adult Mexican immigrants to the United States in the 1990-94 period had not completed high school. And nearly two-thirds of the Hispanic dropouts in the 16-to-24 age group in 1995 were foreign born [U.S. Department of Education, 1997]. Of the foreign born dropouts, about 70 percent had never attended school in the United States [U. S. Bureau of the Census, 1995]. This means that a major educational challenge for the United States with regard to Latino immigrants is to pull individuals who had already dropped out of school in their countries of origin back into the educational system.)

Secondary school attrition reduces the pool of students who might go on to higher education, especially among Latino and Native American youth, but poor performance in high school is another significant factor in the restricted pool of underrepresented minorities in the college-going category. For example, underrepresented minority students take fewer rig-

orous college preparatory courses in high school (NCES, 1997a), and their grade-point averages in the courses that they do take are uniformly lower than for White or Asian students. Table 1 reports grade-point averages for students from six major ethnic groups who took the SAT® exams in 1998 and for all California high school graduates in 1990.

Table 1. Grade-point Averages by Ethnic Group, 1998 National SAT-takers and 1990 California (All Graduates)

Race/Ethnicity	National SAT-takers, 1998	California All Graduates 1990
White	3.29	2.74
Asian	3.36	3.11
Latino[1]	3.18	2.44
Native American	3.09	—
African American	2.90	2.33

Source: College Board 1998 SAT examination data; Ludwig, J., and J. Kowarsky, "Eligibility of California's 1990 high school graduates for the state's public universities" (Santa Cruz: Regents of the University of California, 1994).

Clearly, Latino, African-American, and Native American high school students, including those who intend to go on to college, perform at lower levels in the classroom than their Asian and White counterparts. In fact, the evidence suggests that their performance may be even lower than these GPA data indicate because grade-point averages in low-performing schools, such as those attended by many low-income minority students, do not reflect the same level of accomplishment as in high-performing suburban schools, more often attended by upper-income White students (Haycock, 1997; Carnevale, Haghighat, and Kimmel, 1998). Several explanations have been suggested for this discrepancy in performance, including racism, stereotype vulnerability, segregation, poor quality of schooling, inadequate resources in minority communities and schools, lack of motivation on the part of students, and home environments that are unable to fully support the goals of schooling due to low education and income. There is evidence to suggest that all of these explanations contribute to some portion of the variance in minority achievement patterns.

In a study on minority achievement, Miller (1995) cites data suggesting that racism, or prejudice, is indeed a factor in the lower performance of some students of color. James Kleugel (cited in Miller, 1995) analyzed General Social Survey data to determine the trends in White attitudes toward Black disadvantage (1995: 83). Kleugel concluded that in spite of a drop from 27 percent in 1977 to 21 percent in 1989 in the belief by Whites that Blacks are intellectually inferior, a significant portion of the White population still subscribed to such a belief and this surely had consequences for the American opportunity structure (Miller, 1995: 183). More recent data from NORC surveys on racial attitudes suggest that White attitudes about Black inferiority have continued to drop. In 1996, only 10 percent of respondents would agree that this was a factor in Black disadvantage. However, what appears to be a positive trend is nonetheless problematic because the

[1]*The national Latino category includes only data for Mexican Americans in order to provide a more accurate comparison, since upwards of 80 percent of California Latinos are of Mexican origin.*

belief that Black disadvantage stems from discrimination has also fallen sharply. Now, the single most common response to the disadvantage question is that Blacks lack motivation to succeed (Schuman, et al., 1997). Thus, while Whites appear to be more reluctant to name the problem of disadvantage as one of biological inferiority, they nonetheless attribute it to characteristics in African Americans rather than in the society, and this has implications for the ways in which Whites are willing to address the problem. Schuman, et al. (1997) also cite survey data showing that while Whites overwhelmingly support the *principle* of equality, they are decreasingly inclined to support the *implementation* of measures that would ameliorate it. Thus, they find declining support for the means to desegregate schools and for policies such as affirmative action. Miller (1995: 241-42) concludes that "[T]hese views—which include notions of the innate intellectual inferiority of Blacks and the cultural inferiority of African Americans and Latinos—seem to be associated with a lack of interest in or opposition to the addressing of critical economic, health, and educational needs of urban minorities."

Societal beliefs about the intellectual or cultural inferiority of certain groups can result in constrained choices as well as constrained opportunities. Claude Steele (1997) has advanced the theory of stereotype vulnerability to explain why many Blacks, as well as other minorities, may perform poorly or choose not to participate at all in academic endeavors in which they run the risk of confirming the stereotype that they are intellectually inferior. Steele contends that the pervasive societal belief in the inferiority of some groups weighs heavily on these individuals when they are confronted with tasks that could support this stereotype. Through a series of novel experiments in which he manipulated subjects' perceptions of testing conditions and consequences, Steele demonstrated that Black students (and sometimes women) may *disidentify* (that is, plead lack of interest) with academic goals because of the performance anxiety that is produced by having to compete academically in settings where any mistake can be seen as an affirmation of the widely held stereotype that they are intellectually inferior. Steele argues that such disidentification can lead to disengagement from academic endeavors as well as depressed performance on tests. Support for Steele's theory is also found in the ethnographic studies of Willis (1977) and McLeod (1987) in which both Black and White disaffected, low-income youth rejected the social norms of the society that they perceived as having rejected them, and thereby *bought into* the very stereotypes that the society imposed upon them, thus cooperating in reducing their own limited opportunities.

As a group, children from African-American, Latino, and Native American households are also many times more likely to live in poverty than either Whites or Asians (del Pinal and Singer, 1997), and Black and Latino children are growing up in increasingly segregated environments, both with respect to race/ethnicity (Orfield and Eaton, 1996) and poverty (Wilson, 1987; Phillips, 1990). Because poor children are likely to go to school with other poor children, the schools they attend lack much of the social and cultural capital provided by more affluent parents in suburban schools that operate to support stu-

dents' achievements and aspirations. Research has shown that the learning environments and resources differ markedly between high-poverty and low-poverty schools. For example, teachers in high-poverty schools are more likely to report problems of student misbehavior, absenteeism, and lack of parent involvement than teachers in low-poverty schools; and teachers' salaries and advanced training are lower in high-poverty schools than in low-poverty schools (U.S. Department of Education, 1997). Unfortunately, the relatively low classroom performance of underrepresented minority students is mirrored in their test scores, as shown in Table 2.

Table 2. SAT I Scores for Six Ethnic Groups, National Sample, 1998

Race/Ethnicity	Verbal All Students	Math All Students	% Scoring 500+ Verbal	% Scoring 500+ Math
African American (114,912)	434	426	26	21
Mexican American (41,028)	453	457	32	35
Puerto Rican (13,635)	452	447	33	31
Native American (10,159)	480	483	42	44
Asian (94,066)	498	562	50	70
White (704,462)	526	528	61	62

Source: The College Board, 1998 SAT administration data.

Most notable in these scores is the huge gap (generally one standard deviation or more) between the scores of African Americans and Latinos (both Mexican American and Puerto Rican) and Whites and Asians, and perhaps even more important, the differences in percentages of students in these groups who score 500—the theoretical mean—or above, on either the verbal or math sections of the exam. Three times as many White and Asian students score at or above 500 on the math section, as do African Americans; and Latino students are only half as likely to score in this range as Whites and Asians. Moreover, because the gap between the performance of Asian and White students and all others is greatest among the highest performing students, the underrepresentation of African Americans, Latinos, and Native Americans is greatest at the upper tail of the achievement distribution. To the extent that the SAT is a measure of high school preparation, then there are clearly significant differences among the ethnic groups in the education they are receiving.

However, we add one cautionary note. We have broken out the data for Puerto Rican and Mexican American students rather than reporting for Latinos generally because there are known differences in performance among the various Latino groups. Mexican Americans and Puerto Ricans are among the most disadvantaged and thus the lowest academic performers. Data are not disaggregated by the College Board for Asian groups, indeed the College Board lumps all Asians with Pacific Islanders, and this obscures wide differences within the group. The typical standard deviation for SAT scores of Asian students is almost one-fourth of a standard deviation larger than for Whites and about one-fifth of a standard deviation greater than for other minority groups, suggesting that some Asian students are performing much higher than others. Data on citizenship give us some clues as to who these

students are. Asian students who maintain foreign citizenship perform highest on the math section and relatively high on the verbal section, compared to permanent residents and refugees; and refugees perform much lower than either native-born Asians or those who are foreign nationals. Given the history of Asian immigration to the United States, we can surmise that foreign-born students from Korea, China, Taiwan, and Japan are outperforming many Southeast Asian refugees and Pacific Islanders, in addition to outperforming native-born students of Chinese, Japanese, and Vietnamese ancestry.

Of course, we have known for a long time that schools are not the sole variable influencing students' academic achievement. In fact, many variables, including neighborhoods, peers, and other less tangible factors, contribute to student achievement. However, the largest portion of the variance in academic attainment can be accounted for by family income and education (Coleman, et al., 1966; Jencks, et al., 1972) Hence, looking at the educational and income backgrounds of parents can shed important light on the academic outcomes for students. Table 3 shows the variations in parental education for the college-bound students who took the SAT exams in 1998.

Table 3. Parent Education and Income by Ethnicity for College-bound Students, 1998

Race/Ethnicity	% Parents w/Less than H.S. Diploma	% Parents w/Some College +	% Income <20K	% Income >100K
African American (114,912)	5	46	32	3
Mexican American (41,028)	27	32	31	4
Puerto Rican (13,635)	10	48	31	5
Native American (10,159)	4	55	16	10
Asian (94,066)	11	63	23	12
White (704,462)	1	67	7	16

Source: The College Board, 1998 SAT administration data.

Nearly all of the African-American, Native American, and White students' parents have a high school diploma among this college-going group. Likewise, a relatively high percentage of these parents have at least some college education, with 46 percent for African Americans being the lowest for the three groups. Moreover, there appears to be a troubling discrepancy for African Americans between parental education and SAT scores; based on parent education, one would expect that these test scores would be higher. Almost equally disconcerting are the very low levels of parent education among the Mexican American sample—a stunning 27 percent of parents do not have a high school diploma, and only 32 percent have some college, about half the percentage for either Asians or Whites. On the other hand, Asians, consistent with their test scores, show an almost bimodal distribution of parental background characteristics—they have the second highest percentage of parents with at least some college education and also have the second highest percentage of parents without a high school diploma. Likewise, while they have the second highest percentage of parents in the high-income category, almost one-fourth of these students come from very low-income homes.

Perhaps even more troubling than the data on parent education is the finding that mean SAT I scores for African Americans from *high*-income families (810 for >$60,000) are lower than the mean SAT I scores for Whites and Asians from the *low*-income category (899 and 818 for <$20,000); and high-income Latinos score only slightly higher than low-income White students (904 versus 899) (Miller, 1995; Outreach Task Force, 1997). Miller (1995) hypothesizes that the substantial variation in test scores and achievement for different ethnic groups within the same income and education categories is due to a type of cumulative educational disadvantage experienced by underrepresented minorities. According to this hypothesis, African Americans and Latinos (especially Mexican Americans and Puerto Ricans) are failing to adhere to the American prototype of intergenerational advancement because the *quality* of education that they receive, in both formal and informal settings, is consistently lower than that of more advantaged groups. Hence, parents with lower quality formal education, albeit with similar educational *attainment*, are less able to confer the educational advantages that other parents with the same level, but higher quality, education do on their children. Thus many Black and Latino children do not receive the enriched educational experiences that should be commensurate with their parents' educational background, either in their homes or in their schools. These students, therefore, find themselves at a serious disadvantage in competing with students from other better educated ethnic groups.

Given the disparities in educational preparation and background differences, it is not surprising that the pool of underrepresented students for higher education is so restricted. Table 4 shows the high school completion rates for four ethnic groups (oddly, the data are not reported for Asians). Table 5 shows the four-year college enrollment rates for five ethnic groups, including Asians.

Table 4. Percentage of High School Completion by Ethnic Group, 1996

Race/Ethnicity	Percentage
African American	75.3
Latino	57.5
White	82.3
Native American	70.0*

Source: U.S. Department of Commerce, Bureau of the Census. Current Population Reports. P-20 Series, 1997.
*Estimate based on data collected by Swisher and Hoisch, 1992.

Table 5. Percentage of Four-Year College Enrollment by Ethnic Group, 1996*

Race/Ethnicity	Percentage
African American	9.9
Latino	5.8
Native American	.8
Asian American	6.0
White	73.6

Source: U.S. Department of Education, National Center for Education Statistics, 1998.
*Total does not add up to 100 percent because approximately 4 percent of college attendees are listed as nonresident aliens.

Despite intergroup differences in academic achievement, there are not large discrepancies in high school students' intended majors. Across all ethnic groups, college-bound high school students' interests are very similar. In 1987, business and commerce was the single highest ranked intended major across all ethnic groups and, in 1997, health and allied services was the top ranked intended major for all college-going students, independent of ethnic background. Students are evidently affected similarly across ethnic groups by the same messages about job opportunities, and they appear to be very vulnerable to these messages. Likewise, the percentage of high school students interested in math, science, and engineering did not differ markedly by ethnicity in 1997, although there has been an interesting drop in matriculation in this area over the last decade for Asian students, due largely to a shift out of engineering and into health sciences (see Table 6).

Table 6. Percentage of College-bound Students Intending to Major in Math, Science, and Engineering, by Ethnicity, 1987 and 1997

Race/Ethnicity	1987	1997
African American	14	15
Mexican American	18	14
Puerto Rican	18	14
Asian	29	21
Native American	14	13
White	16	17

Source: The College Board, 1987 and 1997 SAT administration data.

Students are also consistent across all ethnic groups in the rankings they give to the disciplines within the math, science, and engineering categories. For all students, engineering is the preferred major, followed by biological sciences, then physical sciences and mathematics. In neither year (1987 or 1997) did math garner more than 1 percent of any population group, nor were the physical sciences selected by more than 2 percent of any ethnic group. Interesting, however, are the differences by gender and ethnicity.

The racial gap in science, math, and engineering majors occurs only among males. In an analysis of NELS:88 data gathered in 1994, researchers found that while 14.4 percent of White and Asian males were enrolled in these majors, only 9.6 percent of non-Asian minority males were similarly enrolled. However, a slightly higher percentage of non-Asian minority females (7.5 percent) were found in SMET majors than were White and Asian females (7.2 percent) (Peng, Huang, and Hill, 1998). In many of the programs reviewed for this study, which were targeted to underrepresented minority students in the SMET disciplines, we found large discrepancies between male and female participants, with females outnumbering males in some cases by as much as four to one.

Approximately two-thirds of all students enroll in college immediately after high school, however a somewhat smaller percentage (60) of African Americans do. But while a little more than one-third (38.7 percent) of all students go to two-year colleges, the majority of Hispanic (56 percent) and Native American (51 percent) students attend

these institutions (*Chronicle of Higher Education, 1998*). Unfortunately, a very small percentage of the minority students who attend junior colleges actually go on to complete an undergraduate degree (Rendón and Nora, 1994). Underrepresented minority students, particularly those from low-income backgrounds, too often fail to receive the advice and counseling that facilitates transfer to a four-year college or university. However, even those who successfully enroll in a four-year university often leak from the academic pipeline. African-American and Latino students take longer to graduate from college and leave college without completing the bachelor's degree more often than either Whites or Asians (NCES, 1997).

Table 7. Percentage of All B.A. and Ph.D.[2] Degrees Conferred, by Ethnicity and U.S. Citizenship, 1996

Race/Ethnicity	% U.S. Population	% All B.A.'s	% All Ph.D.'s
African American	12.0	7.5	4.7
Latino	10.0	4.7	3.4
Asian	3.5	5.2	3.9
Native American	.7	.6	.6
White	73.0	78.8	85.9

Source: Wilds and Wilson, *Minorities in Higher Education* (Washington, DC: American Council on Education, 1998).

Notable in the figures of Table 7 is that, while underrepresented minorities are beginning to make inroads at the level of B.A. degrees, Ph.D. degrees are still the province of White students. Even Asians receive only slightly more Ph.D. degrees than would be predicted by their representation in the population, and considerably fewer than would be predicted by their overall academic achievement. Of course, Latinos and African Americans are seriously underrepresented at both the B.A. and Ph.D. levels, with only half as many B.A.'s awarded as would be predicted by their representation in the population, and a third as many Ph.D.'s. No doubt at least three factors are responsible for the relatively low production of Ph.D.'s among all non-White ethnic groups. First, of course, is the already noted problem of underpreparation of some minority groups. Second, the problem of inadequate financial aid looms large for students from low-income families. The decreasing real dollar benefits for low-income students through Pell Grants, and the increasing shift from grants to loans, has served to make the financing of many years of higher education more and more difficult for low-income minority families (Postsecondary Education Opportunity, 1999). Additionally, for groups that are characterized by lower than average incomes, such as immigrants and underrepresented minorities, first professional degrees are much more popular than Ph.D.'s. Many of these students tend to see professional degrees as a more direct route to social and economic mobility (Gándara, 1995).

[2]*Because such a large percentage of Ph.D.'s are granted to noncitizens (33 percent), thereby distorting the figures for certain domestic minorities, we cite figures for U.S. citizens only.*

College and University Faculty Diversity

Faculty diversity is a chicken-and-egg problem: Minority faculty can be instrumental in recruiting and retaining minority students in college, however, there are relatively few professors of color in the nation's historically White colleges and universities, due in part to the relatively small pool of minority Ph.D.'s. Nonetheless, there is evidence that minority and female faculty add important dimensions to the educational experiences of both minority and majority students. Martínez (in progress) has found that minority undergraduates in a university mentorship program were more likely to form strong relationships with faculty of color that influenced them to pursue graduate study than with nonminority faculty. Faculty of color may also serve as role models for minority students who find few models of high academic achievement in their own communities. Milem (1999) also found that minority and female faculty were more likely than nonminority faculty to use interactive pedagogical strategies that foster greater learning and relationship building for all students than do more traditional teaching practices. Moreover, colleges and universities with few minority faculty are often perceived as having a "chilly climate" for minorities and may, therefore, have more difficulty recruiting and retaining minority students (Hurtado, 1990). A study conducted in the mid-1980s of the campus climate at one prestigious technical institute provides powerful evidence of the effects of having few minority faculty on a campus (McBay, 1986). In a survey of African-American graduates' experiences at the campus, 40 percent of the respondents who reported having had any memorably good relationships with faculty stated that this only occurred with Black faculty, and the reports by some of the respondents about interactions with White faculty were extremely disturbing, including overtly racist remarks and biased behaviors in the classroom. The report concluded that for minority students, "[This] is a nice place to be *from* but not but not a nice place to be *at*" (McBay, 1986: page 15).

Given the important roles that minority faculty play in the academic life of underrepresented students, the figures in Table 8 are especially disturbing. It is notable that while there is a severe underrepresentation of both male and female minority faculty nationwide, there are also large discrepancies by gender for most groups, far greater than the discrepancies in the numbers of doctoral degrees conferred. For example, in 1986, 61 percent of Ph.D. degrees awarded to African Americans went to women, yet in 1996 only 48 percent of the Black faculty positions were held by women; 47 percent of Latino Ph.D.'s were women in 1986, yet only 39 percent of Latino faculty were women in 1996. A review of data by academic rank shows that African-American women are just now beginning to catch up to, and, even surpass, men. At the lowest level of professorship, however, Latinas still lag far behind their male counterparts in academe, even at the lowest levels.

Table 8. Full-time Faculty in Higher Education, All Ranks, by Gender and Ethnicity, 1995

Race/Ethnicity	% of Population	% of All Professions	% Male	% Female
African American	12.0	5.0	52	48
Latino	10.0	2.4	61	39
Native American	.7	.4	59	41
Asian	3.5	5.1	74	26
White	73.0	87.1	66	34

Source: Wilds and Wilson, *Minorities in Higher Education* (Washington, DC: American Council on Education, 1998).

Table 9 shows the representation of minority faculty between 1985 and 1995 at the University of California, the premiere institution of higher education in the nation's most populous and diverse state. Perhaps the most notable aspect of these data is the very minimal growth in minority faculty in spite of an increasing pool of minority Ph.D.'s.

Table 9. University of California, Full-time Ladder Faculty, by Ethnicity, 1985 and 1995

Race/Ethnicity	% CA Population 1985	% All Faculty 1985	% CA Population 1995	% All Faculty 1995
African American	8	1.8	7	2.5
Latino	21	2.9	28	4.5
Asian	8	6.0	11	10.1
White	63	89.2	53	83.0

Source: University of California, Office of the President, 1998.

A recent study for the American Association of Colleges and Universities (Smith, 1996) calls into question the extent to which the low rates of hiring of minority faculty are, in fact, due primarily to the small pool of applicants. In this study of 298 Ford, Mellon, and Spencer fellowship recipients, Smith found that many minority Ph.D.'s from highly rated institutions, although perceived to be "sought after," in fact had few if any offers for tenure track appointments. This was especially true for the scientists in the sample, all of whom were persons of color. Of these 59 individuals, 54 percent were not pursued by academic institutions for professorships and continued with postdoctoral positions in the absence of any academic offers. This is unsettling news in the face of concerted efforts to stimulate the pool of doctoral level scientists of color and begs the question as to whether it makes good policy sense to pour disproportionate funding into preparing more minority academic scientists if the ones that are now completing degrees are having difficulty finding positions in academia. There is a clear need for more policy-oriented research to determine the obstacles that new Ph.D.'s of color face in securing academic positions and to reconcile this with the perceived dearth of available scholars.

Chapter 3

Academic Interventions for Minority Students in an Era of Waning Affirmative Action

We have noted that this discussion of raising minority achievement takes place in the context of a highly polarized national debate about the legitimacy of using race, ethnicity, or gender as factors for consideration in higher education admissions, special programs, or financial aid. In 1994, the U.S. Fourth Circuit Court of Appeals decided in *Podberesky v. Kirwan* that the University of Maryland's Banneker Scholarship for African Americans was unconstitutional because race was the sole determinant of eligibility. In the same year, the regents of the University of California passed SP-1 and SP-2, two provisions that prohibited the use of race, ethnicity, or gender in hiring, contracting, or college admission decisions within the university. In 1996, California voters followed suit with Proposition 209, led by one of the UC regents, and outlawed the consideration of race, ethnicity, or gender for admission, contracting, or hiring decisions throughout the state. In 1997, the Fifth Circuit Court of Appeals ruled in favor of Cheryl Hopwood, who had been denied admission to the University of Texas law school. She argued that she was discriminated against because minority applicants who were less qualified than she had been accepted for admission to the law school. The Court's decision was interpreted by the attorney general of Texas as outlawing the use of race or ethnicity as a factor in admission, financial aid, *and retention and recruitment programs* in all institutions of higher education within the Fifth Circuit. Maryland's Banneker Scholars Program, California's Proposition 209, and Texas' *Hopwood* decision have resonated across the country, and university administrators everywhere have reflected openly about the potential consequences of these events. The ways in which the states—and the educational leaders—deal with these challenges have enormous implications for the strategies that might be used to increase minority achievement and, just as importantly, for the way in which the "problem" of minority underachievement is conceived—indeed whether it is seen to be a

problem at all and, if so, for whom? Shall we define the underrepresentation (indeed the virtual absence) of minority students among the highest achievers in our schools as primarily an issue pertaining to individuals, to institutions, or to the society at large?

In the aftermath of Proposition 209 and the *Hopwood* decision, we conducted a review of press accounts of statements by college presidents during 1997. Our review yielded well in excess of 300 articles appearing in newspapers, magazines, and other journals in which university CEOs addressed the issues raised by these legal decisions. We found a surprisingly strong consensus in favor of affirmative action among the CEOs of the nation's colleges and universities. The leaders of both public and private institutions of higher education were virtually unanimous in their support of this policy as a tool to achieve some measure of diversity in the nation's colleges. The chancellors of all nine University of California campuses, who were compelled to abandon affirmative action in the face of the passage of Proposition 209 and the 1994 University of California regents' decision known as SP-1 that had a similar intent, were also quite vocal in their support of affirmative action. The outspoken opposition to the regents' decision was notable because the chancellors had been warned by the regents not to interfere with the decision, which was widely viewed as having been orchestrated by the state's governor.

The university presidents' positions on affirmative action were based on two major principles—the first focused on *individual benefit* and the second on *institutional benefit*. These were (1) that colleges and universities that more accurately reflect the composition of the population which they serve are more socially just institutions, and (2) that diversity is intellectually healthy because it brings students and faculty into contact with a broad mix of perspectives. Most of the rhetoric in the press considers the latter principle: the intellectual benefits of diversity, perhaps because this tack is viewed to be the least politically charged, and the most defensible on purely academic grounds. Moreover, the beneficiaries of this position would appear to be the majority population whose intellectual perspectives are presumably enhanced by diversity among faculty and students. Perhaps one of the best examples of this perspective was articulated by Neil Rudenstine, president of Harvard University, in which he asserted that students are challenged

> *by a diverse educational environment…to see issues from various sides, to rethink their own premises, to achieve the kind of understanding that comes only from testing their own hypotheses against those of people with other views. Such an environment also creates opportunities for people from different backgrounds, with different life experiences, to come to know one another as more than passing acquaintances, and to develop forms of tolerance and mutual respect on which the health of our civic life depends* (*Chronicle of Higher Education,* April, 1996).

The other principle, that of social justice, was candidly described by Charles Young, the departing chancellor of UCLA, who was not shy in disagreeing with his own regents' decision to abandon affirmative action in the university.

> *What we're really trying to do is provide an opportunity for groups that have not been able to participate equitably in our society to make the kind of contribution they should, to reap the benefits they should, and to receive the education which will enable them to do so. We are trying to make enrollment in the university look more like the breakdowns in the population—not because that in itself is some ideal, but because those great disparities indicate serious problems* (Gable, 1995).

More subtly coded in both President Rudenstine's and Chancellor Young's comments is another issue as well. Rudenstine refers to "the health of our civic life" and Young alludes to "serious problems." These concerns are no doubt on the minds of many CEOs across the nation: How does a nation, or a state, reconcile the enormous disparities in education and opportunity that result from university admission criteria that effectively, and systematically, shut out large sectors of the population? What are the consequences for race relations? How is the social contract renegotiated? Over the long run, how does it affect the social and economic health of the states and the nation?

William Bowen, former president of Princeton University, and Derek Bok, former president of Harvard University, entered the fray in 1998 with the publication of their book, *The Shape of the River,* which advanced a *third* major argument in favor of affirmative action. Bowen and Bok contend that "race-sensitive admissions" produce an important *social good,* and certainly their arguments reframed the debate. In a study that documented outcomes for more than 45,000 students from 28 selective colleges and universities spanning two decades, they found that African Americans who had been the beneficiaries of such race sensitive policies went on to make greater contributions to their communities in the form of public service and volunteerism than White graduates of the same institutions. Moreover, both Black males and females were more likely to be involved in leadership roles in civic organizations than were their White peers, thus adding substantially to the social capital of their communities. Contrary to the argument that it stigmatizes its recipients, made by such critics of affirmative action as the Thernstroms (1997), Bowen and Bok found that Black graduates contended that the benefits of race sensitive admission far outweighed any stigma that might have been attached to them. Black graduates of these institutions earned far more than Black college graduates nationwide and were far more likely to attend graduate and professional schools. In another important myth-countering finding, Bowen and Bok concluded *that the more selective* the institution, the greater was the likelihood that African Americans would complete their degrees. This, of course, flies in the face of the oft-repeated criticism that admitting minorities who are "less qualified" (according to GPA and test scores) than their White peers only results in disillusionment and self-disdain when they find they are unable to compete. Of course, Bowen and Bok are quick to point out the students were highly qualified for the universities they attended; they simply did not have *as high* test scores and grades on average as their White peers. Moreover, in these selective institutions, a greater concern was shown

for the students' academic welfare than in less selective, often overcrowded institutions that rely on a certain attrition level to maintain a balance in student population. The fact that very selective institutions have far higher retention and graduation rates has long been known, and many programs aimed at increasing the achievement of underrepresented students have attempted to emulate policies of these schools in order to increase their own retention and graduation rates. It must be noted that while the Bowen and Bok study has made a major contribution to the discourse on diversity in higher education, their choice not to include an analysis of Latino data is somewhat unfortunate as the opportunity was lost to broaden the discussion beyond a Black-White paradigm.

As the battleground has been shifting away from affirmative action and toward other means of ensuring diversity in our colleges and universities, institutions have also been exploring ways to address the "fairness" and intellectual diversity issues through college admission criteria. Socioeconomic status appears to have been the winner in this tug of war, as the University of California and the University of Texas went on record endorsing the incorporation of low socioeconomic status as a "diversity" criterion that could cut across all races. Many participants in this debate, however, warned that this strategy would likely result in lower numbers of African-American, Latino, and Native American admitees because many of these students with aspirations to attend four-year colleges are, in fact, middle class. Students from the low-income sectors of these communities often attend high schools that do not specifically encourage these students to attend four-year colleges or prepare them to meet the requirements for university admission or to do well academically once they are admitted. Middle-class students of color may well be the best prepared minority students, both academically and psychologically, to persist in competitive college environments. As Freeman Hrabowski, president of the University of Maryland, Baltimore County, noted, "…students whose parents did attend college and expect them to enroll as well, are better prepared than their lower-income peers for college and more likely to complete their degrees" (Folkenflik, 1996). Unfortunately, however, the debate has now shifted to how to achieve *some* level of diversity in the face of daunting obstacles—an approach that aims to satisfy the principle of intellectual enrichment for all students, but does little to address the racial justice or societal benefit issues, and fails completely to take into account who might be best suited to compete and persist in an environment ruled by middle-class norms.

As was predicted, minority admission and enrollment have begun to drop sharply in both Texas and California as a result of the decisions on affirmative action. In 1997, following the passage of Proposition 209 and SP-1, UC Berkeley's Boalt Hall Law School experienced an 80 percent drop in African-American admittees and, in the end, only one Black student enrolled. The entering freshmen class at the University of California in 1998 registered 66 percent fewer African Americans and 53 percent fewer Latinos than in 1997 at the flagship Berkeley campus. UCLA had a drop of 43 percent for African Americans, and 33 percent for Latinos (University of California, Office of the President,

1998 admission figures). For the two major campuses of the University of California, this translates into a freshman class composed of 2 percent African Americans and 8.6 percent Latinos in a state in which African Americans and Latinos combined represent almost 50 percent of the public school population.

The initial response to the drop in minority student enrollment at the University of Texas campuses following the ruling in the *Hopwood* case was to make the top 10 percent of each high school graduating class eligible for admission to one of the campuses in the UT system. Under the circumstances, this may prove to be a valuable step, although early returns are already demonstrating that in the absence of targeted financial aid, this will not appreciably increase the numbers of students of color who enroll (Chapa, 1997). Moreover, it does not help academically well-prepared, middle-class African-American or Latino students who have finished outside the top 10 percent in highly competitive suburban or private high schools, and who would probably be most likely to attend and succeed, to gain university eligibility. More recently, the University of California followed suit with a 4 percent plan modeled on the Texas effort that is scheduled to take effect in 2001. However, it is anticipated that this will have a relatively minor impact on minority admission, since all told, only about 1,800 new students (of all ethnicities) are expected to be added to the 46,000 freshmen who decide to accept UC offers of admission each year (Weiss, 1999). Moreover, since there is no financial aid tied to these offers of admission, there is reason to believe that the plan will make few inroads with low-income, underrepresented minority students.

The dilemma facing colleges and universities in an era of waning affirmative action is not only that of reconciling divided feelings about the fairness of policies that take race into account in granting admission, but in selecting a pool of students from diverse backgrounds who can survive and prosper in the university setting. Minority undergraduate admission must ultimately produce increased numbers of graduate students of color, and these in turn should produce diverse new faculty for the nation's colleges and universities if the pipeline problem is to be solved, or even ameliorated. Thus, increasing the rate of admission is only a partial solution. The campuses must also find ways to retain these students, help them to excel, and go on to advanced study.

Since the passage of Title VII in 1968, programs designed to recruit and retain minority students at colleges and universities have proliferated. Virtually every college campus in the country has at least one such program; more commonly one can find many such programs on the nation's campuses. However, because of the recent challenges to affirmative action, many programs have been quietly modifying their names and selection criteria to be more inclusive of students who are not underrepresented minorities. The impact of these changes is not yet known. However, the programs that we review in this document were virtually all designed with the specific purpose of bringing more underrepresented minority students through the academic pipeline to the completion of graduate degrees. As such, most incorporate specific features geared toward strengthening the cultural assets that

African-American, Latino, and Native American students bring to the campus. To the extent that the focus of these programs is changed by external pressures, we would expect to see differences in how programs operate as well as differences in the nature of their outcomes. These changes have been too recent, however, to gauge their effects.

Some programs, on the other hand, have taken a different tack. These programs have begun assembling their arguments for why they should not be redirected from their original mission, and they tend to incorporate the arguments we have cited above (cf. Allen, Hunt, and Gilbert, 1997). In any case, greater focus has been shifted to programs that seek to increase the representation of non-Asian minority students at the endpoint of the academic pipeline.

Chapter 4

Programs that Strive to Increase Minority Achievement in Higher Education

Whereas retention programs are critically important to maintaining a strong presence of minority students on university campuses, and many very talented students almost certainly would not complete their degrees without the efforts of these programs, this study is not focused on the broad range of retention programs. One of the principal objectives was to describe the efforts that are underway in colleges and universities *to promote the high achievement* of underrepresented minority students and to assess the extent to which these programs were achieving their goals. To the extent that some retention programs also provide a focus on the latter objective, we have included them in our review. An additional objective was to describe the best practices, or the things that appear to "work" in these programs, that attempt to stimulate high academic achievement.

Methods

The first, and most time-consuming, aspect of this project was to survey the field and determine which campuses had such programs and, if so, what kinds of programs they were. We began by conducting literature searches, using several databases, to identify programs about which something had been written and published. This yielded some programs, but not many. As we later learned, our literature search produced disappointing results because few programs have formal evaluations or other written documentation that one might find in a database. Instead, the written documentation for many programs included flyers, brochures, and program applications for prospective participants. We next

contacted directors of large, well-known programs such as the Minority Engineering Program (MEP)[3] as well as individuals in government and philanthropic organizations that either funded such programs or knew of people who did. This yielded a longer list. We continued to contact program directors and asked them what other programs or contacts they could recommend. This word of mouth, or "snowball," technique, led us to many of the programs we have included in our final inventory. Through our discussions with representatives of programs around the country, we came to the realization that virtually *every* campus had at least one program; and most campuses had more than one, so the list of programs quickly became impossibly long. In fact, one program director asked how we could possibly accomplish such a task because every college in the country had a least "one person like her," who was patching together university and other resources to create a support system for minority students to help ensure that they are successful at the institution. As our list grew we began to group programs according to types and found that many programs that had been recommended actually were modeled after a particular prototype and/or were funded by the same agency with the expectation that they would deliver a similar kind of program. Many of these programs had "sister" sites at numerous other campuses, sometimes with the same name, sometimes with different names. Hence, several of the programs in our initial inventory were actually the same program at different sites. Rather than discuss each variant of a program, we include a discussion of the overall prototype here. (Appendix A lists the institutions, agencies, and organizations around the country from which we sought nominees for possible programs concerned with promoting minority high achievement.) We also decided to eliminate the nominated programs that had very little documentation and no evaluation data because little could be said about them that would be useful to our understanding of best practices. A list of these considered, but eliminated, programs is in Appendix B.

In the end, we settled on 20 programs as exemplars of the vast array of efforts being mounted nationwide. These programs were selected because (1) they are major prototypes and have many spinoffs on a large number of campuses; and/or (2) they have evaluation data that help us to understand issues of best practice; and/or (3) they have been written about and are sufficiently well-known that they merit inclusion simply because they have generated widespread interest. Table 10 lists the programs included in this sample, their locations, and their disciplinary focus, and in the pages that follow we describe various aspects of these programs in greater detail. However, programs with limited data and cursory or absent evaluations are not considered as fully here. Additional information on these programs (plus a few other programs that were in various stages of evaluation data collection) can be found in Appendix C.

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[3]The Minority Engineering Program (MEP) is the higher education extension of MESA, which operates in the secondary schools. Thus, MEP program directors often refer to their program as the MESA Engineering Program.

Table 10. Study Sample Programs, by Location, Focus, and Funding Source

Program	Location	Disciplinary Focus	Primary Funding Source
1. 21st Century Program	U Michigan	All majors	U Michigan
2. Alliance for Minority Participation	27 prog. nationwide (SMET)	Sci., math, eng., tech.	NSF + local
3. Banneker Scholars Program	U Maryland, College Pk.	All majors	Private local
4. Biology Undergraduate Scholars Program	UC Davis	Biological sciences	NSF/Hughes
5. Biomedical Honor Corps	Xavier University	Bioscience (Pre-med)	H Hughes Biomed
6. Challenge Program	Georgia Tech	Math, science	U Georgia
7. Chemistry Learning Center	U Wisconsin	Chemistry	NSF/U Wisconsin
8. Emerging Scholars Program (ESP)	Multiple, nationwide	Math	Each institution
9. Exxon Stevens	Stevens Institute of Technology	Engineering	Exxon Foundation and local
10. McKnight Doctoral Fellowships	Florida Public/Private IHEs	All majors	McKnight Foundation and local
11. McNair Scholarship Program	93 sites in nation	All majors	U.S. Dept. of Ed.
12. Meyerhoff Scholarship Program	U Maryland, Baltimore County	SMET	Meyerhoff Foundation
13. Minority Access to Research Careers (MARC)	62 sites nationwide	Biomedical and math	NIH
14. Minority Biomedical Research Support (MBRS)	Multiple, nationwide	Biosciences	NIH
15. Minority Engineering Program (MEP)	Multiple, nationwide	Engineering	State/Private Industry
16. Minority International Research Training (MIRT)	Multiple, nationwide	Biological Sciences	NIH
17. Minority Medical Education Program (MMEP)	Multiple, nationwide	Pre-med	AAMC/Johnson Foundation
18. MURALS	UC Davis	All majors	University funds
19. Spend a Summer w/a Scientist (SaS)	Rice University	SMET	NSF
20. Student Achievement in Research and Scholarship (STARS)	Ohio Public/Private IHEs	All majors	Ohio IHEs

The most notable feature shown in Table 10 is the fact that the great majority of programs are focused on the sciences, math, and engineering. Only 6 of the 20 programs are designed to support students in majors outside of the science, math, engineering, and technology (SMET) areas, and none is dedicated to nurturing students solely in the social sciences or humanities. Since our sample is not random and, therefore, cannot be seen as representative of all programs nationwide, given the numbers of programs we reviewed in order to cull the list to 20, we are confident that the ratio of SMET programs to all others is reasonably consistent with the nationwide ratio. Certainly minorities are underrepresented in SMET areas, but they are almost as underrepresented in other disciplines as well.

Table 11. Percentage of Doctorates Conferred, by Ethnicity (U.S. Citizens) and Field, 1996

Race/Ethnicity	Physical Science	Engineering	Life Science	Social Science	Humanities	Education
African American	1.0	.9	1.7	3.6	2.3	8.6
Latino	1.2	1.4	1.8	3.4	2.7	3.0
Native American	.2	.2	.4	.5	.5	.9
Asian	2.6	4.2	3.5	1.9	1.8	1.4
White	45.0	33.7	52.5	66.0	69.0	72.0
Foreign	48.0	59.0	39.0	24.0	23.0	14.0
Total Degrees	6,675	6,305	8,255	6,814	5,116	6,772

Source: Wilds and Wilson, *Minorities in Higher Education* (Washington, DC: American Council on Education, 1998).

Even though African Americans, Latinos, and Native Americans made up almost one-fourth of the population in 1995, they represented only 14.3 percent of the B.A. degrees awarded in social sciences (compared to 10.6 percent for biosciences and 10.2 percent for engineering). At the doctoral level in 1996, while they represented only 2.5 to 3.9 percent of the degrees in the sciences and engineering, these ethnic groups also received only 7.5 percent of the degrees in the social sciences and 5.5 percent of the Ph.D.'s in the humanities. Even in education, Latinos and Native Americans garnered no more of the doctoral degrees in this area than they did in all other disciplines (3.9 percent).

The category of "foreign" degree recipients includes all ethnicities, and while the overwhelming majority of these are Asian, it is notable that nearly as many degrees are awarded to African- and Latino-origin foreigners as are earned by African Americans and American-born Latinos, artificially inflating the percentages of degrees going to "Blacks," "Latinos," and "Asians" when data are not desegregated by citizenship. The doctoral degree in the United States is very much the province of domestic White and foreign students, however, this mix has been changing somewhat over time. In 1986, 65 percent of all doctoral degrees were conferred on White students and 28 percent went to foreign students. By 1996, the White student proportion of doctorates earned had dropped to 56 percent, but foreign students represented 35 percent of all Ph.D.'s conferred. Even American-born Asians hold a relatively low percentage of the Ph.D.'s awarded in this country. These figures would tend to suggest a tacit policy of American universities to fill slots with whomever qualifies, without particular regard for stimulating the pool of domestic applicants, especially those of color.

Given the small percentages of domestic minorities completing advanced degrees in all academic disciplines, the disproportionate emphasis and support for underrepresented minorities in SMET would appear to be due to something more than simply the fact that they are underrepresented in these fields. Although much of this literature decries the low percentages of minorities in higher education, one finds few articles that bemoan the specific shortages in the humanities and social sciences. However, considerable attention is given to the shortages within the SMET disciplines. Moreover, because U.S. government support for science research and development is much greater than for other fields, it is likely that the large number of programs in these areas is due at least in part to the greater

availability of funding. Sims (1992) estimates that about $1.5 billion was spent by the federal government during the 1970s and 1980s to increase the number of minorities in science and, at NIH alone, officials estimate that two central programs absorbed about $675 million over the same period. An examination of Table 10 shows that programs that focus on non-SMET areas are much more likely to be funded out of university or other nongovernmental sources while SMET-targeted programs more typically receive their funds from government agencies.

Eligibility and Outcomes Criteria

Inasmuch as the College Board's Task Force on Minority High Achievement has expressed an interest in identifying programs that promote high academic achievement and/or target high-achieving minority students, we focused our efforts on locating programs that were specific about recruiting top minority students for participation. We found, however, that many programs are quite vague about their selection criteria; most programs admit a continuum of students—from "developmental," i.e., students in need of specific academic support, to high achievers—and only a few programs actually specify that their target is solely high achievers. In some cases, it was difficult to make this determination. For example, the BUSP program, located on one of the University of California campuses, which admits only the top 12.5 percent of graduating high school seniors in the state (and is even more selective for out-of-state admission), has been relatively nonselective with respect to the students it admits (though in recent years the program has tightened its selection requirements, reducing the take of students who were not prepared to enter at least precalculus from approximately 30 percent of the group to between 5 and 10 percent, and raising the SAT I–M threshold by about 50 points, from an earlier mean of 427 to 483). However, it considers itself a program that targets high achievers because, by definition, University of California students are among the top students in the state and the nation. Whether this would meet others' definition of highly selective, however, is an open question. Table 12 displays the selection criteria for the various programs. In the far right-hand column we have indicated whether we assessed this as a program that truly targeted the top 10 percent of minority achievers, and if it purported to include high achievement—defined in terms of students' performance in course work—as a criterion of its own success.

Table 12. Minority Programs and Selection Criteria

Program	Selection Criteria	Select: High Achievement	Outcome: High Achievement
1. 21st Century Program	Nonspecific; underrep. minority all areas		
2. Alliance for Minority Participation	Nonspecific; undergrad. SMET min.		
3. Banneker Scholars Program	Black; "high achievement"	X	X
4. Biology Undergraduate Scholars Program	Underrep. UC students; math exam		
5. Biomedical Honor Corps	ACT=20+; SAT=820+; HSGPA=3.0+		Med School
6. Challenge Program	Nonspecific minority students		X
7. Chemistry Learning Center	Any interested student		
8. Emerging Scholars Program (ESP)	Nonspecific minority students		
9. Exxon Stevens	Black and Latino with SAT 1200+	X	X
10. McKnight Doctoral Fellowships	Nonspecific African American		
11. McNair Scholarship Program	Underrep. minority, GPA varies, e.g., 2.8-3.0	X	Grad School*
12. Meyerhoff Scholarship Program	Top minority math and science students	X	X
13. Minority Access to Research Careers (MARC)	Jr. and sr. minority honors students	X	
14. Minority Biomedical Research Support (MBRS)	Undergrad 2.3+ with a "spark"; grads, 3.0+		
15. Minority Engineering Program (MEP)	Disadvan. and underrep. students		
16. Minority International Research Training (MIRT)	Students' "ability/desire"; professor's judgment		
17. Minority Medical Education Program (MMEP)	1st yr. GPA 3.0+; 2.75 sci.; SAT=950+		
18. MURALS	Generally 3.0+ (some as low as 2.75)		Grad School
19. Spend a Summer w/a Scientist (SaS)	High achievers	X	Grad School
20. Student Achievement in Research and Scholarship (STARS)	High ability soph/jrs. w/min. 3.0 GPA	X	

*These programs may or may not select the highest achieving minority students to participate, depending on the particular program site requirements. McNair eligibility is based on college GPA, and given that these are typically highly selective colleges, the GPA requirement represents a higher standard than the high school GPA. The aim is to make students graduate school eligible, thus high achievement outcomes are assumed.

The Missing Discourse of Excellence

Only six of the programs could be considered to focus on the upper 10 percent or so of minority scholars (and an additional two are marginal in this category) upon entrance. However, four of the programs set high achievement (students performing at the level of 3.5+ GPA) as a measure of their effectiveness, and another four set a goal of enrollment into medical or graduate school as the criterion of success. Other programs certainly included these students among the mix they accepted, but very few even considered test scores, and for the most part, a 3.0 GPA was considered evidence of high achievement. While this would place many of the students in perhaps the upper 30 to 40 percent of their college class, it does not reach the standard of the upper 10 percent, or the highest achievers.

There are clearly several reasons for the lack of focus on the highest achieving students, at least with respect to entrance criteria. As noted earlier, minority test scores and GPAs tend to be significantly lower than those of Whites or Asians, hence the pool of minority students at the upper tail of the achievement distribution is very small, limiting substantially the pool from which programs might draw. Moreover, most programs are interested in serving a broader range of students and many are reluctant to accept scores and grades at face value. Also, as the director of the BUSP program noted, whereas

students with high SAT I–M scores were significantly more likely to successfully complete their undergraduate science degrees, some students with low SAT I–M scores did achieve this outcome, and the program was reluctant to overlook even a handful of students who might be successful. Dr. Bruce Weber, director of the CSU Fullerton MBRS program, noted that his campus has been fortunate in its decision to accept students with GPAs as low as 2.5 into the program, who show a "spark" or seem particularly adept and interested in laboratory work, because the great majority of their judgments about the abilities of these students have proven correct and the students have been successful in the program and beyond. Concern with increasing the pool of minority students for graduate school remains so pervasive that many people find it unjustifiable to focus program recruitment too narrowly, even though high scores and grades are confirmed predictors of success.

Finally, the debate over focusing resources on the highest achieving students versus the lower achievers has raged for years within education circles. The debate is usually resolved in favor of the lower achievers since resources are always limited and the general belief is that high-achieving students usually come from environments that are resource rich and do well relatively independent of school inputs, but low achievers may be totally dependent upon school resources to achieve any level of success. Of course, within the context of higher education this argument can be framed quite differently. Since university students are, by and large, among the more advantaged of their group as well as of the population as a whole, and since the university may legitimately place a high priority on nurturing a cohort of students to fill future faculty slots or leadership and professional positions in several other sectors of the economy, the argument can be made quite compellingly that some resources need to be dedicated to this specific purpose, and that by doing so the interests of minority communities, as well as those of the university and society as a whole, are best served.

Program Components

None of the programs focused on one single strategy. All incorporated various strategies to help ensure successful outcomes for students. We were able to identify five major areas of student support, each with several subcomponents. The five major components are mentoring, financial support, academic support, psychosocial support, and professional opportunities. This categorization, however, was necessarily somewhat arbitrary. For example, whether a particular strategy was characterized as "academic" or "psychological" support depended greatly on the way it was written about or described to us, but someone close to the program might well offer a different interpretation. Second, there is a great deal of crossover among the strategies. Mentoring strategies are one example of this. Human relationships are complicated and varied, and we expect that mentoring relationships range from true involvement in many aspects of the student's academic, personal, and professional life to little involvement with the student and a rather distant

personal relationship. A program that has no academic strategies per se, but focuses on the mentor-student relationship, may in fact provide students with a great deal of academic support through an extensive mentoring relationship.

A. Mentoring

In our analysis of program components, we included only those programs that explicitly identified mentoring as a program strategy. We realize, however, that informal mentoring relationships may arise in many of these programs, particularly those that focus on building a cohort or community among peers and program staff.

Based on a corporate model in which upper-level executives mentor up-and-coming middle managers, mentoring programs have become extremely popular in recent years in all kinds of settings (Governor's Office of Child Development, 1997; Tierney, Grossman, and Resch, 1995). Whereas mentoring is defined in many ways depending on the setting, and mentoring relationships may be fleeting or may last over years, one generally agreed upon definition includes the notion that the mentor must be someone with greater experience and/or stature in the field and that he or she shares this knowledge with the protégé with the intent of enhancing the protégé's academic or career path. Most of the evidence for the effectiveness of mentoring is anecdotal and qualitative, and few studies have been conducted that actually attempt to test the effectiveness of mentors by using control samples of individuals who have not been mentored (Romero, 1996). Certainly one primary factor that inhibits such research is the difficulty in measuring effectiveness. Mentoring relationships can vary so greatly even within the same program that variation within groups may well be greater than that found between groups. Another issue that arises in attempting to understand the effectiveness of mentoring is the important distinction between *planned* mentoring and more naturally forming mentor relationships (Redmond, 1990). Naturally forming relationships are more likely to be successful but, by their nature, cannot be planned. However, some students will form such relationships, independent of the programs they are in, and there cannot be a control for this in a study design.

The literature does, however, yield some theoretical perspectives that are useful for assessing the types of mentoring relationship that might be most productive with particular students. Kram (1988) has pointed out that mentoring relationships operate along at least two dimensions—role and function of the mentor; and Jacobi (1991) delineates four models of mentoring: (1) involvement in learning, (2) academic and social integration, (3) social support, and (4) developmental support. Each of these models is geared toward a different kind of support. In reviewing the mentoring strategies used by the programs in this study, we found that they tended to differ more along the lines of *who* provided the mentoring rather than by any systematic analysis of the functions the mentors performed or the roles they played.

Table 13 displays the four mentoring subcomponents we identified among the programs studied and who implemented the strategies that each incorporated. The four mentoring

subcomponents include: (1) faculty or staff mentoring and advising about program and personal decision making; (2) mentoring by more advanced peers, providing personal guidance; (3) program participants used as mentors of younger students, thereby reinforcing their own knowledge base and boosting self-esteem; and (4) industry mentors who provided career advice and guidance.

Table 13. Programs by Mentoring Components Used

Program	Faculty/Staff Mentoring	Mentoring by Advanced Peers	Participants as Mentors	Industry Mentors
1. 21st Century Program		X	X common serv	
2. Alliance for Minority Participation	X	X	X outreach	
3. Banneker Scholars Program	X	X		
4. Biology Undergraduate Scholars Program	X	X		
5. Biomedical Honor Corps		X		
6. Challenge Program				
7. Chemistry Learning Center		X		
8. Emerging Scholars Program (ESP)				
9. Exxon Stevens	X			X
10. McKnight Doctoral Fellowships	X	X		
11. McNair Scholarship Program	X			
12. Meyerhoff Scholarship Program	X		X common serv	X
13. Minority Access to Research Careers (MARC)				
14. Minority Biomedical Research Support (MBRS)	X			
15. Minority Engineering Program (MEP)				
16. Minority International Research Training (MIRT)				
17. Minority Medical Education Program (MMEP)	X			
18. MURALS	X			
19. Spend a Summer w/a Scientist (SaS)	X	X	X	
20. Student Achievement in Research and Scholarship (STARS)	X			

Fifteen of the 20 programs incorporate some kind of mentoring component. Eight use more than one type of mentoring, such as faculty and peer mentoring or mentoring by faculty and representatives of an industry or a profession. By far the most common mentoring relationship, used in 12 of the 15 programs, is that between a student and a faculty member. The next most common form was that of students who are further along in the education process who mentor younger college students. Six programs included such components. Three programs asked their participants to work with high school or younger students in a mentoring or outreach capacity. We infer that these models were based on the research findings from peer tutoring that demonstrate that while the tutor is viewed as the "service provider," substantial and, sometimes greater, learning and self-esteem advantages accrue to the tutor rather than to the tutee (Cloward, 1967; Osguthorpe, 1984). Two programs attempt to establish a formal mentoring relationship between the student and a mentor from the industry in which the student aspires to a career. Finally, we must note that for several of the programs that do not specify mentoring as a formal strategy, there is the potential for such a relationship to develop through long-term contact. Project

Success, a variant of the MEP model, in which students work within a particular company during their undergraduate engineering studies and last six years on average, is a good example of a program in which students may well develop an important mentoring relationship with someone in their sponsoring company. Likewise, students in programs with peer advisers who are not identified as mentors could easily develop a mentoring relationship with these older students who "have been there."

While mentoring was a popular strategy used across many of the programs, and clearly there was a strong belief in its effectiveness, no independent data were offered to support this belief. Moreover, programs did not investigate the relative effectiveness of *particular* mentoring components, nor did they attempt to make judgments about *what type* of mentoring strategy might work best. Given the literature on mentoring, we suspect one would find an interaction effect between type of mentoring and the psychosocial development of the student (Rice and Brown, 1990), however, none of the programs pursued this line of investigation.

B. Financial Support

Direct financial support was the least commonly employed of the five strategies, which we find interesting given the fact that inadequate financial resources is so often the reason cited for underrepresented students failing to continue their education. Thirteen of the 20 programs offered some kind of financial support, but the means by which they did this varies. Only three offered enough support to fully cover tuition and expenses through school, and all three provided the funding through scholarships. In addition, Project Success offered the students jobs in a cooperative relationship with local industry. In this model, students receive entry level professional wages for working full time at a company of their choice during summer and other long breaks over the course of their undergraduate careers. Also, one semester is spent with the same company in an internship program. Students earn enough at these jobs to cover most of the costs of their undergraduate education. Other models, such as the MURALS program, provide smaller stipends that help offset the students' educational expenses. Given that the literature has shown that grants and scholarships are more effective in ensuring minority students' successful completion of degree programs than are student loans or other strategies (Hauptman and Smith, 1994), we find it interesting that more emphasis is not placed on direct financial support of students.

We know that reluctance to incur excessive debt and working an excessive number of hours to support schooling are significant impediments to college persistence (Mortensen, 1990; Callan, 1994). Moreover, since many minority students need extra academic support to ensure successful degree completion, a job that is not related to the student's academic program can rob the student of critical time for study and academic focus. Table 14 shows the financial support strategies used by the programs in this study.

Table 14. Financial Support Strategies

Program	Industry/university internship; pay covers school costs	Industry/university research where pay offsets school costs	Scholarship/other assistance; but not full costs	Scholarship/grant tuition, fees, and/or living expenses
1. 21st Century Program				
2. Alliance for Minority Participation			X	
3. Banneker Scholars Program			X	X
4. Biology Undergraduate Scholars Program		X		
5. Biomedical Honor Corps		X	X	
6. Challenge Program				
7. Chemistry Learning Center				
8. Emerging Scholars Program (ESP)				
9. Exxon Stevens				X
10. McKnight Doctoral Fellowships				X
11. McNair Scholarship Program			X	
12. Meyerhoff Scholarship Program			X finalists	X scholars
13. Minority Access to Research Careers (MARC)		X		
14. Minority Biomedical Research Support (MBRS)		"most costs"	X	
15. Minority Engineering Program (MEP)				
16. Minority International Research Training (MIRT)				
17. Minority Medical Education Program (MMEP)			X	
18. MURALS		X		
19. Spend a Summer w/a Scientist (SaS)		X		
20. Student Achievement in Research and Scholarship (STARS)		X	X	

Funding all or part of the costs of students' education can be a powerful form of support, but decisions about how to finance students, if at all, rely as much on philosophy as they do on available resources. For example, some programs invest a large portion of their available funds to support elaborate structures of services but provide relatively little direct financial support for students, whereas others choose to fund students more directly through large grants and scholarships. Assuming that cost is an issue in most cases, and that most programs must decide to support some options and forego others, we tried to make sense of the decisions that the programs made and to discern the underlying philosophy that drove these decisions. For example, the McKnight Doctoral Fellowship or the MEP Project Success at CSUS have clearly identified funding as a central issue they believe directly affects whether students stay in college and complete a degree or drop out. Whereas social, emotional, and academic supports are built into these programs in more limited ways, their underlying philosophy appears to be that if students do not have to worry about money, they will be able to maximize their own resources more effectively. Other programs such as Exxon Stevens and Banneker provided heavy funding as much to attract students to their institutions (or industry) as to help maintain the students in the program. These scholarships, which are not need-based, serve as magnets to bring a cohort of students to a campus where they can support each other. Well-endowed programs such as Meyerhoff can afford to do it all—provide full scholarships and extensive additional support services. However, with more constrained budgets, most programs would do well to ask the question: Which components are producing the greatest good for the investment?

Another decision that program designers make is whether or not to have students work for the support they receive, thereby engaging them in research or professional activities, or to give grants without the work component attached. Any kind of work, even something that is related to one's academic interests, takes time that could be used for study. Moreover, the administrative costs of pairing students with faculty mentors and industry jobs can be costly and time consuming as well. On the other hand, a great deal of learning can occur in these work situations, which can also help to motivate students and socialize them to professional norms. It would be useful to know under which conditions, and with which kinds of students, these different strategies might be most fruitful.

In sum, many funding decisions are not just about money. They are also about what programs identify as the students', or the institution's, central needs and how they believe these can best be met. Yet, we found no program that had actually attempted to conduct any kind of cost-benefit analysis of the support services it was providing, and few seemed to question their belief systems about what works best from the perspective of sound economic analysis.

C. Academic Support Strategies

All of these programs aim to increase the number of graduating minority students in a target field or degree program. As such, all of the strategies a program employs could be seen as academic strategies, that is, tactics to enhance academic achievement. For example, mentorship or financial assistance may be viewed as the academic support strategies a program believes are most likely to produce increased academic achievement. Nonetheless, in this section, we discuss program strategies that include specific kinds of academic activities. We identified seven different strategies used by the programs, and many programs incorporated a number of these strategies simultaneously. Table 15 displays these components.

Most common among these approaches are workshops or seminars. As with other program components, the focus of these workshops and seminars reflects the unique philosophy and orientation of the individual program. Some of the seminars focus on college life, others on academic skills, with a particular emphasis on mathematics; others focus on study habits and organizational strategies. The seminars and workshops may occur at any time of the academic year and/or during the summer before the freshman year. Some programs use these as vehicles to help integrate new students and create shared experiences among the cohort. Unfortunately, little is known about the effectiveness of such seminars and academic enhancement activities and their individual contribution to the effectiveness of college-level intervention programs.

Another frequently employed academic approach is the close monitoring of students' progress and guidance in the selection of courses and sections through academic advising. Because underrepresented minority students are less likely to seek out and use academic counselors and advisers than are other students (Atkinson, Jennings, and Livingston, 1990), they are often characterized as "falling through the cracks" in the system (Rendón

Table 15. Academic Support Components

Programs	Pre-coll. bridge orientation	Learning/Study Centers	Tutoring	Study Groups	Curricular Innovation	Workshops/ Seminars	Advertising
1. 21st Century Program				X	ESP	X	X
2. Alliance for Minority Participation	X	X	X	X		X	
3. Banneker Scholars Program							
4. Biology Undergraduate Scholars Program	X		X		ESP	X	X
5. Biomedical Honor Corps	X		X	X	X	X	X
6. Challenge Program	X						
7. Chemistry Learning Center		X		X			X
8. Emerging Scholars Program (ESP)	X			X	X		
9. Exxon Stevens	X			X		X	X
10. McKnight Doctoral Fellowships						X	X
11. McNair Scholarship Program			X			X	X
12. Meyerhoff Scholarship Program	X		X	X		X	X
13. Minority Access to Research Careers (MARC)					X		
14. Minority Biomedical Research Support (MBRS)							
15. Minority Engineering Program (MEP)	X	X	X	X	ESP	X	X
16. Minority International Research Training (MIRT)						X	
17. Minority Medical Education Program (MMEP)					X	X	X
18. MURALS						X	X
19. Spend a Summer w/a Scientist (SaS)						X	X
20. Student Achievement in Research and Scholarship (STARS)							

and Nora, 1994). Furthermore, because these students frequently lack the "cultural capital" that provides familiarity with strategies for navigating successfully through college and career decisions (Mehan, et al., 1996), a successful intervention strategy for minority students, both in high school and college, is close supervision of students' academic progress and decision making (Cooper, et al., 1995; Gándara, et al., 1998). Definitions of "success" for this strategy include higher institutional retention rates, increased numbers of students completing college preparatory course work or successfully navigating the graduate school application process, and completion of degree objectives. Empirical evidence does appear to support the idea that careful monitoring of students can improve the academic outcomes for minority students.

Seven of the programs formally use tutoring as an academic strategy. Tutoring has been shown to be a particularly effective academic approach for students in need of additional support. Compared with other kinds of strategies, one-on-one academic support and guidance in the form of tutoring has been shown to be a very effective tool in K–12 settings (Slavin and Karweit, 1985). Less is known about the effectiveness of tutoring for college students. However, several studies have shown that college students who learn material in order to teach it to others demonstrate greater mastery of the material, especially at the conceptual level, and greater student connectedness to the college or university (Benware and Deci, 1984; Bargh and Schul, 1980).

A related strategy, the use of study groups, is employed by seven of the programs. Within study groups a certain amount of natural peer tutoring occurs, in addition to the encouragement of academic aspirations and emotional support. There is considerable research demonstrating the effectiveness of cooperative learning groups, especially for minority and lower functioning students (Slavin, 1983), however, little is reported in the literature with regard to college-age students. Fullilove and Treisman (1990) present relatively compelling evidence that the Treisman model, variously known as the Emerging Scholars Program and the Math Workshop Program, does produce significantly better academic outcomes for underrepresented students when compared to similar students who did not participate in the program. The model is built on three critical elements: (1) a "nonremediation" approach that stresses to students their special abilities to participate in "challenge" workshops, rather than focusing on their possible deficits in preparation, (2) a specialized calculus curriculum that is presented to students who (3) work in study teams, overseen by a graduate student (a variation on cooperative learning groups), on challenging problems and then are encouraged to maintain their study groups beyond the classroom. It is not possible to know, based on the evaluation data, which aspects—the curriculum, the study groups, or both—are most critically related to the improved outcomes. However, the Treisman study group model was the result of considerable study and analysis and appears to have a strong empirical basis. Moreover, other implementations of the model have shown similar successes (Bonsangue and Drew, 1995). There is reason to believe, based on this research, that the study group model does have an independent effect on successful outcomes for minority students.

Another important aspect of academic support included in some of these programs is a unique curriculum developed to support and stimulate the students, especially in key areas such as math. In all of the programs we reviewed, the specialized curriculum was found only in the SMET programs and it focused on intensive mathematics instruction and curriculum modification in the science series. In fact, the MEP and 21st Century programs use ESP model workshops as one of their strategies. The Xavier Biomedical Honor Corps program, however, was the most extensive in its reworking of the math/science curriculum. This program had taken a whole-school approach to integrating the course work across levels and disciplines and had entirely reshaped curricular areas that had proven troublesome to students. Of course, quantitative "gateway" courses such as calculus or first year chemistry have been shown to be key barriers to successful completion of the degree in SMET areas (Gainen, 1995; Villarejo and Tafoya, 1995), and so it would make sense to focus efforts in this area. The BUSP program at the University of California, Davis, for example, credits its successes with minority students in the biology curriculum in large part to the specially designed prechemistry course it offers as an integral part of its intervention. Other studies have shown that the highest attrition of math and science majors is in the first year, after students have encountered the gateway courses, and often failed to perform adequately in them (cf. Gainen and Willemsen, 1995). Hence, the focus on these courses, and on a curriculum that not only supports students but encourages them to challenge themselves to the

highest standards, is consistent with literature on the chief barriers to completion of degrees in the sciences, math, and engineering. We find it interesting, however, that no such literature appears to exist for students in the humanities and social sciences, and we found only one program, 21st Century, that supports and challenges minority students to high standards in these areas of academic endeavor as an antidote to dropping out.

Three of the programs used a special learning center or other learning technique to support students' academic work and one of the programs has such a center as its focus. The programs that use learning centers as a central strategy, including MEP and AMP, stress the importance of the centers as places for students to meet each other and establish a support network of peers and program staff, in addition to providing necessary learning tools and an appropriate study space.

Finally, several of the programs provided a precollege bridge or freshman orientation class prior to enrolling in the university. The focus of these courses included preparation for the rigors of college study and specialized classes that are intended to give students a "leg up" in their majors as they enter the program. Program directors were careful to point out that the content of these courses was designed to be enriching rather than remedial and that they offered students greater in-depth study. Providing more time to explore difficult material is an effective way to improve academic achievement—either by slowing down the curriculum to allow for more intensive study or by incorporating different approaches that give students the opportunity to learn in new ways (Karweit, 1989). Thus, the precollege courses can be important components of an intervention program if they provide more time to learn the same material or add different approaches that are attractive and motivational to a variety of learners. However, it is probably important that these courses be part of a longer term strategy. The research appears to bear out that stand-alone classes, or programs that have a relatively short duration, also have limited effects. These may be helpful interventions at the time that the students are involved in them, but the effects appear to wear off (Gándara, et al., 1998). The most effective intervention programs tend to be those that help students bridge various transition points in their academic lives and monitor students throughout their academic careers (Cooper, et al., 1995). We found two such programs—Alliance for Minority Programs (AMP) and Xavier's Biomedical Honor Corps—that specifically addressed this need. AMP, a family of programs at 27 sites, is articulated to provide help for students at the critical transition points in their schooling—from high school to college, two-year college to four-year college, undergraduate to graduate school. However, there is considerable diversity across the programs sites in how this is accomplished. The Xavier program begins with students at the end of eighth grade, providing summer math and science courses each year that are articulated with the high school curriculum and strengthen the students' academic foundation. In the summer prior to college, students can participate in the SOAR program, which focuses on problem-solving skills and vocabulary development. This multiyear, extensive "grooming" of the Xavier students was unique in the programs we reviewed and had the

added benefit of bringing college and high school faculty together in ways that almost certainly had to have an impact on math and science teaching in the secondary schools.

D. Psychosocial Support

Sixteen of the 20 programs used one or more strategies that we describe as providing psychosocial support. This support was provided in four primary ways: (1) personal counseling, (2) building a cohort of peers, (3) providing campus housing as a unit, and (4) encouraging family involvement or participation in cultural events. A few of the programs, including 21st Century, ESP, Meyerhoff, and McKnight doctoral fellows, stressed the central importance of building a cohort of peers to minority student success, and this community building was fundamental to these programs, no matter what array of strategies they employed.

Table 16. Psychosocial Support Strategies

Program	Personal Counseling	Cohort of Peers	Campus Housing	Family/Cultural Involvement
1. 21st Century Program		X	X	comm. serv.
2. Alliance for Minority Participation				
3. Banneker Scholars Program		X	X	
4. Biology Undergraduate Scholars Program		X	X	
5. Biomedical Honor Corps	X			
6. Challenge Program		X		
7. Chemistry Learning Center		X		
8. Emerging Scholars Program (ESP)				X
9. Exxon Stevens				
10. McKnight Doctoral Fellowships	X	X		
11. McNair Scholarship Program	X			X
12. Meyerhoff Scholarship Program	X	X	X first year	X
13. Minority Access to Research Careers (MARC)				
14. Minority Biomedical Research Support (MBRS)				
15. Minority Engineering Program (MEP)	X	X		X
16. Minority International Research Training (MIRT)				
17. Minority Medical Education Program (MMEP)		X		
18. MURALS				
19. Spend a Summer w/a Scientist (SaS)				
20. Student Achievement in Research and Scholarship (STARS)				

By far the most common strategy for psychosocial support that we identified was the fostering of a sense of community among the students in the program. Twelve of the programs used this as a central strategy of support. This was generally accomplished through structured opportunities for the program participants to engage in academic and nonacademic activities together. Several of the programs scheduled students into classes together so that they would meet naturally throughout the day and have "built-in" study partners. The literature on higher education and minority students is rife with studies that support this strategy. Hurtado (1990 and 1994) has shown that the social climate that minorities experience on campus is related to the friendship networks that they form, and Tinto (1987) has demonstrated that engagement in activities outside of the classroom is

critical to the integration and, thereby the persistence of minority students in college. Moreover, a long line of research on peer influence and aspirations suggests that students tend to increase their own aspirations when involved with peers with high aspirations (Epstein and Karweit, 1983) and that academically oriented peer groups are especially critical for minority students who may face some derision from less-academically oriented peers if they demonstrate too much interest in their studies (Steinberg, 1996; Mehan, et al., 1996; Gándara, 1995). Moreover, the evidence on the effects of peer norms on aspirations and college completion suggests that peers do have a modest, but significant effect on college outcomes (Pascarella and Terenzini, 1991).

Personal counseling and advising was another strategy used relatively widely by this group of programs. No doubt programs seek to provide this level of personal support for students because of the well-established literature on the effects of social climate on the persistence and well-being of minority students on traditionally White campuses (Hurtado, 1990). However, we found little documentation within the program materials or evaluations conducted on these programs that described the nature of the personal counseling or its independent effects on student outcomes. Evidently for similar reasons, some programs attempted to engage either the families of students or aspects of their culture into the intervention programs. Whereas attempts to bridge the multiple worlds of ethnic minority students are supported by the literature as useful strategies in enhancing the educational experience of ethnic minority students (Cooper, et al., 1995; Phelan, Davidson, and Cao, 1991), these were the least frequently reported efforts of all the psychosocial strategies, and very little is written about either their theoretical foundations or their perceived effects on students in the programs.

E. Professional Opportunities

The fifth major strategy utilized by many of these programs was to provide an opportunity for students to experience the real professional world that they were preparing to enter. Most programs view these kinds of opportunities as motivational. To the extent that these strategies involve either research, publication, or presentation opportunities, or experience in the industry or academic setting that the student hopes to enter, these activities can serve as important steps in building a résumé or career opportunities. They also place the students in close contact with working professionals, providing important models of professional norms.

Fifteen of the programs provided some form of professional experience or support for the student's future career in a given field. Three major strategies were identified: (1) student research or internship opportunities, (2) internships or other cooperative relationships with industry, and (3) scholarly forums and/or publication opportunities.

Table 17. Professional Opportunities

Program	Undergrad Research Opportunities	Internships/Other Coop Relationships w/Industry	Scholarly Forums/ Publications
1. 21st Century Program			
2. Alliance for Minority Participation	X	X	X
3. Banneker Scholars Program	X		X
4. Biology Undergraduate Scholars Program	X		
5. Biomedical Honor Corps	X		
6. Challenge Program			
7. Chemistry Learning Center			
8. Emerging Scholars Program (ESP)			
9. Exxon Stevens		X	
10. McKnight Doctoral Fellowships	X graduate		X
11. McNair Scholarship Program	X		
12. Meyerhoff Scholarship Program	X	X	X
13. Minority Access to Research Careers (MARC)			
14. Minority Biomedical Research Support (MBRS)	X		X
15. Minority Engineering Program (MEP)		X	
16. Minority International Research Training (MIRT)	X		
17. Minority Medical Education Program (MMEP)	X		
18. MURALS	X		X
19. Spend a Summer w/a Scientist (SaS)	X		
20. Student Achievement in Research and Scholarship (STARS)	X		

To the extent that these professional opportunities offered within the programs allow students to acquire valuable experience in the professional world, make important job-related contacts, socialize them to the world of work and to academia, and strengthen their résumés for application to graduate school, these strategies provide important advantages for students above and beyond their academic preparation. To what extent such opportunities actually result in lowering the attrition of ethnic minority students or in placing more students of color in the doctoral or professional pipeline remains largely unknown. However, one study of a university mentorship program that places minority undergraduates with sponsoring faculty to work jointly on academic research projects has demonstrated an impressive percentage of students going on to graduate school when compared to both nonminority and minority students with similar GPAs who did not participate in the program (Martínez, in progress). This program, MURALS, is described in greater detail in the next chapter. Thus, there is considerable anecdotal data and some survey data (Sessoms, 1997) on how students view these opportunities, however, there is very little empirical evidence for the effectiveness of most of these programs with respect to helping ethnic minority students stay in college and travel the academic pipeline to the terminal degree. This area is in need of further study.

Summary

Table 18 is a summary, showing which programs that we studied used which overarching strategies: mentoring, financial support, academic support, psychosocial support, and professional opportunities. As is evident from the table, most programs incorporate at least three of the strategies—most commonly, academic support, psychosocial support, and professional opportunities. Some form of mentoring is also provided by 13 of the 20 programs.

In summary, the programs are multifaceted, employing many strategies to create successful outcomes. Inasmuch as a primary charge given to us was to identify programs that target high-achieving minorities, it is relevant to ask: Did those programs targeting high achievers use any different strategies than those that did not? The answer is a qualified "yes."

The seven programs we identified as specifically targeting high achievers were Banneker, Exxon Stevens, McNair, Meyerhoff, SaS, STARS, and MURALS. All provided some form of funding, either partial or full, and about half used this funding to lure high achievers to the school. All provided mentoring coupled with professional opportunities. All but the Exxon Stevens program incorporated the professional activities with the specific intent of promoting graduate study. Thus, students were encouraged to work in a laboratory or to work on a publishable study and present their results—activities that would prepare them for graduate school and faculty positions. These kinds of professional activities were also seen as prerequisites to strong graduate school applications. The Exxon Stevens program was more directed toward preparing students for eventual employment in the field. While some of the programs also provided psychosocial and academic support strategies, not all did, no doubt owing to the perception that these students were already high achievers and were not in need of intensive academic intervention. The fact that some of these programs for high achievers offered academic and psychosocial support and others did not begs an obvious question: Did the ones offering these additional services have better outcomes than those that did not? Unfortunately, our data did not allow us to answer that question, though we believe it is an important issue to pursue.

*Table 18. Summary of Strategies**

Program	Mentoring	Financial Support**	Academic Support	Psychosocial Support	Professional Development
1. 21st Century Program	X	none	X	X	
2. Alliance for Minority Participation	X	partial	X	X	X
3. Banneker Scholars Program	X	variable		X	X
4. Biology Undergraduate Scholars Program	X	partial	X	X	X
5. Biomedical Honor Corps		partial	X	X	X
6. Challenge Program		none	X	X	
7. Chemistry Learning Center		none	X	X	
8. Emerging Scholars Program (ESP)		none	X	X	
9. Exxon Stevens	X	full	X		X
10. McKnight Doctoral Fellowships	X	full		X	X
11. McNair Scholarship Program	X	partial	X	X	X
12. Meyerhoff Scholarship Program	X	variable	X	X	X
13. Minority Access to Research Careers (MARC)		partial	X		X
14. Minority Biomedical Research Support (MBRS)		partial			X
15. Minority Engineering Program (MEP)		none	X	X	X
16. Minority International Research Training (MIRT)		none	X		X
17. Minority Medical Education Program (MMEP)	X	partial	X	X	X
18. MURALS	X	partial	X		X
19. Spend a Summer w/a Scientist (SaS)	X	partial	X		X
20. Student Achievement in Research and Scholarship (STARS)	X	partial			X

*Some programs have many sites, thus all program strategies may or may not be used at every site.

**Institutions are listed as providing funding only if funding is a *core* aspect of the model and all students in the program would routinely receive it. Programs that provide partial funding often do this through work-related opportunities under the sponsorship of a faculty member.

Chapter 5

Confronting the Overprediction Problem and Stimulating High Achievement

An oft-cited concern with minority admission is the reliance—to a greater or lesser degree depending on the institution—on standardized test scores (SAT or ACT™) to determine student eligibility. There have been many critiques of this practice that largely center on the contention that they do not adequately assess the abilities or potential of many minority students and, therefore, operate to shortchange opportunities for these students on the basis of invalid information. In spite of the controversies surrounding the tests, they continue to be widely used by colleges and universities because, coupled with grade-point averages, they are reasonably good predictors of first year performance in college (Willingham, 1985; Ramist, Lewis, and McCamley-Jenkins, 1994), and even of class rank at the end of college (Bowen and Bok, 1998). Since most attrition from college occurs prior to the second year, institutions find the ability to predict first year performance—at any level of accuracy—especially valuable in making difficult admission decisions (Tinto, 1987). These tests are not, however, as good predictors of the first year performance of minorities (especially Hispanics) as they are for nonminorities (Durán, 1983; Crouse and Trusheim, 1988). In fact, contrary to popular concern, the tests tend to *overpredict* the performance of underrepresented minorities (Willingham, 1985; Durán, 1983; Ramist, et al., 1994). That is, underrepresented minority students (including African Americans, Latinos, and Native Americans) tend not to perform as well in their first year of college as their standardized scores would predict (Ramist, et al., 1994).

This overprediction phenomenon is especially acute for quantitative courses and sciences (Ramist, et al., 1994), and it is a serious problem along the entire continuum of achievement, but it is perhaps most alarming at the upper tail of the achievement distribution. For example, Bowen and Bok (1998) found the class ranking for Black gradu-

ates with mean SAT I scores of 1300 and above—the highest category of scores—from the 28 elite colleges and universities in their sample was four percentile points *lower* than White graduates whose mean SAT scores were less than 1000—the lowest category of scores (36th versus 40th percentile). Thus, although these elite institutions graduated Black students at higher rates than other colleges and universities, they did not close the performance gap between Blacks and Whites. This is especially troubling given that they recruited the top African-American students in the nation. There is considerable speculation about why this gap persists, and some portion of the discrepancy is almost certainly due to inadequate high school preparation (Bowen and Bok, 1998). However, the large gap between Black and White performance cannot be explained by background factors alone. Some observers have come to describe this discrepancy in performance as the "inhospitality index" of the institutions that the students attend. In other words, one way to interpret the failure of some students to achieve at expected levels is that the institutional environment *causes* these students to underperform because of lack of support, prejudicial beliefs on the part of faculty and other students, exclusionary social practices on the campus, and other factors that make up a "chilly" campus climate.

The climate may be especially chilly in the SMET disciplines. Not only do underrepresented students do less well in freshman courses than predicted, they also do less well than either Asian or White students overall, and because their grades tend to be especially low in quantiative and science courses, they are more likely than Whites or Asians to drop out of these majors, and to drop out of school altogether. Ramist, et al. (1994) suggest that the rigorous grading practices in freshman sciences and mathematics may result in "artificially forced career choices" (p. 33). Thus if these disciplines evaluated students in introductory courses using similar grade distributions as the social sciences and humanities, Ramist, et al. hypothesize that more underrepresented students would pursue degrees in these fields. Most of the programs described below, which have done systematic research on how they affect student performance, take this notion of campus inhospitality very seriously and attempt to address it in their program designs. Thus, for example, the programs we studied in the SMET areas generally emphasize preparing students to succeed in introductory "gateway" courses that are often stumbling blocks for underrepresented students. It should be noted, however, that the performance gap between underrepresented students and others at the upper tail of the achievement distribution remains a significant challenge even for these outstanding programs.

Among the many programs that we reviewed, we located 11 that have attempted to systematically evaluate their impact on the students they serve and while not all of these studies would meet high technical standards for evaluation, all have attempted to be thoughtful about what they are doing and where the likely impact of their programs lie. As such, these studies provide important insights into to how we might go about "breaking the back of the overprediction problem"—that is, ensuring that underrepresented students do

at least as well as their high school grades and test scores predict, and come to exceed the sometimes low expectations that this society has for them. In fact, the goal of all of these programs is that underrepresented minority students with whom they work will excel in college and go on to join the leadership pool of which Edmund Gordon has written.

At this point it is important to note the following caveat. We collected evaluation reports from many programs, however, these reports commonly consisted of descriptive data on the numbers of students they served and how well these students fared in the program and in the institution. Some provided information about postgraduate status. Rarely was any information provided about how these students performed compared to a similar group of students who had *not* participated in the program, and rarely was there any attempt to control for important background factors such as socioeconomic status or prior educational record. Thus, it was generally impossible to know to what extent student outcomes could be attributed to the programs, or if they were the result of something else outside of the program. Even more rare was an attempt to understand, in a systematic way, *what it was about the program* that seemed to produce the desired effects. We do not fault the programs for this lack of data. Most programs expend all their resources on delivering "the product," and funders seldom require or pay for the kind of evaluation that would yield the data that allow for these kinds of within-program or participant/nonparticipant comparisons. However, the reader who is familiar with many of these programs will no doubt ask: Why is there no specific mention of "X" program? The reason is *not* that these programs were found to be ineffective—they may be outstanding—but that there was an absence of rigorous data that allowed us to know how effective they were.

These 11 programs not only provide important insights into what works in college intervention programs, they yield interesting tales about the challenges they have faced—and continue to face—in developing successful programs, and the factors that are necessary to sustain them. The best designed programs are only as effective as their implementation, and these programs have all been challenged over time with changes in student populations, social and institutional conditions, and staff turnover that could have easily derailed them. One thing that almost all of these programs have in common is that they were started by visionary individuals who had a *passion* for finding a remedy to the problem of underrepresentation of some groups within the ranks of high achievers at the university. These individuals represent a mix of ethnicities, but all have been outspoken leaders in their fields. They are also charismatic individuals who easily attract followers to their own visions. As is typical of highly successful people, all could be described as "workaholics" who have devoted major portions of their lives to these endeavors.

In interviews with their creators, it is also apparent that the programs did not come about by accident, nor were they designed "on the fly." Most were the result of extensive research, experience, and collaboration, and most have undergone significant design modifications over time. Because of this strong interest in improving on their designs, there is much to be learned from the modifications they have made in response to their

own formative evaluations. Data are presented here that serve to demonstrate not just whether they worked, but for whom and under what conditions.

Even though none of these programs relies on a single component or strategy and, in fact, virtually all are multifaceted, we have attempted to organize them into four categories according to the *primary focus* of the program, while at the same time acknowledging that they incorporate many other activities and objectives. In fact, there are many ways in which the programs could be categorized, and to some extent the categories we use here are arbitrary. An alternative that occurs to us is that they could be organized along the dimension of time, that is, *when* they occur during the college career of the student: Some focus on the bridging function from high school into college (e.g., Challenge), others focus on the first year (e.g., ESP), or at the end of the undergraduate experience (e.g., MURALS), or during graduate school (e.g., SaS), and still others, particularly those that provide long-term funding, may operate over the entire undergraduate experience (e.g., Meyerhoff). However, by organizing them into four categories (see Table 19), it allows us to "cross reference" their findings by specific strategies and lend broader support to their conclusions.

The 11 programs we review in greater detail here—the Biology Undergraduate Scholars Program (BUSP), Georgia Tech Challenge, Exxon Stevens, Emerging Scholars Program (ESP), Meyerhoff, McKnight Fellows, Project Success of the Minority Engineering Program (MEP), Xavier's Biomedical Honors Corps, 21st Century, Spend a Summer with a Scientist (SaS), and Mentorships for Undergraduate Researchers in Agriculture, Letters & Sciences (MURALS)—are shown in Table 19 by category of focus.

Table 19. Programs by Category of Focus

Financial Support	Academic/Professional Socialization	Freshman Year	Comprehensive
Exxon Stevens	Challenge	BUSP	Xavier
McKnight	SaS	21st Century	Meyerhoff
Project Success	MURALS	ESP	

Financial Support

Philosophy

Given the unquestioned importance of financial factors in both the matriculation and persistence of underrepresented students in college and graduate school (Cabrera, Stempen, and Hansen, 1992; Astin, 1975; Campbell, 1997), we found it curious that more attention was not paid to this issue by other programs. The three programs categorized as having a focus on financial support included a variety of additional activities, however, all shared the core philosophy that providing virtually full financial support could be a key factor in attracting highly talented students and/or helping them to persist and excel in their studies. Financial support was used by these programs to (1) attract students to the program and help create a critical mass to support each other, (2) reduce worry and distractions associ-

ated with financial concerns, (3) eliminate the need to work and increase students' time to devote to study, and (4) operate as an incentive to maintain high grades.

Exxon Stevens Ambassador Franklin H. Williams Scholars Program

The Exxon Stevens Ambassador Franklin H. Williams Scholars Program is located at the Stevens Institute of Technology. It was designed to attract more highly qualified minorities to the school, but it was not driven by any particular theory about what leads students to excel. Thus it has focused mostly on the careful selection of candidates and providing support and monitoring throughout their college career to ensure that they maintain their high performance. Its purposes are to increase the number of Black and Hispanic students who are well prepared to major in engineering at Stevens and to increase the numbers of highly qualified (3.5+ GPA) graduates who are competitive for entry-level engineering positions with selective employers such as Exxon or for continued study at the graduate level. The program has two major features: It provides generous financial support for the duration of the student's career at Stevens, and it offers three years of summer internships beginning in the summer following the freshman year. The objective behind the non-need based full scholarship is two-fold: to attract highly competitive Black and Hispanic students to the program and to allow them to focus full-time on their studies. The summer internships not only provide part of the funding for the students but also serve to socialize the students to the standards and expectations of the corporate world and allow them to develop a close mentoring relationship with a supervising engineer that ideally extends over the three-year period. Another component of the program is a summer bridge course to help students make friends and acclimate to the campus. The Stevens program admits only a select few students each year, generally 3 or 4, and its standards for admission are high, including a combined SAT I score of at least 1200.

Evaluators found that when the 21 Stevens Scholars who had completed their freshman year between 1989 and 1995 were compared to White students with similar SAT scores for the same period, the Scholars outperformed the White students by a considerable margin. For example, when compared to White students with SAT I scores within 1100 and 1499 (the range into which the Stevens Scholars fell), the Stevens Scholars averaged a freshman GPA of 3.32 compared to 2.53 for the White students (Miller and Morning, 1996). Of course, the Scholars were very carefully selected, not only on the basis of grades and test scores, but also as the result of interviews in which selection committee members noted they had taken family socioeconomic backgrounds, parents' education, and other educationally socializing experiences into very serious consideration. There was a strong bias in favor of middle-class students from homes that had been exceptionally supportive of the students' academic development. The selection committee did everything possible to ensure that the students would have a high probability of success. They also had to maintain a 3.0 GPA in order to remain in the program and maintain their scholarship. No such threat hung over the students who were not in the program.

With respect to producing high achievers, 43 percent of the first four cohorts of students (n=14) maintained a 3.5 or better by graduation, and four of the seven students (57 percent) admitted between 1993 and 1995 had maintained a 3.5 or better through 1996. Virtually all students maintained a 3.0 to ensure the continuation of their scholarships.

Program Modifications. Changes that were made in the program over time included adding a calculus screening test to better determine the actual skill level of participants in order to tailor instruction accordingly. It came as a surprise to the program directors that there was so much variability in calculus preparation among a group of such high achievers—an important lesson for program designers. As it matured the program also changed its selection standards to include the external support factors such as parental backgrounds and interests noted above. It found that this was key to ensuring the success of the students, most of whom were African Americans. Finally, it shifted some of the academic advising responsibilities to the students' corporate mentors, believing that this was an appropriate function of mentors and one for which they were well equipped to help students.

Program Costs. The cost of this program was in excess of $30,000 per student.

Program Challenges. The high cost of the Exxon Stevens program prohibited the recruitment of large numbers of students, thus some cohorts were as small as two students and even a large cohort did not normally have more than 5 to 6 students. Convinced that group study and peer support were important elements of this, or any intervention, program, the directors lamented the fact that the student cohorts could not be larger and suggested that it might make more sense to reduce the size of the scholarship and increase the cohort size.

McKnight Doctoral Fellowship Program

The McKnight Doctoral Fellowship Program is one of the few that includes all majors, although it also leans toward selecting SMET students. Its current class is comprised of 50 percent SMET students. It is not highly selective in admission, operating under the philosophy that students who have GPAs above 3.5 and SAT I scores above 1100 "do not really need this program." It is a private/public partnership, receiving funds from the state of Florida as well as from the McKnight Foundation, but it is administered outside of the state's bureaucracy. The objective of the program is to increase the number of African Americans receiving doctoral degrees across all disciplines. It provides a full-cost scholarship that is not need-based, although the designers of the program reasoned that most African-American students would need such support if they were to continue their studies to the Ph.D. level. They make the argument that so many middle-class Black families are "only one paycheck away from poverty," having been middle class for no more than one generation, that this socioeconomic indicator may be essentially meaningless for most African-American stu-

dents. The program also offers a student support system, which is essentially a liaison on each campus responsible for monitoring and advising students and linking them with the statewide organization. The statewide directors, two prominent African-American educators, also advise students on a daily basis. They contend that they know each of the students in the program by name and consult with most over the course of their graduate careers. Three annual meetings or conferences are held to bring together all fellows (typically 130+ in a cohort) with outstanding scholars who serve as mentor/role models for the students. Presentations on all aspects of college life are included, and students have opportunities to bond with each other as well as with the group mentors. There is also a spiritual element to the program that involves pastor/scholars who are called upon to participate in the conferences in an effort to provide the students with spiritual guidance.

For purposes of evaluation, 103 McKnight scholars from the 1990 cohort were compared with 130 non-McKnight African-American students who were also matriculating in the same year and were receiving either partial or no scholarship funds. A questionnaire dealing with background characteristics, present status in graduate school and, for the McKnight fellows, an assessment of the program was administered to both groups. There did not appear to be significant differences between the groups on the dimensions of background characteristics or undergraduate or master's GPA, although the parents of McKnight fellows did have somewhat higher educational levels overall. For example, 44 percent of parents of McKnight fellows had at least a college degree, while only 27 percent of the non-McKnight fellows were as highly educated. McKnight fellows were also more likely to be pursuing degrees in math, science, and engineering than the non-McKnight fellows, and although there were no differences in their graduate GPAs, the McKnight fellows appeared to be more satisfied overall with their college experience than the non-McKnight fellows. Whereas the study does not make this point, the possibility exists that the McKnight fellows' GPAs would have been higher than the non-McKnight fellows if they had been disagregated by discipline. It is widely documented that GPAs in the sciences and mathematics tend to have a much wider range than those in the social sciences and humanities, and since more McKnight fellows were in the SMET fields, GPA data may have been biased against them. It is not especially surprising that McKnight fellows were more satisfied with their graduate experiences, since they were so much better supported. No other outcome comparisons were made with the control group.

The study concludes that, since its inception, 128 fellows have received their Ph.D.'s and 32 more have advanced to candidacy. This appears to be a major contribution to doctoral production in the state of Florida, although comparison data are not provided for the years prior to 1984, or to the numbers of students completing degrees without the help of the scholarship. Although fellows report satisfaction with the support system and the annual meetings provided by the program, these data do not reveal how these specific program strategies contributed to student outcomes above and beyond the high level of financial support provided. The primary conclusion to be drawn from the McKnight eval-

uation study is that scholarships that pay for the costs of education are likely to increase both the numbers of African-American students who will enroll in graduate programs as well as the percentage of those students who complete the program successfully. Money does matter and a number of studies have borne this out.

Program Modifications. Changes in the program over time provide important insights to persons interested in replicating a program like McKnight, and the changes also speak poignantly to the issue of race-based programming. Directors had to find new ways to advertise the existence of the McKnight Fellows program because when they first began they were unable to secure a sufficient number of applicants to fill all of their slots. What they thought would be a bonanza for African-American students seeking Ph.D. degrees went almost ignored at the beginning of the program. They found that advertising in the *Chronicle of Higher Education* was not the best way to get the word out to African-American students; they later sought more grassroots publications and spread the word through African-American colleges and organizations. Another change included more formal mentoring of students to ensure that everyone had someone to whom they could go for advice, enhancing the more informal arrangements that existed previously. A third change was the addition of a spiritual element that the program directors felt needed to be an important part of any program serving African-American students. Every Sunday a scholar minister is brought to the campuses to worship with the students and provide spiritual guidance. The directors contend that this has added a very positive element to the program. They also note that this is consistent with African-American culture and, therefore, reinforces positive cultural messages about striving to succeed for reasons beyond the self. Finally, the program has been changed to allow students to take their scholarships to out-of-state universities, with the assumption that they will return to Florida upon completion.

Program Costs. The per-student cost for the program is about $30,000 annually, including $16,000 for stipend and tuition, costs of annual conferences, materials, and program infrastructure.

Program Challenges. An obvious issue for the McKnight Fellows program is the fact that it admits only African Americans and, in a period of widespread hostility to affirmative action, such a program could come under political attack. The directors, however, contend that to date there has been no movement to require it to open its doors to non-African-American students. In fact, it was pointed out that a recent visit to the state by UC Regent Ward Connerly who sought to bring a 209-like movement to Florida was politely rebuffed by the Florida governor with a "No, thanks." It is hard to imagine, however, that this state of affairs could endure for long, and it is likely that McKnight will have to address its Blacks-only policy at some point.

Project Success

Project Success is one of 20 Minority Engineering Programs throughout California, and there are numerous others in 14 additional states. Project Success operates at the California State University campus at Sacramento. The program's objective is to graduate more underrepresented students in the field of engineering. It provides a host of supportive strategies and activities, including MEP learning centers and freshman orientation classes that focus on college adjustment. Students are closely monitored and interventions are made if problems arise.

Program Modifications and Costs. In 1991, the director of Project Success, Jaime White, noted that the average time to complete the engineering degree for minority students was eight years—two years longer than for nonminority students—and that significant attrition was occurring over this lengthy period. Mr. White also noted that 85 percent of the MEP students were working 20 to 30 hours per week, significantly reducing the time they had to study. In order to remedy this situation, he entered into relationships with a number of local engineering firms. Charging a finders fee for interns, he established a program that puts approximately 10 MEP students each year into summer internships just prior to their freshman year, and then for all summer and lengthy breaks thereafter, including a one-semester internship that is part of the engineering program and that also confers unit credit. By introducing the students to the work setting early, the director argues that the students become socialized to professional norms and increase their motivation to stay in the program. The internship opportunities pay sufficiently well that students do not have to take other jobs, and the MEP program is totally self-sufficient, relying on the finders fees to pay for the program costs. Since the inception of the program, retention rates have risen to 80 percent—very high for engineering programs when compared to both statewide and national data—and minority students are averaging six years, the same as nonminority students, to complete their degrees.

Summary of Financial Support Strategy

The central strategy that these programs embrace is one that is supported in the literature as well as one that is routinely recommended by student services officers. However, the level of support that is provided by two of the programs virtually ensures that not many programs will be able, or would choose, to adopt the strategy. Most programs do not have this much funding or, as in the case of the Exxon Stevens programs, might consider that it would make more sense to fund more students with equal dollars. Nonetheless, to the extent that such support is possible, it appears that money can make a difference in producing more scholars at the doctoral level and challenging good students to maintain high performance. Moreover, to the extent that programs are innovative and have the good fortune to have nearby sources of discipline-related employment, the Project Success

model may well be one that could merge the objectives of these scholarship-based programs with a lower cost alternative.

Academic and Professional Socialization

Philosophy

The primary goals of academic and professional socialization programs are the socialization of students to the demands of a rigorous college curriculum, the norms of their chosen professions, and the high standards of achievement. The interventions in the programs targeted the period just prior to entering college or graduate school. For two of these programs an important element in the socialization process was the development of an academic relationship with a sponsoring faculty member with whom a student could conduct research. Whereas all of these programs use a variety of strategies to socialize students, including mentoring, peer study groups, peer networks, and professional and research opportunities both within the university and outside of it, their common underlying philosophy is that the most important thing an intervention program can do is to socialize students to a set of expectations that they will internalize and which will then facilitate their social, psychological, and academic adaptation to a demanding university setting. In fact, the director of the Challenge Program at Georgia Tech suggested that a primary reason for conducting the program in the summer before students began their studies is that they were able to get students used to working hard "before they discover that all students do not."

Challenge Program

The Challenge Program at Georgia Tech targets potential Black and Hispanic scientists and engineers and recruits virtually all Black and Hispanic students who are admitted to the campus. It began as a retention program based on a theory that students who felt connected to the campus and to other students and faculty would be more likely to complete their degrees. However, program directors began to note that it had taken on a remedial orientation, conveying the impression that "getting by" was sufficient; this did not serve to challenge students to perform to high levels and was of little interest to high-achieving students. In 1990 the program changed its focus to a high achievement orientation. It is a voluntary program for students who have been admitted to the college, and it provides a four-to-five-week summer program of study in calculus and chemistry, and an optional course in psychology, which can serve to reduce the overall credit load in the fall quarter of the freshman year. There is no "Challenge curriculum" per se associated with the summer program; the program's faculty can teach whatever they choose, however, the focus is on strengthening students' skills in the subject matter that will be presented to them in the fall. The informal arrangements for the teaching component is at least partly intentional. The former director of the program noted that the quality of teaching varies considerably

and that adapting to different styles of teaching was one of the skills that students needed to learn. According to him, they needed to understand that to excel, it might sometimes require that students learn *in spite of* less than stellar teaching. Thus, the informal objective is that students will go over a significant portion (though not all) of the first semester's course work, giving them a "leg up" when they begin the school year. The program discourages faculty from covering an entire course because students can become complacent, believing that since they have already covered the material they do not need to put in the same level of effort during the regular school year. The idea is that students will be exposed to enough of the regular curriculum that they will be able to increase their first semester grades, which provides two important advantages: (1) It raises their GPA, even giving them a little margin for error when courses get harder and GPA can falter, and (2) it socializes them to the expectation of getting high grades. The directors reason that if students start their first year getting high grades, they will come to see this as a goal. Additionally, the program facilitates connections to the learning center that offers tutoring to help students attain their goals of high achievement. The program also offers a mentoring component and an awards banquet to honor high-performing students.

Student recruitment has been enhanced since the program shifted to a high achievement orientation. While all minority students are invited to participate, the program can honestly present itself as being geared toward high achievers and, therefore, it does not suffer the stigma of a program that simply targets retention goals. While it enrolls both Hispanics and Blacks, program personnel are largely African Americans and the "culture" of the program has an admittedly African-American orientation. This would appear to be a wise decision inasmuch as the Hispanic students have evidently been successful in forming a supportive network and can call on substantial personal resources that may not be as readily available to many of the African-American students.

Evaluation of the Challenge program has consisted of comparisons for GPA and retention among the Challenge participants, non-Challenge minority science and engineering students, and all Georgia Tech students. Data provided show that with respect to GPA, the Challenge students outperform non-Challenge students and equal or surpass the performance of all GT students for every year between 1990 and 1997 (Hume, 1997). Retention rates for students who entered in 1990 and 1991 appear to be higher for the Challenge students than for the school as a whole (Hume, 1994), however, this is almost wholly attributable to the Hispanic students who consistently outperform both Black students and all GT students in both grades and retention. Hume (1994) attributes this to "their hard work and focus. They have leveraged their common language and culture to succeed" (p. 3). However, there are indications that these students also come from high-income homes from within the Cuban-American community and Latin America, and thus have preparation advantages over the more economically heterogeneous African-American (and probably White) students. It is notable, however, that Black Challenge students consistently outperform Black non-Challenge students with respect to GPA and retention. Moreover,

five-year retention rates for African Americans improved dramatically from the mid-1970s, approaching the overall Georgia Tech retention rate by the mid-1990s.

Program Modifications. The primary modification in the Challenge program was the initiation of the academic preseason that is targeted to high achievement. Important gains in GPA were realized for students after this modification, and the slight GPA advantage that accrues from early successes appears to be sustained over time, though all these data are not yet available. Nonetheless, the logic of the strategy makes a great deal of sense and is consistent with the findings of other bridge programs.

Program Costs. The costs are fairly minimal and appear to be about $1,200 per student, part of which is now paid by students, and part of which is funded by the university. Cost has been a consideration in the design of the program and the fee for students was imposed recently when it was apparent that the budget allotment no longer covered all costs. Whereas the program was a major priority of a former Georgia Tech president, it has taken a lower priority in recent years under a new administration and the program, therefore, cannot count on a budget augmentation.

Program Challenges. The primary challenge to the program is its struggle for acceptance within the mainstream of academic departments. While it is housed in the OMED: Educational Services (formerly the Office of Minority Educational Development), which is an academic unit, it still seems to suffer from its original label as a "minority" program. The former director of the program saw this as a serious impediment to the program's continued development, feeling that for it to have a greater impact it would need to gain greater credibility with some faculty in the disciplines who may not support either the program, some minority students, or both. This lack of support on the part of some faculty, moreover, may weaken the potential of the program. Thus, he felt that the program would always be somewhat of a stepchild on the campus—no matter how successful it was—until it was accepted as an integral part of the academic function of the campus by the entire faculty.

MURALS

The MURALS program has existed on the UC Davis campus since 1988. It was designed to pair ethnically underrepresented upper-division students who have GPAs usually at least as high as 3.0 with faculty mentors who would supervise a joint research project in order to socialize the students to the research experience, provide them with a mentor, and hopefully spur their interest in continuing on to graduate school. The goal is to put more underrepresented minority students in the academic pipeline for the Ph.D. and eventually to help close the gap in faculty and research positions. The program normally enrolls about 50 students each year. In a unique twist, the program initially only includ-

ed the social sciences and humanities, but it was later expanded to include math and sciences. The faculty mentor was also seen as an important link in helping to facilitate graduate school applications for the students. The philosophy behind the program is that for most underrepresented students (whose parents are unlikely to have any experience with graduate education) the decision to go to graduate school is associated with encouragement by faculty, and with someone taking an interest in shepherding the student through the process. Most students spend two quarters in the program with the same faculty researcher; some will stay in the program for a whole year when the research study is ongoing and the collaboration is very successful. The program also provides a $400 quarterly stipend for students (and $250 per quarter for faculty), which serves both as an incentive for the students to participate and as a means of defraying college expenses.

An in-progress evaluation of the program includes a retrospective examination of the outcomes for student participants since its inception through 1997. Of the 400 students who had participated in the MURALS program and graduated by 1997, Martínez (in progress) was able to identify the outcomes for three-fourths, or about 300 students. Of these, 75 percent had gone on to graduate study, and two-thirds had done so within two years of graduation. Of those who enrolled in graduate programs, 72 percent enrolled in master's or Ph.D. programs. That is, most students were in academic disciplines as opposed to professional schools (which normally capture the bulk of minority postgraduate students). However, in order to understand how these outcomes may have differed for all students on the campus as well as for other underrepresented minority students, Martínez compared the outcomes for the MURALS graduates in the years 1993 and 1996 with both minority and nonminority graduates with similar grade-point averages and academic interests in those years. These two years were selected because the campus had conducted surveys of what its alumni were doing one year after graduation in those two years and excellent comparison data were available. (Response rates for both the MURALS sample and the university comparison sample were nearly identical at between 54 and 57 percent.) Martínez found that nearly equal percentages of students had enrolled in graduate school one year after graduation in all three groups—about 40 percent. However, non-MURALS minority students were found overwhelmingly in teaching credential programs, law school and, to a lesser extent, in master's programs. Only 1 percent had enrolled in Ph.D. programs. Among the MURALS students, on the other hand, 10 percent were enrolled in Ph.D. programs, compared to 6 percent for the nonminority sample. The study, while carefully conducted, suffers from relatively small sample sizes (56 MURALS; 274 non-MURALS minority; 1,143 nonminority) and certainly is vulnerable to the criticism that the data are at least partially biased by self-selection of MURALS participants. Nonetheless, the findings suggest that the program is channeling a significant number of underrepresented students into the academic pipeline and that many of these students are being accepted by Ph.D. programs immediately after completion of their undergraduate degrees. Moreover, the argument can be made that with MURALS the playing field has

been more than leveled for minority students wishing to go on to graduate school. Martínez further points out that since students are commonly counseled to use the year after graduation to get their graduate school applications ready so that they maximize their chances of acceptance, she predicts that a higher percentage of MURALS students than others would be found entering graduate programs in the second year after graduation, a proposition that could not be tested because equivalent data were not available for the non-MURALS samples.

Program Modifications. The primary modification to this program over time has been the gradual ratcheting up of the GPA requirement for participation. When the program began in 1988, the GPA requirement was 2.5. It was explicitly set at this relatively low point because administrators were interested in capturing students who might not be considered for other programs, and because there was a sense that working closely with a faculty member might inspire students to become more interested in their disciplines and increase their efforts to excel. The GPA requirement was later raised to 2.75 on the recommendation of university administrators for no particular reason other than that the prevailing mood on the campus was in favor of raising standards across the board for all programs. There were no data to show that the students who had a 2.5 had any poorer outcomes than students with higher GPAs. Finally, in 1997, the GPA requirement was raised to 3.0. Once again, this was due more to general campus philosophy than to any data that suggested such a change was needed. Ironically, the Martínez study finds that MURALS students in these lower GPA ranges were much more likely than non-MURALS students with similar academic profiles to pursue graduate education, and that this may be the area in which the greatest advantage is seen for MURALS students.

Program Costs. The program provides a small research stipend for participating faculty ($250 per quarter) and a $400 stipend to students. Since most students participate for two quarters, the direct costs for each student and faculty dyad are about $1,300. Adding the infrastructure costs for the program raises the per-student cost to about $2,500 annually. All program costs are borne by the university.

Program Challenges. The program has received strong support on the UC Davis campus, however, it is part of a University of California system that has rejected the consideration of race, ethnicity, and gender for participation in any of its programs. Thus the program changed its name from Minority Undergraduate Research Apprenticeships in Letters and Sciences to Mentorships for Undergraduates in Agriculture, Letters, and Sciences in order to avoid being labeled as a "minority program." And, although it is now open to all students, the focus of the program is still on narrowing the gap in graduate education for minority students. It requires considerable political skill, however, to maintain the balance.

Spend a Summer with a Scientist (SaS)

The Spend a Summer with a Scientist (SaS) program was created in 1989 by Richard Tapia, professor of applied mathematics at Rice University. The program provides the opportunity for both undergraduate and graduate students to spend one or more summers with a research scientist, jointly conducting research. The program's ultimate goal, like that of MURALS, is to stimulate the pool of minorities and females going on to graduate education and completing a Ph.D. degree. However, SaS focuses on applied mathematics, computational sciences, and engineering; and it functions as both a recruitment and retention program as well. The program pays students to do research, and it incorporates a mentorship component that is provided by a faculty or older graduate student and requires weekly meetings at which participants get to know each other and "learn important lessons about what it means to be an academic, a researcher, and a minority in one's field" (Alexander and Foertsch, 1998). There is also an outreach component to the program in which participants serve as mentors to high school students for two weeks during the summer and give presentations on their research to K–12 teachers attending a summer workshop. Thus, participants are socialized to roles of researcher, academic, and teacher; and they also learn to work with the K–12 educational sector.

In an attempt to evaluate the effectiveness of the program in stimulating graduate school enrollment and degree completion, Alexander and Foertsch tracked the outcomes for 52 of the 68 participants in the program between the years 1991 and 1997. Surveys were sent to all 52 locatable participants, and 29 were returned for a response rate of 56 percent. In addition, 25 participants were interviewed by telephone.

For the 22 (of the 52) respondents who were undergraduates at the time of their participation in the program, two-thirds had gone on to graduate school and the other one-third were employed in a technical field. Of the 30 who were graduate students during their tenure in the program, 8 (27 percent) had completed Ph.D.'s and 45 percent were still enrolled in graduate school with eventual outcomes unknown. Only one of these students had left college without a degree. Of course, these were all highly competitive students (no GPA or test score data are provided for participants, but they are selected on a competitive basis from throughout the nation) who had expressed an intent to continue their studies and wanted to spend their summers doing research, so this is a very "targeted" sample. Acknowledging this fact, the evaluators sought to answer the question: *Would they have gone on to graduate school anyway, without the experience in SaS?* They did so by interviewing students to gain their perspectives on this question. The evaluators note that "many" of the graduate student participants cited the program as a "major factor" in convincing them to remain in graduate school and complete their degrees "when the going got tough," and all four of the undergraduate students who were interviewed said the SaS program was "the deciding factor in their decision to attend graduate school." The numbers in this study are very small and hardly representative of underrepresented minority

students as a whole (in fact, we really do not know what they were representative of since no demographic data are reported for the samples). However, the findings are highly consistent with accounts in the literature of the critical importance of faculty encouragement (cf. Stamps and Tribble, 1995; Gándara, 1995). Several SaS students commented that they "had never even thought of themselves as having the potential to enroll in graduate school until they participated in the program and were convinced by Dr. Tapia and their experiences in the program that they had what it takes to succeed as a graduate student" (Alexander and Foertsch, 1998).

Importantly, 89 percent of the surveyed participants reported that being in the company of other minority students during the SaS program increased their desire to enroll or remain in graduate school. Interviews with SaS participants also corroborated the importance of this aspect of the program. The program directly confronts the issues of race, ethnicity, and prejudice within academe in the weekly meetings, thus it fosters an acknowledgment of both the challenges that minorities face and the importance of finding support in personal networks of peers.

Program Modifications, Costs, and Challenges. Because we were unable to interview anyone from this project, we could not gain access to information about modifications made to the program, though it is clear that some had been made since the researchers caution that it took many years to refine the program and to bring it to its current level of success. No data have been provided about costs, however, we discern that the program is fairly expensive since it pays salaries to both faculty and students during summer months and supports an infrastructure that includes workshops aimed at the K–12 community. With respect to challenges, the evaluators do not note particular challenges for the program, but it is notable that Rice University is in the Fifth Circuit where the *Hopwood* decision has resulted in the ban on use of race, ethnicity, or gender as considerations in program admission or financial aid. Because Rice is a private university, it is not directly affected by *Hopwood,* though the social climate in Texas is certainly a difficult one in which to be addressing the special concerns of minority students in higher education.

Summary of Socialization Programs

Programs that focus on the socialization of students into different sectors of academe all attempt to provide much of the cultural capital—knowledge of the ways of the system—that many underrepresented students lack. In an effort to induce the students to pursue graduate study, these programs focus on acclimating students to the demands of the academic culture, helping them to both internalize and meet high performance standards and helping them see the rewards inherent in a life of research and study. Two of these programs are also quite explicit about confronting issues of racial and ethnic bias that students would encounter in academe, and/or they grouped students in ways that would foster intraethnic and interethnic alliances to support the students both psychologically and academically. A

clear part of the socialization of these students is understanding what it means to be a high-achieving minority in a world that often sees the term as an oxymoron and coming to terms with attitudes and situations that the students would not be able to change—at least in the short run. A primary challenge alluded to by these programs as well as others is the difficulty in getting some of the mainstream faculty to see the value of the program, support its goals, and provide support for its students. Directors of programs have told us that the single greatest stumbling block they face is the entrenched attitudes of some faculty—especially in the SMET disciplines—who have never worked successfully with a minority student. On the positive side, these programs demonstrate the power of encouragement, under conditions of close collaboration, provided by faculty members and older graduate students in helping ethnic minority students to internalize the norms of academe and to envision themselves as professors and researchers in their disciplines.

Freshman Year Programs

Philosophy

The overriding philosophy for all three programs in this category was that the most formidable impediment to academic success for underrepresented students was the key "gateway" courses in SMET disciplines that are normally taken in the freshman year and are well known to serve as a means of screening out first year students. Many colleges, especially large public universities, operate on the assumption that they can admit many more students into their programs than they have faculty or space to accommodate because a large percentage of the students will exit the program upon failing the gateway courses. Because many underrepresented minority students come from high schools that have not been as rigorous as those attended by suburban White students, minority students are the most vulnerable to the weeding-out process. If students can be helped to be successful in these courses, a major barrier to successful completion of a degree in a SMET discipline can then be removed.

21st Century Program

The 21st Century Program at the University of Michigan is based on a theoretical perspective advanced by Claude Steele of Stanford University that attempts to explain the consistently low performance of some ethnic minorities (and women in some areas) as a function of disidentification with schooling and academic activity. Steele (1997) maintains that because African Americans and other minorities are often stereotyped as intellectually inferior, academic situations in which they must perform competitively can be threatening, producing performance anxiety that can significantly depress scores. Hence, devaluing academic prowess and removing themselves from academically competitive situations are effective ways of protecting their self-images. Thus the observation of many of the resistance theorists (Ogbu, 1986; Fordham and Ogbu, 1986) that many students of

color resist trying to do well in school for fear of "acting White" is revealed as a strategy to save face and deny others the opportunity of confirming their stereotypes about ethnic intellectual inferiority. A broad cross section of individuals across campus, including personnel from student services and housing, spent two years planning for the program as a partial test of this theory.

Each year, the program recruits approximately 250 freshman students who are randomly selected, admitting all ethnicities but oversampling for Blacks and other minorities. In order to avoid being typed as a remedial program, students were told the program was about transition to college but the invitation had an "honorific" voice. The program's objective is to reduce underachievement among minority students. Students are housed together in one dormitory to create a sense of community, and they are offered, on a voluntary basis, challenge workshops for four hours per week in calculus, chemistry, physics, or writing, modeled on ESP workshops. Students are also expected to participate in small weekly discussion groups that focus on personal and social issues. These activities last for the first semester of the freshman year. The 21st Century Program attempts to create a "safe space" for the participants where they can openly share doubts and concerns, find both psychological and academic support among peers, and build confidence in their own skills.

In evaluating the performance of students at the end of the first two years of the program, comparing regression lines (with first semester freshman GPA regressed on SAT scores) of Black 21st Century students (27) and several comparison groups of both Black and White participants and nonparticipants, Steele concluded that the Black 21st Century students outperformed their Black comparisons with respect to first semester GPA. He further noted that "the Black students showed almost no underachievement; in the top two-thirds of the achievement distribution, they had essentially the same grades as White students. …and that as long as four years later, only one of them had dropped out" (p. 626). Thus the effects of the program were largely confined to the upper two-thirds of the program population. And, while the program did appear to reduce the dropout rate for Black students, in each subsequent year the Challenge group looks more like the patterns of dropout for all students, and for Black students at large. Steele also noted that no significant differences were found for minority groups other than African Americans—a finding that has been reported in other studies reviewed here, and one that deserves further investigation.

Steele believes that the program did demonstrate the viability of his theory and the need for students, especially Blacks, to find a supportive niche within the university when they arrive. However, he also notes that after it was piloted changes were made in the program that contributed to weakening its effects, and some components that would have reinforced the effects of the program never came to fruition, such as the desire to link the program with a mentoring program on campus that would have provided continued support and monitoring for the students in their sophomore year.

Program Modifications. Steele found that while students were encouraged to attend the academic workshops and seminars, they did not always do so and thus the potential effect of these workshops was not consistently experienced by all participants. Therefore, by the third year of the program, students were told they were *expected* to attend workshops and the seminar was made a required part of the program that carried class credit. Unfortunately, it is difficult to know to what extent these modifications had on longer term effects because research stopped short of analysis of these data. After the originator of the program left the campus, changes were made that were inconsistent with the original intent, including an increase in its size, the loss of the research perspective, and a change in the nature of the program.

Program Costs. The 21st Century Program was designed to be low cost, in part because if it were higher it would have run into considerable political problems on campus. Cost per student was about $240 annually at the time of the research (early 1990s), and this was borne by the campus.

Program Challenges. This program had several challenges on the Michigan campus. Even though the directors had foreseen that it would be a laboratory for innovative pedagogy, most faculty in the disciplines eschewed the opportunity to experiment with their teaching or curriculum. The program had some difficulty getting students to attend the workshops, which had been based on the ESP model, so the pedagogical aspects of the program were not fully realized for all students. There was also some competition for funds for special programs and because this program had received a fair amount of publicity, some jealousies surfaced that may have served to undermine its aspects. Perhaps a key challenge was that because it was initiated as an experiment and the research aspects of the program were as important as the service delivery, the program lost much of its vigor and some of its direction when the research was ended. While it was specifically designed to be low cost and not dependent on a charismatic leader, it appears that, in the end, it suffered from the absence of a charismatic researcher.

Biology Undergraduate Scholars Programs (BUSP)

The Biology Undergraduate Scholars Programs (BUSP) began at the University of California's Davis campus in 1988 under the direction of microbiologist Merna Villarejo, with the objective of increasing the number of underrepresented minority students who are strong candidates for graduate and professional programs in biology. The premise of BUSP is that a solid academic foundation and positive experience at the university in the early years will provide the platform on which to build future academic success. It operates to ensure that students successfully navigate the gateway courses of calculus and chemistry, which so often eliminate underrepresented minorities from science majors, and

to strengthen students' writing skills. This is accomplished by providing a summer bridge program and special courses and workshops in math, science, and writing.

We include BUSP with freshman year programs because this is its core focus and the mission with which it began in 1988. However, the program has matured over the years to encompass a host of additional services, and it monitors students and engages many of them over their entire undergraduate career. As such, it *could* be categorized as a comprehensive program, however, here we wish to focus on the success it has been able to demonstrate with freshman year course work.[4] The program also provides students with financial support through a paid internship in a faculty member's laboratory, a supportive network of peers, and supplemental course work in chemistry and calculus that is based on an enrichment rather than a remediation model and that prepares students to excel in these gateway courses. The curriculum for these workshops is based on the ESP model, emphasizing challenging problems and group-learning strategies. These courses provide workload credits, but do not fulfill graduation requirements. Students are also enrolled in a two-quarter sequence of classes entitled "Opportunities and Issues in the Life Sciences." This course is geared toward reinforcing students' interest in the life sciences and expanding their understanding of professional options as most students in the program do not envision any options beyond medical school. The program gauges its success in large part by the number of students it places in the pipeline to become research scientists.

BUSP is also highly structured, requiring students to sign a yearly contract committing them to participate in all program activities. The only component that is optional is the research laboratory experience, and approximately two-thirds of the students, representing the entire continuum of academic achievement, elect this option. BUSP has been hugely successful in engaging faculty in the program—230 faculty members (of a potential 350) take students into their labs and BUSP provides stipends in inverse proportion to students' usefulness (i.e., freshmen salaries are fully subsidized, sophomores are partially subsidized, etc.).

Given the program's objectives, the director felt that the most important outcomes to investigate would be the students' performances in the gateway courses and persistence through the first year core courses. Data were collected for 219 BUSP participants admitted in 1988 through 1991, a pre-BUSP comparison group of 63 largely ethnic minority students admitted to the biology major in the two years prior to the inception of BUSP, and a cross-sectional contemporary comparison group, comprised of 139 largely non-minority students and matched for gender and SAT I–M scores. The two control groups were incorporated because the historical group, while providing a comparison with other ethnic minority students like those in BUSP, had significantly lower mean SAT I–M scores than the BUSP experimental group, and the cross-sectional group did not contain sufficient numbers of BUSP-like minority students to be matched on ethnicity.

[4] *An evaluation of the total program, including data on the long-term outcomes for BUSP students, will be written in the summer of 2000.*

One major finding of the study was that the SAT I–M was the strongest predictor of performance in general chemistry and calculus. As might be expected, BUSP students significantly outperformed the pre-BUSP students in chemistry, however, this finding is moderated by the fact that the BUSP students entered the university with much higher SAT I–M scores than their pre-BUSP comparison group. When BUSP students were compared with controls, matched on SAT I–M scores but not socioeconomic background, there were no significant differences in either performance in gateway classes or persistence through the first year core. The authors (Villarejo and Tafoya, 1995) conclude that "BUSP participants have largely overcome the disadvantages historically associated with membership in an underrepresented minority group and perform at the same level as the cross-sectional biology group" (p. 16). If one assumes that the SAT I–M scores would have overpredicted the minority students' performances as a number of studies have concluded (cf. Durán, 1983; Nettles, Thoeny, and Gosman, 1986), then this conclusion can be taken at face value. Villarejo and Tafoya also found that BUSP had an effect on increasing the proportion of students receiving grades of B or better in chemistry and calculus such that the percentage of BUSP students performing in this range was essentially the same as for the non-BUSP students (43 versus 46 percent). Recent data show that 39 percent of BUSP graduates enroll in postbaccalaureate degree programs, and another 33 percent express an intent to continue their education. Ten percent are teachers in K–12 schools.

Program Modifications. This program has undergone major programmatic changes over the years. As noted earlier, the director found that students who were not prepared to succeed in at least precalculus, based on their SAT I–M scores and a prescreening test, were not likely to succeed in the bioscience curriculum and BUSP was not especially effective with these students. Therefore, the decision was made to divert these students during the freshman year into remedial mathematics courses prior to entering the biology major and the BUSP program. Only about 20 to 25 percent of students who are so diverted enroll in BUSP the following year, however, those students who persist are likely to succeed in the program. At the suggestion of students, more workshops and courses have been added to the initial core program that focused on freshman-year calculus and chemistry. Weekly sophomore seminars, preorganic chemistry workshops, and BUSP Honors Research for juniors and seniors have all been added. The new program activities are designed to extend the reach of BUSP well beyond the freshman year, to build in more consistent contact with students, and to provide a forum for discussion of their research as well as other issues that arise.

Program Costs. Freshman year activities cost about $2,200 per student, based on an annual cohort size of 68 students. This includes the cost of supplemental instruction, advising, and the laboratory work for which students are provided stipends sufficient to help defray their university costs. The major source of funding for the program is the

Howard Hughes Medical Institute. But the program receives funds from several sources, including some in-kind contributions from the university.

Program Challenges. BUSP did not discriminate by socioeconomic status (SES) for admission to the program prior to the passage of Proposition 209. However, with the passage of this initiative, it became illegal to use state funds to target "minority" students as opposed to low-income students, and the Howard Hughes Medical Institute introduced new rules that are consistent with the intent of Proposition 209. This would have had the effect of eliminating underrepresented students from ostensibly middle-class backgrounds who represent an important resource to their community from the program. However, funding from an NIH-sponsored initiative allows the program to continue to serve some students who do not meet the current disadvantaged criteria.

While the program has enjoyed widespread faculty support, no doubt in part due to the extraordinary efforts of the director to bring in funds that also help support faculty research, it has not been able to attract all the faculty to its mission. The director notes that her biggest challenges are not the students or any aspects of the program itself, so much as a small group of recalcitrant faculty who do not support the program and who can, sometimes in subtle ways, undermine its objectives. Fortunately, because of its financial independence from the campus, it has not been vulnerable to funding cuts, but unsupportive faculty must be monitored.

Emerging Scholars Program (ESP)

The Emerging Scholars Program (ESP), which is also known as the Math Workshop Program (MWP) at Berkeley and on other campuses, began in 1978 at the University of California at Berkeley and since that time has been disseminated to numerous sites around the country. Professor Uri Treisman developed the program in response to the observation that Black students, in particular, often did poorly in calculus. But the reason for their failure was *not,* as many people thought, because the students were inadequately prepared coming into Berkeley, but because of an insidious pattern of social and academic isolation that did not allow them to capitalize on the strengths they brought to the university. In contrast, Asian students who were quite successful in the same classes were not isolated. They developed strong study groups and peer networks that aided their mathematics performance. From these observations, Treisman designed the program with three essential features: (1) a nonremedial philosophy; (2) a carefully constructed, challenging curriculum designed to both fill in any gaps in students' math preparation and provide enriched, high-level instruction in calculus; and (3) a cooperative learning environment where students can interact with the curriculum and with each other. The learning groups are encouraged to socialize and study together outside of class and to provide important peer support for one another. Mathematics graduate students lead the workshops and discussion sections and also serve as role models for continuing on to graduate education. Another

important aspect of the program is increased time devoted to the material—ESP students sign up for an intensive discussion section that yields unit credit and extends the amount of time dedicated to the lab section from the normal two hours per week to six. Class sizes are also reduced for the ESP labs to foster more interpersonal contact. Another central tenet is "making rules explicit." The program works to make students understand what mathematics courses are necessary to continue on to technical majors and what is required to be successful in calculus. Treisman (1992) has left a long paper trail, allowing the reader to understand the logic that underlies the evolution of ESP.

While it is relatively straightforward, and perhaps because it is, ESP has been broadly disseminated and is actually quite well researched and documented. We were able to locate several studies on different campuses around the country whose methods were sound enough to lend considerable encouragement to the findings.

Recently published evaluation studies were located for ESP programs operating at the University of California at Berkeley (Fullilove and Treisman, 1990), California Polytechnic (Bonsangue and Drew, 1995), the University of Texas, Austin (Moreno, et al., 1999), and the University of Wisconsin, Madison (Kosciuk, 1997). All of the studies found significant differences between ESP students and their comparisons. Two studies (Bonsangue and Drew; Kosciuk) were especially careful in controlling for precollege variables such as ACT, SAT, GPA, and calculus placement test scores, and both provided comparisons for a host of other minority and nonminority comparison groups, including both genders. Whereas the two studies had moderately small ESP samples (57 and 123), they incorporated several different types of analyses (odds of success ratios, ANOVAS, and simple tests of difference). Across all comparisons, the ESP students outperformed the non-ESP students in GPA and successful completion of core courses. In all studies but the Kosciuk, which had the smallest sample sizes, ESP students outperformed their non-ESP comparisons with respect to retention as well. Differences between genders were not significant. While none of the studies was able to control for self-selection—ESP students are recruited and voluntarily enroll in the program—the weight of the combined studies, samples, and methodologies lends credence to their unanimous findings. It would appear that there are independent effects for the ESP model and that something in the combination of a high-powered curriculum that places high demands on students, coupled with a supportive learning group of peers (including sophomores, juniors, and graduate students) where problems are solved jointly, evidently does increase the achievement of (underrepresented) students.

It is difficult to draw conclusions about the percentage of ESP students who perform at very high levels, inasmuch as none of the evaluations of the ESP program provides data on the percentage of students performing at the above 3.5 level. Several studies show the percentage of students who earn grades of B or B– and above in the calculus sequence, thus aggregating the very high performers with those more moderately successful achievers, and comparing these to non-ESP students. The percentage of ESP students with grades at this level is 70 percent and above, and this is consistently higher than the non-ESP comparisons.

Program Modifications. Like the Georgia Tech Challenge Program, ESP felt that it was critical to be embedded within the mathematics department, instead of being an isolated program outside the mathematics mainstream, in order to gain credibility with faculty and ensure their support. Thus, several years into the program it was moved into the mathematics department, which also permitted students to take the ESP sections for unit credit in mathematics, allowing them to carry a somewhat lighter course load in the freshman year. Program evaluators note that the integration of the program into the core of mathematics instruction is one key to its success.

Program Costs. It costs approximately $1,200 per year per student to provide the program, inclusive of personnel, materials, and infrastructure. The cost has been an issue, and directors report that some campuses balk at the idea of spending these funds on particular students and not on all students.

Program Challenges. ESP has a long history and is well-established in Berkeley, Austin, and other campuses. Over time it has been refined into a carefully articulated, structured program with well-considered components. The ideas that drive it are so widely accepted that many programs around the country incorporate it in part or in whole into their sets of strategies. However, it is clear that Proposition 209 and *Hopwood* pose real challenges to the program. While multiethnic, the core focus on African Americans and other underrepresented minorities has been central to its mission. Like other programs in the post-affirmative action era, ESP is searching for the proper balance between serving students broadly and maintaining its central mission to close the gap in mathematics performance between minority and majority students.

Summary of Freshman Year Programs

Substantial evidence in the literature demonstrates that gateway courses pose a significant barrier to pursuit of degrees in the SMET disciplines for underrepresented students. Thus, programs that "unpackage" the gateway curricula and help students to experience success early in their careers provide several advantages: They socialize students early to set high (and demonstrably achievable) standards for themselves; they maintain the students' interest in the discipline; and they significantly reduce attrition. First year programs may also focus on helping students to find a comfortable niche in the university setting. Since most college attrition occurs between the first and second years, largely because students do not come to feel connected to the institution or other students, there is a clear need to ease both the social and academic transition into college for students who may feel marginalized. Each of these programs has achieved some success in these endeavors and each has lessons to impart. Common themes among these programs are the need to engage all faculty in the mission of the program, the need for extended contact with stu-

dents beyond the first semester or first year, and the need to strike a balance between providing diverse environments for students and creating a "safe place" for students who need the social and psychological support of other students from similar backgrounds who share many of their same struggles.

Comprehensive Programs

Philosophy

Two of the programs were so comprehensive in their approach that it was impossible to define a single focus. In fact, in one case (Meyerhoff), the directors contend that the program could not function without all of its separate elements working in concert. In the other case, Xavier Biomedical Honors Corps, the program is so integrated into the fabric of the institution itself that it is sometimes difficult to separate the program from the institution. Here, the philosophy is clearly that multiple sources of support and connection are critical to providing the kind of "cocoon" that the program attempts to create for its students and the relationships that extend over the entire course of the undergraduate career.

Xavier University's Biomedical Honor Corps (BHC)

Xavier University's Biomedical Honor Corps (BHC) is unique in a number of ways. Minimum criteria for admission to the BHC are not exceptionally high: ACT of 20 or SAT I of 820 and GPA of 2.9, although the average scores and GPAs are considerably higher and have been rising for some time. Like the ESP, the Xavier program makes explicit what is required to succeed in the program, and it also is explicit about what it considers success—admission to graduate or professional school, especially in medicine. The program begins to groom its future participants starting at the end of the eighth grade. Xavier is an all-Black Catholic college and draws about half of its students from the surrounding community (the other half come from all over the United States and abroad). Throughout their high school years, students who seek admission to Xavier can take summer courses that prepare them for algebra, biology, and chemistry. Xavier keeps the cost of the summer program to a bare minimum and defrays the cost to the students through grants. During the summer prior to entering college, new freshmen can take a residential course, SOAR, that focuses on developing vocabulary and problem-solving skills to bolster students' skills in these important areas as well. Hence, students may enter the university with several years of careful preparation for college.

Xavier faculty who work with the Biomedical Honors Corps can only be described as passionate about their mission of leveling the academic playing field for African-American students. Unlike research universities where a faculty member's value is largely measured by his or her research and extramural funding, the emphasis at Xavier is on teaching. Xavier faculty consider it a honor to teach freshman classes "because it means that your teaching skills are excellent." Moreover, testing is viewed by the faculty as a

measure of their own teaching effectiveness. Xavier faculty also work very closely with high school teachers in developing appropriate precollege and college curricula, and over time the Xavier faculty have modified their science and math courses in ways that are consistent with much of the literature on learning and cognition. For example, courses are carefully mapped so that students can anticipate each aspect of the curriculum in advance. They are given more time to deal with topics in depth, rather than attempting to survey the entire field at a more superficial level. Students are provided with frequent feedback in the form of tests and quizzes, allowing them to identify areas of weakness and to relearn concepts that have not been adequately assimilated. Problem-solving and vocabulary development are core aspects of all of the classes. Cooperative learning techniques are employed extensively and students are helped to form study groups. The standardization of curriculum also provides for careful articulation among the courses and facilitates tutorials across classes and instructors. Additionally, the BHC provides careful monitoring of students, peer counseling and tutoring, and special workshops and seminars focused on academic and career topics. In order to motivate students to aspire to graduate education, they are exposed early and often to the procedures and requirements for applying to graduate and professional schools.

The feature that makes the BHC unique among all programs we have reviewed (and observed) is the extraordinary degree of curricular modification. It extends far beyond what most colleges and universities would be willing to attempt. Xavier faculty in mathematics and sciences came together to design a curriculum that all faculty could agree eliminates redundancies, dovetails from course to course, is linked across the disciplines, contains specified common lessons, and is uniform across the campus. In so doing, the faculty voluntarily gave up a great deal of autonomy in the classroom. In designing the curriculum, faculty identified areas that were troublesome for students (where they tended to test poorly), and lessons have been designed to target these concepts, sometimes interdisciplinarily. It is impossible to imagine this degree of cooperation among faculty in a research university, nor in many cases would it be considered desirable in these institutions. However, the result at Xavier is a curriculum that prepares African-American students who may not even be accepted as undergraduates at many major research universities to become very competitive for the nation's highly coveted slots in medical and graduate schools.

Xavier is the nation's number one provider of Black students to medical and pharmacy schools. The BHC bases its evaluation outcomes on successful applications to professional and medical schools, and using national statistics for similarly prepared (ACT or SAT scores) African-American students, Carmichael, et al. (1988) conclude that "more than three times as many of a wider range of students (those from the top 20 percent of African Americans nationally) who enter Xavier University as biology or chemistry majors persevere and gain entry into biological science graduate or professional schools." Xavier BHC evaluation studies do not provide data on the percentages of students who perform at

exceptionally high levels in college courses, however, evaluators of the program have published numerous studies on the predictive power of high school grades and standardized test scores on performance at Xavier. The investigators conclude that Xavier has eliminated the conditions that lead to the overprediction phenomenon among Black students.

Program Modifications. The major changes in the Xavier program have been the constant modifications to the curriculum as faculty meet and review student performance on a regular basis. When a problem area is noted in the curriculum because students are testing poorly, faculty meet to rethink and redesign the curriculum or the pedagogical approach.

Program Costs. Costs for the Xavier program are relatively minimal. The Howard Hughes Medical Institute provides grants that largely support the summer program, and the students are assessed a small fee. The academic year program is woven into the operations of the college, and the only expense that the director could identify was the cost of release time for the faculty to meet. Xavier reports data that show that its per student expenditures are actually lower than the average for other similar historically Black colleges and universities (HBCUs).

Program Challenges. The faculty view the greatest challenge to the Xavier program to be keeping a core of professors with the same sense of mission and level of dedication as the faculty who have come together to create the BHC. The hetereogeneous faculty in this historically Black college are not highly paid by average college/university standards; they carry heavy course loads—teaching up to five courses per semester. Moreover, they have given up a great deal of personal and instructional autonomy in favor of teaching a uniform curriculum designed to maximize students' ability to succeed in rigorous mathematics and science courses. To date, the university has been successful in recruiting like-minded faculty. Whether it can continue to do so in the increasingly competitive marketplace of higher education remains an open question.

Meyerhoff Scholars Program

The Meyerhoff Scholars Program was begun in 1988 at the University of Maryland, Baltimore County, by the charismatic Black educator who was to become president of the school. Freeman Hrabowski, using a gift from the philanthropist for whom the program is named and additional federal funding, targeted the program to Black SMET students (however, more recently the program has opened its doors to non-Black students). Hrabowksi had studied the problem of Black underachievement for many years as a faculty member, then later as a college administrator at both traditionally Black and White institutions. He pored over students' transcripts and observed the problems they experienced in college. More than 20 years of experience brought him to a series of conclusions about what was needed to ensure success for Black students in rigorous math, science, or

engineering curricula. Noting that the students needed a stronger foundation in mathematics and science, Hrabowksi instituted a first year algebra minicourse designed to strengthen mathematics skills and worked with faculty to redesign courses in physics, chemistry, biology, and engineering to make the courses more relevant. In chemistry, students were first introduced to research interests of the faculty to make the subject come to life; in engineering, students were encouraged to engage in a project for the homeless to see how engineers might connect with real social problems. Hrabowksi also concluded that students needed to understand what was required to succeed at high levels, so he incorporated older students who were functioning at the highest levels to act as TAs and counsel new students on what is required to excel. Students are also counseled to share tests and notes to help each other succeed at high levels. Courses incorporate a lesson in which students are required to plot the number of hours needed for study in order to get an A in a class—the standards and requirements are made explicit.

Because the Meyerhoff Program is geared toward producing leaders in their field—the goal is to produce science or engineering researchers with graduate degrees—the criteria for acceptance are fairly selective. It admits students with a minimum combined SAT I score between 1000 and 1050, SAT I–M between 500 and 550, and GPA between 3.5 and 3.7. However, the actual mean scores of participants tend to be considerably higher (SAT I = 1180 and SAT I–M = 635 for the 1989-91 cohorts). The program accepts between 30 and 50 students each year. Students are provided with virtually every kind of program component that can be found in the literature: full or partial scholarships; mentors; tutors; academic advising; special summer bridge classes in math, chemistry, and humanities; family involvement activities; and shared living space with other participants.

An element of the program that Hrabowski considers to be both unique and very important for the success of the Meyerhoff students is not actually written about in the extensive literature on the program. Hrabowski contends, like other Black educators with whom we spoke, that a spiritual element to the program is responsible for a good deal of the values inculcation and personal support that takes place. Students are encouraged to attend church with the president, and Hrabowksi notes that a significant portion of the church choir is comprised of Meyerhoff students. Hrabowksi has a great personal impact on the students in the program and their point of contact is often through the Sunday services. Moreover, he contends that the values-oriented curriculum—learning to succeed for something more than one's own aggrandizement—is a critical, though little spoken of, aspect of the program. Queried about the effect that introducing non-Black students into this milieu has on these culturally relevant aspects of the program, Hrabowski notes that the non-Black students are less inclined to participate in these activities, though they provide important models of achievement and individual struggles for the Black students. By participating in a program with non-Blacks, the Black students come to see both the similarities in the struggles of all students and to find ways in which they can support each other across ethnicities.

The first four cohorts of Meyerhoff students were followed to ascertain persistence rates. Between 85 and 95 percent of students in the first four years remained in the program to completion. Given persistence rates for African-American students in science and engineering, this is extraordinarily high. To try to understand to what extent these persistence rates could be attributed to aspects of the program, 34 Meyerhoff scholars from the 1989-91 cohorts were matched with 34 non-Meyerhoff African-American students from the period prior to the inception of the program. Students were matched on SAT scores, high school GPA, gender, and ethnicity. Analyses of covariance demonstrated significant differences between the two groups on freshman GPA, science GPA, and grades in calculus, analytic geometry, and chemistry between the matched samples, all in favor of the Meyerhoff scholars—and by substantial margins. For example, the average freshman GPA for the Meyerhoff group was 3.5 compared to a pre-Meyerhoff group mean of just 2.8 (Hrabowski and Maton, 1995).

The Meyerhoff scholars' average GPAs in both science and nonscience courses were significantly higher than for controls, and ranged between 3.4 and 3.6 (no standard deviations are reported), suggesting that *on average*, the Meyerhoff participants were achieving at high levels. Assuming that the standard deviations were not extraordinarily large, we can infer that the Meyerhoff Program was producing a significant number of high-achieving science and engineering students. Because historical comparison groups, such as the group used in this study, have certain drawbacks—it is not possible to control for differences in a host of experiences that the two groups may have encountered—the evaluators conducted another study with current matched samples (Maton, Hrabowski, and Schmitt, in preparation). Again, the researchers found that Meyerhoff scholars (at this point, still all Black) were two to three times more likely to persist to graduation in SMET majors than either Asian or Caucasian peers, and that their GPAs were equal to those of the Asian students with similar preparation and higher than those of the Caucasian students.

The evaluation team is dedicated to conducting the most rigorous type of evaluation possible, even introducing random selection of participants and controls, and studying the outcomes for Meyerhoff students longitudinally. As data are released, this is expected to be among the best studies of program effects available in the literature. Nonetheless, at this point, using the existing data, it appears that the program is highly effective in helping students to sustain high levels of achievement and to aspire to graduate education.

Program Modifications. The most significant modification in the Meyerhoff Program over the course of its existence was the decision to include non-Black students. Program directors note that this decision was made prior to the Banneker decision (which was the result of a challenge to another UMBC program), but certainly was in response to what was apparently a growing sentiment—that such programs could be viewed as exclusionary. This change in policy certainly has implications for the impact of particular aspects of the program, especially those that have a cultural relevance. Still, 60 to 65 percent of

participants are African Americans, and African-American culture is the focus of much of the summer bridge program. Program staff are all African Americans, as is the president of the university and the founder of the program. The evaluation team systematically interviews program participants and graduates in order to better understand their experience in Meyerhoff. These interviews should provide important information about how a more diverse participant pool affects student experiences and outcomes.

Program Costs. The Meyerhoff Program is often referred to as the "Cadillac" of college intervention programs. Meyerhoff scholars receive full tuition (about $15,000 annually) and Meyerhoff finalists receive partial tuition in addition to the many support services and activities the program offers. There is considerable program infrastructure, and careful evaluation has been built into the program as well. Thus, while no one had calculated the exact cost of the program, it is not unreasonable to assume that it averages at least $25,000 per scholar. Costs are covered by a number of grants in addition to the Meyerhoff foundation monies.

Program Challenges. Whereas program directors are reluctant to engage in this conversation, it is clear that the changes in the composition of the Meyerhoff students will present at least two kinds of challenges. First, the rather dramatic increase in non-Black students over a short period of time (from zero to about 35 percent in three or four years) suggests that there will be a significant demand for the program from a sector of the population for which the program was not initially targeted. Second, the increase in non-Black students raises questions about the viability of cultural components that have been geared fairly exclusively to a Black student population. It remains an empirical question as to whether or not the program can achieve equal successes with all ethnic groups and if aspects that have been viewed as uniquely tailored to the needs of Black students will continue to have the same impact in a more diverse setting.

Summary of Comprehensive Programs

The comprehensive programs we studied represent enormous investments of resources—financial or human, or both. While these programs tout extraordinary successes, there remains a question as to whether many other colleges or universities could (or would choose to) implement similar programs because of the costs associated with them, as well as the very real sacrifices made by some faculty. The great value of these programs is the example they set for what is possible when dedication, sense of mission, and resources are combined at very high levels. The challenge is to draw lessons from these programs that can be transported (and adapted) in sites that will not have the same resources, but may wish to enhance their own strategies. Certainly we can conclude that program strategies that engage students over their entire undergraduate career, offering various kinds of opportunities to connect with the program, and "unpackaging" the curriculum, using testing as a measure of teaching

effectiveness, and placing the faculty with the best teaching skills in the first year courses are all strategies that appear to bear fruit in these comprehensive programs.

Conclusions Based on Program Evaluation Findings

While we found few published studies that tried to evaluate programs with anything like scientific rigor, those we located that did attempt to study their effectiveness yield important insights into how to address the overprediction problem. In fact, we conclude that there is now a substantial knowledge base about increasing the achievement of underrepresented minority students. The approaches we have uncovered fall into two categories: (1) strategies for reducing the "inhospitality index" of institutions and, therefore, reducing or eliminating the overprediction problem; and (2) strategies that are geared toward stimulating exceptional achievement among targeted students. Of course, those strategies that we define as reducing the overprediction problem may well be necessary components of the second goal—stimulating high achievement—and should be considered as foundational for any program that attempts to increase student achievement. However, while the implementation of these strategies may meet minimum conditions for increasing achievement, they may not be sufficient to accomplish the more daunting task of creating a cohort of exceptionally high-achieving students. Therefore, we address each set of approaches separately.

Reducing or Eliminating the Overprediction Phenomenon

1. **Recruiting a critical mass of underrepresented minority students.** Being "the only" or one of a handful of students of color on a campus or in a program can be both socially and psychologically isolating. Without supportive peers in whom a student can confide his or her self-doubts or seek academic help without concern about reinforcing other people's stereotypes about ethnic inferiority, students risk feeling marginalized and may fail to make binding connections with the institution or with their peers. Abundant evidence indicates that such students are much more likely to dropout or underperform. On the other hand, a critical mass of like-students provides both moral support and the opportunity to employ a number of well-researched interventions that have proven effective for increasing student achievement.
2. **Creating supportive groups for study and social life.** A growing body of literature lends support for the effectiveness of carefully engineered study groups that provide support and peer instruction and that are integrated into the social lives of students. The ESP model—which incorporates rigorous (and carefully constructed) academic tasks, more advanced peers or faculty as group resources, and regular structured meetings for extended time periods—has been shown to increase academic achievement among both minority and nonminority students. Moreover, the study groups may become an important part of the students' social network, helping to link students to the school and to their peers.

When the curriculum is structured to challenge students, while simultaneously reinforcing lower level skills, it can play an important role in enhancing student achievement.

3. **Unpackaging the curriculum.** Some of the most successful programs had engaged in extensive study of their own curricula, seeking to identify what was critical and what was not, what students consistently stumbled over and therefore should be taught differently, what overlapped with different classes and therefore was redundant, and what simply required more time and intensive study to assimilate. Given this information, successful programs adapted their curriculum and provided supplemental instruction to students to ensure that difficult concepts were learned. In the rather extraordinary example of Xavier University, faculty actually agreed to present a uniform curriculum, including specific lesson plans, across the entire mathematics and science curricula. This allowed any tutor to work with any student and know exactly what had been covered in class and what the learning expectations were for any lesson. Unpackaging the curriculum, however, also works counter to some assumptions in science and engineering departments in many large universities. These schools often over admit students, assuming that a significant portion of them will be screened out of the program by the "gateway" courses. Given this traditional function of the gateway courses, some faculty may not be fully supportive of these program goals.
4. **Providing a "head start" on the freshman year through summer bridge or "preseason academies."** Summer before freshman year programs can serve a number of purposes. Primarily they may serve as vehicles to socialize students to the expectations of the school and begin to form connections for them with other students and faculty. They can, as in the Georgia Tech program, also "preview" the course work and provide students with enough of a head start so that they can be assured of a successful first semester, or first year. This not only provides students with the self-confidence that they can compete at high levels, but can also provide the very practical advantage of an early high GPA, which both sets a standard and allows students a little margin for error when things get more difficult.
5. **Providing financial aid and reducing concerns about money.** Virtually all of the programs we studied viewed financial concerns as a major impediment to either successful completion of a degree and/or the ability to devote the time and focused attention needed to excel. In an attempt to reduce this barrier, several of the programs either provided grants and scholarships or opportunities for employment that were woven into the students' academic work, such as jobs in research labs or at companies that did the kind of work the student was studying. This strategy, of course, is most effective for students in the sciences or engineering and is somewhat less effective if students are studying medieval English literature for example.
6. **Providing program components that extend beyond the freshman year.** While some programs focus almost exclusively on the freshman year as the critical point in time to ensure that students make a successful transition to college, the programs we studied

had almost all concluded that it was important to continue to monitor and provide some services to students beyond the first year. This may be especially true if the program is focused on helping students to excel, since underrepresented students often remain at risk throughout their college careers because of competing demands on them from home and community, financial concerns, and failure to feel truly integrated into mostly White campuses. Thus, the program can be the critical safety net that keeps these students from falling through the cracks.

7. **Placing the best teachers in the freshman courses.** The greatest attrition of students occurs between the freshman and the sophomore years, and underrepresented minority students are more likely to leave college prematurely than nonminority students. Moreover, a number of studies have shown that underrepresented minority students are more sensitive to teaching quality than nonminorities from more advantaged backgrounds. Programs that were successful with these students worked to ensure that the freshman year was a successful experience for students, both socially and academically. Faculty who are good teachers and who interact comfortably with students can play vitally important roles in engaging and encouraging students, and helping them to identify and make use of supportive resources on the campus. Freshman courses at large research universities, however, are often relegated to part-time lecturers and faculty with looser connections to the campus, and the most prized faculty are generally "protected" from teaching the large, more general, freshman courses. Moreover, in these large universities, senior faculty are usually "rewarded" by being assigned small, graduate seminars, eschewing undergraduate education altogether.
8. **Providing culturally relevant experiences in the college or university context.** Almost all programs that were designed by educators of color were explicit about the importance of incorporating aspects of the students' culture into the program and/or addressing concerns that were specific to students of color. Not surprisingly, we also found that some programs tended to have a greater impact on those students whose culture was at the center of the program. Two programs, for example, were quite explicit about the role of the Black church in the lives of the students and incorporated spiritual experiences that even included taking students to church and engaging them in the church choir. The directors contended that the programs were more effective in binding students to the program and the school as a result of this intervention. Another provided ample opportunities to discuss and confront issues of racism as they affected students of color in the academy. These planned discussions were described as powerful and direct and helped students to come to terms with experiences they encountered, or feared encountering.
9. **Acknowledging that skill development is cumulative and that less developed students may need more time.** Remedial education has a mixed track record. Remedial programs tend to stigmatize students and reinforce the belief that they are intellectually inferior, reducing motivation and self-confidence. However, pushing students to

achieve at levels for which they have not been prepared is an equally bankrupt strategy. The successful programs had a number of creative ways of dealing with this problem, but they almost always included providing *more time and intensive study* for students who needed to strengthen their skills. The ESP selects students who are high performers, but even among these high performing students, there are often gaps in knowledge or understanding that result from inadequate high school preparation. For these students, the program is careful to (subtly) help them identify where they have gaps and to construct lessons that both reinforce lower level content while simultaneously challenging students with difficult material that forces them to stretch. This occurs in the context of workshops and laboratories that require a commitment of additional study time. Another program invited students to join after they could demonstrate satisfactory completion of more basic course work that would help ensure their success in a highly competitive biology curriculum. Thus, the door was never shut on any student who wanted to enroll, but it was left up to the student if he or she was willing to do the extra foundational work that the program deemed necessary to ensure success. About 20 to 25 percent of students who are given this opportunity choose to take it, and most are very successful. Unfortunately, because so few programs focus on the social sciences or humanities, especially at the undergraduate level, we have no examples of similar strategies for these students.

Promoting High Academic Achievement

1. **Investing resources in a high achievement agenda.** Some of the programs that we studied were focused entirely on producing high achievers, or leaders, in their fields. This required that standards for entrance were high and that students were carefully selected along a number of dimensions. By corollary, this meant that many students would not qualify for these programs and the programs would not be egalitarian in their selection. These programs were all in the SMET areas and were preparing students for entrance into highly competitive Ph.D. programs. We argue that this is a legitimate function of some programs, and even though they are vulnerable to attack for being "elitist," they promote the welfare of minority communities by ensuring that a growing number of students of color will be prepared to join the leadership circle of the most selective public and private institutions.
2. **Making high academic expectations explicit.** Many programs noted that a prime impediment to higher achievement for many underrepresented minority students is the failure to understand what is expected and what is required for high achievement. The very successful programs all talked about making the requirements for high achievement explicit. This was done in various ways—having high-achieving older peers talk with students about their own experiences and how they manage their time and resources; doing exercises in class, such as plotting the study time required to receive an A in the class; and providing clear predictable lessons and syllabi that explain what is required to

excel in a course or subject matter. Some programs also make their goals both tangible and explicit so that students understand the criterion for success—for some a "successful" outcome is admission to a Ph.D. program; for others, admission to medical school. Thus, students always know what they are shooting for.

3. **Providing financial incentives for high achievement.** Some programs made financial support contingent on a high level of academic performance; slipping below this level meant the student forfeited his or her support. No controlled studies were conducted to determine specifically if students with this kind of incentive outperformed those without such an incentive, but students in these programs seldom slipped below the minimum standard.
4. **Close research collaboration with a faculty/professional mentor.** Numerous mentorship programs are in place to support students from elementary school through graduate school, and we know relatively little about how effective they are in their various guises. However, programs that focused on preparing students for competitive graduate study—for example, Ph.D. programs—used faculty or professional mentors to very good advantage. The opportunity to work closely in the context of a research study, whether in a chemistry laboratory or on a project investigating medieval English literature, provides a number of benefits to students that can stimulate high achievement: It socializes them to the roles and expectations for a researcher and/or faculty member; it can stimulate the student's interest in the field or discipline and reinforce the desire to pursue graduate study; it can increase a student's academic self-confidence; and it provides an adviser who can be invaluable in helping students to prepare graduate school applications, including sometimes the opportunities for joint publications.
5. **Providing comprehensive, long-term program involvement.** If the goal of the program is to produce a cadre of students who will be competitive for graduate or professional schools, then it must extend its focus beyond the freshman year, and it must monitor students and provide support all the way to degree completion and graduate school application. Too many events intrude in the lives of students—especially those from backgrounds that may not provide high levels of social, psychological, or economic support—that can derail their academic and career plans. There are two major ways in which this monitoring is done—either by designing a program that takes responsibility for students throughout the college career or by linking students with particular faculty members who will assume this responsibility.
6. **Involving the full spectrum of students who are willing and able to commit to a high achievement goal.** The successful programs did not discriminate against middle-class minority students in their efforts to push a high achievement agenda. Most acknowledged that such highly motivated students would often come from homes that had the economic and educational resources to support their children's high aspirations. Thus, while financial support *can be* need-based (but is not always), the resources of the program were available to these high-achieving minority students independent of their putative social class backgrounds.

Chapter 6

Conclusions and Recommendations

In this section we look at some of the major issues that have arisen in our review of the state of minority achievement and the programs that attempt to ameliorate this situation. We also add our own recommendations to these observations, which have been greatly influenced by the wisdom of the exceptional individuals with whom we spoke in conducting this project.

1. There is a heavy emphasis on support of students and programs in a very few disciplines. Programs appear to follow dollars and we think that it is not merely coincidence that most of the successful ones began in the late 1980s as funding for these efforts became available and that they focus so heavily in the SMET disciplines where support has been the greatest. The bulk of both federal and philanthropic funds available to stimulate the pool of high-achieving minorities is channeled into the areas of math, science, and engineering, and very little funding goes to support similar activities in either the humanities or the social sciences. This cannot be because there is not a nearly equal need in these areas because African Americans, Latinos, and Native Americans are nearly as underrepresented in the social sciences and humanities as they are in the physical and biological sciences. A higher national priority is placed on these disciplines, though the evidence suggests that many of the minorities being prepared in these fields are not finding academic/research positions in these areas even when they hold Ph.D.'s from prestigious institutions (Smith, 1996). A further reason to reconsider the wisdom of funding SMET programs disproportionately is that it can serve to distort market interest on the part of students. Low-income students, in particular, might be more likely to pursue an academic career in these areas where their talents and dispositions may

not be an ideal match simply because it is more economically feasible to do so rather than to pursue their true areas of interest. Such students are less likely to persist in the program of study and less likely to find satisfactory employment in the field if they do complete their studies.

One premise that is often cited, though inadequately researched, is that increasing the number of minority faculty at a college has the effect of creating a more hospitable climate for minority students and increases the likelihood that they will enroll and persist (Hurtado, 1990 and 1994; Milem, 1999). If this is so, then it is essential to increase the numbers of minority faculty in all disciplines so that underrepresented students will be encouraged to complete undergraduate degrees and move through the pipeline to graduate study. Certainly, an anthropology professor who takes an interest in minority students at the undergraduate level can be as effective in producing future scientists as a biologist by providing support, counsel, and letters of recommendation. The strategy of focusing so much attention on a few disciplines, to the exclusion of all others, would appear to be somewhat shortsighted, especially if one views the production of minority scientists and engineers as a multigenerational effort.

A dissertation study underway has uncovered data that should be useful to our thinking about how to approach the production of minority scientists (Sessoms, in preparation). Interviews with students who successfully completed undergraduate biology degrees and participated in a program designed to stimulate the pool of graduate researchers, but who *chose* not to continue on this path reveal some important insights into this process. First, the assumption of many programs is that minority students who do well in the sciences will want to continue academic careers in these disciplines if they are exposed to the professional milieu and properly socialized to the academic life. Of course, this is an overly simplistic view, since enjoying scientific research requires more than just the abilitiy to do it; it requires a passion for inquiry within a specialized field that is as much a function of personality as it is of ability. Sessoms also found that ability to excel in science courses does not necessarily correlate with a desire to do research for the minority students she studied. In her interviews, many students who thought they would pursue a research career in the sciences because they performed well in this area, later chose to enter occupations that involved more interpersonal interaction and that appeared to have a more immediate impact on social conditions. Many of the promising minorities who are recruited to the program come from homes and communities in which opportunities are limited. They are keenly aware of their privileged positions in the world of academe. And many are uncomfortable with the isolation from community concerns that a life of science can entail. Several comments from this study demonstrate the dilemma of many students. One student who was clearly headed for a career in research when he became involved with a health clinic supported by the Latino medical students on campus related the following:

> *I think I started to realize that I could actually have a lot more impact doing that (clinica) than working in the lab…. So, I think it was that immediate gratification that you saw and the impact that you saw on the population, on the community that you were working with.* (Sessoms, 1997)

This young man completed his biology degree but chose to go into another line of work. Another young woman, who according to Sessoms, "was headed toward a successful career in scientific research" remarked:

> *When you talk about research, you know… their research never gets to the very people they want to serve…. Sure, I can discover what this protein does, but what does that do for me? Show me something that's going to… make life better.* (Sessoms, 1997)

It may well be that many academically talented minority students from lower income circumstances must first find a meaning in their work that more directly links them to their communities. Certainly, the pursuit of a life as a community physician fulfills this need, and it is probably not surprising that medical schools have much greater success in recruiting minority science majors than graduate schools. It may require more than one generation of academic successes within a family to produce the cadre of mathematicians, scientists, and engineers that are sought. It may be that the first generation of academically talented students will feel a greater need to maintain occupational linkages with their own communities than subsequent generations who are more removed from those realities. This also has direct implications for the issues of affirmative action and the recruitment of middle class minority students.

> *Recommendation: Funders should consider an intergenerational approach to stimulating high achievement among underrepresented minorities, acknowledging that funding the production of exceptional social scientists, poets, and philosophers will build the intellectual infrastructure within minority communities that will also yield scientists and mathematicians in future generations.*

2. The current attacks on affirmative action are causing programs to make fundamental changes that may have a serious negative impact on their ability to produce significant numbers of high-achieving underrepresented minorities. In the face of the political assault on affirmative action, a number of the programs had changed their selection criteria and were accommodating increasing numbers of nonminority students. Because these programs were generally designed with particular target students in mind, and often had been the result of extensive study and deliberation about what worked best *for these particular students,* the impact of a change in the population served on these programs remains a very real question. Similarly, the impact of such a change on the minority participants in the program is also important to study. Several program directors/designers

noted the importance of a "safe space" where minority students could come together for mutual support, of cultural components of programs that spoke to specific aspects of the cultural group that was targeted, and of personnel associated with the program who reflected the target students. All of these components had been designed to support the learning of *specific groups of students*. While some directors were upbeat about the opportunities that such increased diversity of participants represented, all registered some concerns about maintaining their focuses and goals, and some were openly opposed to such diversification because of loss of integrity of the programs.

The assault on affirmative action and the new focus on opening these programs to nonunderrepresented groups has other consequences as well. Among those are the search for new selection criteria that have increasingly come to include *low income* in lieu of minority status. Thus, "middle-income" minorities have been systematically excluded from consideration. This is especially unfortunate for a number of reasons. Many so-called middle-income minorities have only been members of the middle class for one generation and have a tenuous hold on their middle-class status. They frequently do not have the social, economic, or educational resources believed to make them equal competitors with middle-class White and Asian students. These students often represent the second stage in the early development of these minority communities. Thus, they have leveraged their parents' ability to school them in more affluent surroundings and have thereby advanced the family's educational capital, but they have not yet reached the point where they can compete with students whose parents enjoy a much stronger social and educational background than their own. In short, these students are still in need of supportive structures to succeed, but they are denied access to this support system under new selection guidelines. This represents an enormous potential loss to these communities and is not unlike the former misguided policies of federal Title I programs, which provided support for students in low-achieving schools. In prior years when Title I schools improved their academic standing, they were automatically removed from funding eligibility. Thus, without any continued support, they routinely fell back to their earlier low performance levels. A number of studies effectively pointed out that such progress requires transitional support in order to take root, and the rules were changed to allow this support.

Given the underrepresentation of some minority groups in higher education—especially at the upper end of the achievement continuum—the fact that increased diversification of these programs will result in fewer students of color participating is disturbing. Progress in enhancing the achievement of underrepresented groups has been slow, even with affirmative action. Without such a tool, and with decreased slots for students of color in these programs, progress could become even slower.

University CEOs are virtually unanimous in their support of the need for affirmative action-type strategies. They point out that several social benefits accrue from such policies: social justice, intellectual enrichment, and social good. Moreover, data are now accumulating that support these contentions (cf. Bowen and Bok, 1998; Chang, et al.,

1999; University of Michigan, 1999). Public opinion leaders must not shy away from this debate. The issues must be confronted, and better use must be made of the accumulating evidence as well as the cumulative wisdom of so many in leadership positions in academe.

> *Recommendations: Agencies and philanthropic organizations interested in increasing the achievement of underrepresented minorities should fund more research that investigates the broad social impact, as well as the individual benefits, for several underrepresented groups, of affirmative action-type policies. Moreover, leaders of these institutions need to step forward and articulate a vision for this society that includes finding ways to more equally redistribute educational opportunity for racial and ethnic minorities.*

3. An oft-cited lament of program directors is the problem of groups of faculty, especially within the SMET disciplines, who are not supportive of the goals of these programs and work in subtle ways to undermine them. There is a clear need to diversify the nation's higher education faculty. Faculty of color are seriously underrepresented in colleges and universities across the nation and across all types of institutions, but most particularly in those research institutions that prepare graduate students. We have cited studies showing that minority students are more likely to form important bonds with faculty of color than with others and that these faculty are more likely to provide the support to guide these students successfully toward graduate education. However, the diversification of the faculty should not stop with color or with gender because this is not a guarantee of how they view the problem of underrepresentation of students of color in academe or how they view their own role in ameliorating that problem.

> *Recommendation: Decisions about faculty hiring and promotion should be based, at least in part, on evidence of an individual's willingness to support strategies that equalize opportunities within the university in addition to the traditional standards by which faculty are evaluated.*

4. Many program directors noted the problem of gaining credibility for their programs among the mainstream faculty within the academic departments. Even when programs were designated as "academic" as opposed to "student services" programs, they often lacked credibility with some faculty and departments and were too often seen as marginal to the central functions of the campus. To some extent this is related to the problem of recalcitrant faculty who may harbor negative beliefs about underrepresented minority students, but it is a larger problem than this. Many programs provide adjunct services for students, summer programs that are held before the school year begins, study groups that meet outside of regular classes, and tutorial services that are provided by "skills centers" housed outside of the academic departments. Thus, most of their activities are invisible to these departments and have little direct impact on nonparticipating faculty. Moreover,

the traditional divisions—and extensive parallel bureaucracies—between the academic and student service functions in large universities virtually militate against true cooperation across these borders. In order to garner support of these faculty and departments, the programs need to be woven into the fabric of the academic department—for example, by including the broad cooperation of mainstream faculty and administrators in the program and providing unit credit for adjunct course work.

> *Recommendations: Administrators need to seek ways to better integrate academic and student support functions within the university, including placing as many components of these programs as possible under the umbrella of academic units. University CEOs need to enhance the prestige of these programs by expressing strong public support for both the goals and the activities of these programs.*

5. Good programs are not cheap. Even though there is a considerable amount of money expended on programs nationwide, there is insufficient attention paid to (1) the portion of funds that goes to directly supporting students and (2) evaluation of the effectiveness of these programs. There was widespread agreement among program directors who had studied the problems of minority underachievement that financial concerns were primary reasons for the failure of many students to persist or excel. Nonetheless, few programs actually directed significant portions of their funding to support students. Most programs were more likely to purchase extensive services and support systems, with the attendant administrative infrastructure. We do not know if this is the best use of funds, but we think it is an empirical question that should be investigated—which leads to our next concern.

Given that billions of dollars have been spent on programs to recruit, retain, and support underrepresented minorities, it is difficult to justify the paucity of rigorous studies of their effectiveness and the inattention to different levels of effectiveness (e.g., the ratio of *survivors* to *leaders*). This is not to say that we do not have a good idea how we arrived at this state of affairs. The huge bulk of all of this activity, and funding, has gone to a few disciplines—math, science, and engineering. The people who run these programs, and often the individuals who conceive them, are by and large mathematicians, scientists, and engineers, or administrators who have spent their careers in this milieu. If they are faculty researchers, as were many of the directors, then their primary areas of research interest are in their own disciplines. This is where they devote the bulk of their professional lives. It is unreasonable to think that they would take the time away from their own disciplinary work to devote to answering "social science" questions such as: What about this program produces the effects we are seeing? Who would constitute an appropriate control group against which to test our program effects?

If the directors or creators of the programs are primarily administrators, most lack a social science orientation that would lead them to ask the kinds of questions a social scientist does about the impact of systems or interpersonal interactions on human behavior.

For the most part, the administrators are interested in the bottom line: Are the numbers of scientists, engineers, and mathematicians increasing as a result of my program? When the answer is "yes," as it evidently usually is, they do not question further. Particularly, if the simple answer, "yes," leads to continued funding. But this should not be sufficient for the individuals who make the decisions about funding such programs. We are hard pressed to understand why, after repeated calls for better data collection and increased monitoring of these efforts (Gordon, 1986; Sims, 1992), funding agencies have not placed a higher priority on the evaluative aspects of the work they fund.

> *Recommendations: (1) Funding agencies should require that a portion of each program budget be devoted to rigorous evaluation activities. The funding agencies should also specify the kinds of questions they want answered and suggest methodologies for the answers. An effective enhancement would be to include social scientists in the evaluation efforts. Social scientists would not only bring the kinds of skills that could enhance the evaluation activities, but would have the incentive for conducting the research since it could contribute their own research agenda. (2) Resources should be focused on those programs that are able to demonstrate their effectiveness and explain how they achieve their results, using rigorous evaluation criteria.*

6. There is a serious problem of underrepresentation of minority males at most levels of higher education, and this extends to participation in the programs geared toward enhancing academic outcomes for underrepresented students. A consistent finding across the programs we studied was that minority women outnumbered minority men oftentimes by a two-thirds to one-third margin. Moreover, in recent years most of the gains in access to higher education for Latinos and African Americans have been made by the women in these groups. Minority males do not appear to be breaking down the barriers to educational opportunity as effectively as women and, ironically, they do not take advantage of the programs that are designed to help them accomplish this in anything close to the numbers that women do.

> *Recommendations: (1) More attention needs to be paid to the particular problem of underrepresentation of minority males, including funding of more research to understand the problem. (2) Programs should place a greater emphasis on recruiting, retaining, and nurturing minority males without reducing their concern or attention to females.*

7. Both program and school size may make a difference in academic outcomes for underrepresented minority students. We consistently found that many of the practices that serve to eliminate underrepresented minority students from the academic pipeline are embedded in the cultures and practices of large research universities. We include practices such as "gateway" courses designed to screen out less well-prepared students; a

faculty culture that places a very low value—and provides few rewards—for teaching undergraduate students; large class sizes with minimal, if any, faculty contact at the undergraduate level; a level of faculty autonomy that assures that every class taught by a different faculty member, notwithstanding the fact that it carries the same course number, will differ in content and emphasis, making it difficult for students to get targeted tutorial help or to discern what is truly critical to know in the discipline. We also found that highly effective programs and/or universities tended to be smaller in size. It is important to include the caveat that programs that are too small may not reach a critical mass that will make them effective; likewise college or university campuses that are too small may lack the resources and diversity of course work and faculty to be truly effective institutions. Nonetheless, we think it is important to study the impact that institution and program size (and orientation) have on the development of strategies to increase the academic achievement of underrepresented students.

> *Recommendation: More research should be directed at looking at the effects of institution and program size and at the orientation of the institution (e.g., undergraduate teaching, graduate study, research) on the effectiveness of program strategies for participants.*

8. Some programs appeared to be more successful with one ethnic group than with another. We hypothesize that this was related to the level of comfort that participants felt with the culture they encounted in the program. For example, we found there was a "culture" associated with the programs that was defined in large part by the individuals who ran and staffed them. Thus, a program run predominantly by Black faculty and administrators might be more sensitive to creating a comfortable social context for Black students simply because they were more aware of what that social context should include. In fact, several of the programs were actually created for Black students and incorporated aspects of their particular histories, needs, and culture into the fabric of the programs. With changing political circumstances, some of these programs have integrated their student population with a consequent reduced focus on the original target group. We do not see the fact that one group might feel more comfortable in a particular program than others as a problem. On the contrary, this strikes us as a natural and predictable outcome. However, given the urge toward "color-blind" solutions to problems of educational disparities, we think that the issues surrounding variable outcomes for different groups of students and the impact of desegregation on programs that have been created for a particular target group are worthy of systematic investigation. We also saw this as raising important empirical questions such as: To what extent can a single program meet the personal, social, and academic needs of diverse groups of students equally? Might it be that in order to increase the "comfort level" of a program, it makes sense to focus on a particular group—at least for some functions.

Recommendations: Program evaluations should attend to questions such as: (1) For which (ethnic) groups does the program appear to have the greatest impact? (2) What are the features of the program that are responsible for different outcomes for different groups of students? (3) What are the benefits—and the disadvantages—to serving multiple groups of students within the same program, and what are the effects on students and programs when they are desegregated?

9. We found a great deal of confusion about the goals of many of these programs—whether their ultimate objectives are to produce survivors or leaders. We have indicated that we think the strategies may differ to some extent, depending on the purpose of the program, and therefore an attempt should be made to more clearly define program goals and to investigate the strategies that are most likely to enhance those specific goals. We have also indicated that we believe the case can be made for supporting both of these goals within a broader strategy of increasing minority achievement. We are reminded of the comments of one program director who noted that his program had suffered from a low expectations problem in its earlier incarnation and had shifted to a high standards approach. He defended the change in approaches by commenting that these efforts must be seen as developmental. At the time his program began it could not have supported such a high standards approach; the pool of students coming to the institution was less academically prepared and students were not equipped to meet the standards that the institution now sets. But, he notes, times have changed and students now are prepared to meet higher standards, in part because programs now are demanding them. We think there is wisdom in this observation that might well be applied to the current state of preparation of minority scholars. We observe that it may now be time to promote a high achievement agenda with focused efforts not just on helping underrepresented students to survive the university experience but, indeed, to support them to excel.

Recommendations: We conclude from this study that there now exists an arsenal of effective practices that can be applied to the task of raising minority achievement—not just to the level of creating more academic survivors (which is a worthy goal) but to a level of excellence that will begin to erase the gap between underrepresented minorities (African Americans, Latinos, and Native Americans) and White and Asian students at the upper end of the achievement continuum. We urge foundations, government agencies, and university administrators to fund the programs and engage the practices that have demonstrated the power to eradicate the overprediction problem in American higher education and level the whole playing field, not just one end of it.

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Appendix A

In addition to contacts we made for programs included in, or ultimately excluded from, our inventory we talked with individuals from institutions, agencies, and organizations around the country who might be able to recommend programs targeting high-achieving minority students. Among these were:

Academy for Education Development
American Association for the Advancement of Science
American Association of Medical Colleges (AAMC)
American Council on Education
California Department of Education
California State Universities at Fresno and Sacramento
College Board of California
Cornell University
Council of Graduate Schools
Hispanic Outlook in Higher Education
Howard Hughes Medical Center Foundation
Howard University
Mellon Foundation
National Action Council for Minorities in Engineering (NACME)
National Council of La Raza
National Education Association (NEA)
National Endowment for the Humanities (NEH)
National Institutes of Health (NIH)
National Science Foundation

Northwestern University
Quality Education for Minorities
Rice University
Society for Advancement of Chicanos and Native Americans in Science (SACNAS)
Spellman College
Stanford University
Trinity College of San Antonio
United States Department of Education
University of California (most campuses)
University of Maryland, Baltimore County
Wake Forest University

Appendix B

Programs contacted and initially considered for inclusion in the study that were ultimately not included in our inventory because of lack of data or inappropriateness of the models for our purposes (e.g., programs targeting developmental or secondary-level students) are listed below.

CCNY, CSUN, Xavier: Project Preserve
Colorado School of Mines MEP
Indiana University: Minority Achievers Program
Morehouse: Dansby Scholars Program
Rice University: Mathematical and Science Awareness, GirlTECH
Rutgers University: Project Excel ESP
University of California, Berkeley: Summer Undergraduate Program in Engineering Research; Summer Research Opportunities Program; Public Policy Internship Program
University of California, Davis: Science Career Opportunities (SCOPE); MEP (data being collected)
UCLA: CARE; MS Squared ESP Program
University of California, Irvine: CAMP
University of California, Riverside: Summer Research Program
University of California, Santa Barbara: Summer Academic Research Internship
University of California, San Diego: Summer Science Enrichment Program
University of Illinois, Champaign-Urbana: MERIT ESP Program
University of Minnesota: Package Course Experience
University of Washington: Minority Science and Engineering Program; Early Scholars Outreach Program

Appendix C

Alliance for Minority Participation

Funded by: National Science Foundation and local institutions

Locations: 27 programs nationwide

Subject areas: Science, math, engineering, technology (SMET)

Date began: 1991

Student eligibility: Undergraduate minority SMET students (no written information regarding GPA or SAT thresholds for admission)

Purpose/Goal: To increase size of pool of interested and qualified minority students eligible for graduate study with view that these students will ultimately take faculty positions on college and university campuses.

Data: Nineteen AMP campuses provide data in the Program Evaluation Report. Most include the number of minorities in SMET and the percentage increase this represents. Some campuses report other information such as retention data, students who have co-authored papers, and how program funds are spent.

Program description: All programs give special consideration to critical transition points, i.e., high school to college, two-year to four-year college, undergraduate to graduate education, and graduate to faculty. Each project is somewhat different depending on local needs. Most include: bridge programs between the critical education phases mentioned above; undergrad-

uate research opportunities and, when possible, undergraduate opportunities to publish; opportunities to present research findings at the annual NSF Student Research Conference; drop-in centers for tutoring; computer-assisted instruction; study groups; meetings with faculty and peer mentors; individual skill development through participation in special seminars and colloquia; workshops on GRE preparation and ways of increasing GPA; cooperative relationships with, and internships in, industry; and performance-based scholarships.

Banneker Scholars Program

Funded by: Scholarship fund at University of Maryland-College Park

Location: University of Maryland-College Park

Subject areas: All

Date began: 1979-80

Student eligibility: High-achieving undergraduates. Eligible applicants must show not only high academic achievement but also leadership potential; be widely involved, multi-talented individuals; and be advocates of, and contributors to, the common good. As originally conceived, the Banneker Scholars Program targeted only African-American students. After a 1994 legal decision challenged the Blacks-only policy, UMCP responded by merging Banneker with the Francis Scott Key Program in 1995. The new program includes 15-20 percent African Americans, but overall about 50 percent are students of color.

Purpose/Goal: To address problems, tracing largely from the long history of the university as a segregated campus, of underrepresentation, under-achievement, and unhappiness and alienation of African-American students at UMCP.

Data: Survey information on the contribution of the Banneker Scholars program to UMCP efforts to desegregate and enhance diversity (Allen, et al., 1997). This research is a response to litigation challenging the programs' acceptance of high-achieving African-American students only. Article notes that this was the first time extensive written information had been collected during the 15-year history of the program, but that there was a wealth of oral information. Article notes, but does not cite, reports on the program that show that it has been successful over the years in attracting a large number of these highly recruited, high-achieving Black students and that these students have maintained a high GPA in the program and have had high retention rates at UMCP. Graduates of the program are highly represented in fields that are nontraditional for African Americans.

Program description: Scholars receive four full years of support for tuition and fees, priority housing on campus, additional need-based financial aid, admission to the Honors Program, special library privileges, faculty mentorship arrangements, and participation in

scholarly forums and research opportunities. Surveyed students identified the importance of the support network of interested Black students, faculty professionals, and administrators in providing them with a sense of self-esteem and prestige as well as a challenge to achieve and the reassurance that the university was truly committed to Black students.

Biology Undergraduate Scholars Program (BUSP)

Funded by: Howard Hughes Biomedical Institute

Location: University of California, Davis

Subject area: Biology

Date began: 1988

Student eligibility: Underrepresented minority students who qualify for UCD selected during Special Transitional Enrichment Program (STEP) prior to their freshman year.

Data: Evaluation report.

Program description: Program combines academic enrichment, laboratory research experience, and extensive advising. Core aspect of the program is summer bridge program, academic year seminars, and additional course sections designed to support instruction in the "gateway" courses of chemistry and calculus. Students are funded for research work during their first and second years of study and may obtain continued funding from other campus sources for research opportunities during their upper-division studies.

Biomedical Honor Corps and Howard Hughes Medical Fellowship

Funded by: Howard Hughes Biomedical Institute

Location: Xavier University of Louisiana

Subject areas: See below.

Date began: First component in mid-1970s; a 1988 Howard Hughes grant allowed them to refine the series of components into a coherent program.

Student eligibility: Students interested in one of the health professions served by the program. New freshmen must have a composite ACT of 20 or above, or a SAT I of 820 or above, and a high school GPA of 3.0 in core courses. XU students must have a GPA of 2.75 or above to qualify.

Purpose/Goal: To increase the number of underrepresented minorities, especially African Americans, who gain entry into medical, dental, veterinary, optometry, and podiatry schools or into biomedical science graduate programs, and ultimately receive degrees from these schools.

Data: Article in *U.S. News and World Report* about Xavier University (not specifically about the Biomedical Honor Corps) states that 47 percent of Xavier students graduate with math and science degrees, vs. the national average of 7 percent.

Program description: Seminars by minority Ph.D.'s, M.D.'s, and D.D.S.'s; systematic exposure to health professions and graduate programs beginning the first week of the freshman year; help in preparing for the GRE, MCAT, and Dental Admissions tests; assistance in finding summer positions in programs enhancing chances of success in biomedical sciences; assistance in improving test-taking, note taking, and other skills; and careful monitoring of student progress with systematic feedback.

Challenge Program

Funded by: University of Georgia (no other sources mentioned in materials)

Location: Georgia Institute of Technology (Georgia Tech), Atlanta

Subject areas: Math, science

Date began: 1989

Student eligibility: Minority students

Purpose/Goals: To help with math and science achievement and with social adjustment to college and to move the focus and orientation of earlier programs with these goals away from a remediation model. Part of the rationale of the program is based on statistical studies indicating that students who do well during their first quarter of college have a much greater chance of completing their baccalaureate degrees.

Data: Comparison of program and nonprogram minority students' first quarter GPA. Overall Georgia Tech five-year retention rates. Some data for earlier years in article on non-Asian students in the sciences. In a conversation with Bob Hume, one of the program's researchers, he reported that they see some positive difference between Challenge and non-Challenge students. He reports that it has been particularly successful in improving minority retention rates but not as successful in improving GPA. Article in the *New York Times* cites results of study by the National Action Council for Minorities in Engineering, which indicate that GT's 70.3 percent graduation rate for minorities is almost twice that of other engineering colleges.

Program description: The Challenge program is characterized as an "academic preseason" by Bob Hume. The program is a four-week summer course designed to "bring participants up to speed" regarding such areas as time management and organization, how to "work the school," and other aspects of college life. The program began as remedial intervention 10 years ago. Now it is a precursor to college attendance. The program also includes calculus and chemistry, which is equivalent to about one-half of a quarter of instruction, although the students do not earn college credit.

Chemistry Learning Center

Funded by: National Science Foundation and University of Wisconsin-Madison

Location: University of Wisconsin-Madison

Subject area: Chemistry

Date began: 1987

Student eligibility: Students from groups underrepresented in the sciences, students with special learning needs, and others as space allows.

Purpose/Goals: To assist students enrolled in general chemistry courses with their course work and skills—and ultimately to retain minority students in the sciences at UW-Madison and to increase the numbers of minority professionals in fields where they have been underrepresented.

Data: Comprehensive evaluation report with survey data and comparison of the GPA in chemistry classes of students who attend the Center for a given number of weeks with the average GPA of all students in these classes. Summary comments in the report are: (1) Minority students are utilizing the Center in high numbers; (2) the effectiveness of the Center is high for African-American and Native American students; (3) students virtually unanimously report finding the Center helpful; (4) students who average one hour per week over the course of the semester have a dropout/failure rate of zero; and (5) students who attend an average of one hour a week perform comparably to the class as a whole.

Program description: The Center offers individual and small group tutorials in general chemistry. The Center has copies of texts and other course materials, computers and relevant software, and materials to assist students to study over the summer or winter breaks for subsequent chemistry courses. The Center staff advise students on appropriate courses to take and follow their academic progress. Activities include intake interviews to assess student difficulties, individual- and group-help sessions, laboratory workshops, review sessions, practice exams, exam conferences to plan strategies and ease anxieties, and career workshops.

Emerging Scholars Program (known as Math Workshop Program at original site, University of California, Berkeley)

Funded by: Varies by institution

Locations: Many institutions nationwide now have ESP programs. We have information on five programs: University of California, Berkeley, California Polytech, Pomona, University of Kentucky (and Lexington Community College), University of Texas, Austin, and University of Wisconsin, Madison.

Subject area: Math (calculus)

Date began: Approximately 1978

Student eligibility: Minority students

Purpose/Goals: To increase the number of freshmen excelling in calculus who come from groups that are historically underrepresented in math-based disciplines: women, Latinos, African Americans, and students from rural areas. Research has shown that mathematics courses, particularly freshman calculus, are gatekeepers to scientific majors and other professional majors such as business. This network of programs that have a cooperative learning "antiremediation" focus use a variety of unique methods to help students get beyond this "gate" by succeeding in freshman calculus.

Data:

- UC Berkeley: Comparison data between nonparticipant minorities (Black students at UCB) in "non-Asian minorities." Article by Treisman and Asera based on focus group interviews. Treisman and Fullilove article: various subgroup comparisons on grades and retention.
- Cal Poly-Pomona: Data in "non-Asian Minorities…" comparing Hispanic math achievement to Asian and White students. Article comparing results for workshop and nonworkshop minority students: grades, retention in major. Comparison also with White and Asian nonworkshop groups.
- Kentucky: Comparison of calculus grades for Math Excel (ME) and "regular" students (ME students achieve about one grade point higher). Similar results for model (AIM) at Lexington Community College.
- UT Austin: Program evaluation, 1988-93. Comparison of calculus grades for ESP and non-ESP peers (controlling for SAT), persistence in SMET majors, and attrition. Draft article by Treisman and Asera (1988-95) analyzes calculus performance of ESP vs. non-ESP students. On average, ESP students have higher odds of earning an A or B in first semester calculus and have higher calculus grades than non-ESP participants.

- Wisconsin: Comparison of WES and non-WES students' calculus GPA and retention in SMET majors. WES students received a B or higher twice as often as non-WES students controlling for prior achievement and other factors. However, there was no significant association between WES participation and SMET persistence.

Program description: Programs share common characteristics, but each university takes these characteristics and adapts them to fit local needs. Original program was developed after an observation study of African-American students, who traditionally do not do well in college math, and Asian American students, who do. Researchers asked: What distinguishes strong math students from weak math students? Findings of this study were the basis of the program design.

The original program implemented at Berkeley includes three central elements. The first begins with a letter of invitation to Latino and African-American students, asking them to participate in a "faculty-sponsored honors program," and to attend an orientation about the program. The orientation sets the tone of the program as a nonremediation approach, which succeeds at fostering high math achievement among minority students. The second element involves the program itself, which functions much like a regular discussion section that accompanies all math lectures. However, the workshop's 20 to 30 students are organized into groups of 5 to 7 students who work together for approximately two hours twice a week on worksheets containing carefully constructed, unusually difficult problems. Students are encouraged to discuss the problems and help each other regarding solutions and proofs. The third central element is the worksheets themselves. They are designed to provide the skills students need to earn an A in first semester calculus, form a math foundation that will promote continued excellence, and provide opportunities to identify areas in math knowledge that students must strengthen in order to survive and excel. Worksheets include carefully chosen elements such as problems that are often found on tests but not on homework, problems designed to reveal deficiency in preparation or understanding, etc. A graduate student workshop leader observes the small group sessions and assists as necessary.

ESP model workshops are included as part of the approach to fostering minority achievement in some of the other programs in this review.

Exxon Stevens
Ambassador Franklin H. Williams Scholars Program

Funded by: Exxon Education Foundation and Stevens Institute of Technology

Location: Stevens Institute of Technology

Subject area: Engineering

Date began: 1989

Student eligibility: Black and Latino undergraduates who meet a minimum standard of 1200 on the SAT I.

Purpose/Goals: To increase the number of African-American and Latino engineering students at Stevens who are well-prepared academically to major in engineering and to increase the number of Black and Hispanic engineers hired by Exxon and regarded as well-prepared, both academically and socially, to advance within the company.

Data: Preliminary data for a sample of 23 students. Interviews with students and graduates of the program, minority recruiters for Exxon, and others. No valid minority-minority comparison yet. Scholars have had higher average freshman GPAs than White students with similar SAT scores.

Program description: Students participate in three years of summer internships with the Exxon corporation and mentoring by someone in the company. This component is designed to serve four functions: provide a mechanism for helping students develop technical and interpersonal skills appropriate for a corporate setting, provide personnel with information on education and social needs of the students in order to address these needs during the academic year, offer Exxon an opportunity to observe students in a work context, and allow Exxon to bond with students who they may eventually wish to hire. Another central aspect of the program is that it provides non-need based full tuition and room and board scholarships, which represents more financial aid than is typically offered to students and which provides a substantial financial incentive to attend Stevens both for economically disadvantaged and middle-class students. Rather than being remedial, the summer bridge program offers students the opportunity to take the first semester of calculus so that they can make friends and become acclimated to the campus and the pace of engineering study. Finally, the program offers as-needed tutoring, and faculty mentoring and advising.

McKnight Doctoral Fellowships

Funded by: Initial capital from the private McKnight Foundation of $10 million, along with $5 million in public funds from the state of Florida

Locations: Florida public and private colleges

Subject areas: All majors

Date began: Developed in three phases beginning in 1984

Student eligibility: No threshold GRE score. An applicant must: (1) be a U.S. citizen, (2) be an African American, (3) be a graduate of a regionally accredited institution, and (4) take the GRE or GMAT.

Purpose/Goal: To create a private-public partnership in order to circumvent bureaucratic roadblocks that can stifle the overall goal of increasing the number of African-American doctorate holders and university faculty.

Data: Questionnaire and archival data. Compares African-American doctoral students who have McKnight fellowships with African-American doctoral students who have other kinds of financial support or no support. The report based on this questionnaire includes a detailed discussion of differences between groups, including gender, urban-rural, age, marital status, previous academic experience, etc.

Program description: Program developers consider the private-public partnership to be crucial to the success of the program. It allows them to be administered independently of the state, i.e., outside the state bureaucracy. On the other hand, the program influences educational policy in Florida through its president and board of directors who represent both public and private sectors.

Elements of the program are: (1) a student support system through the FEF office and president that makes the students "feel a sense of importance" and that "they have a strong advocate in the FEF president"; (2) full financial packages that pay a living allowance, tuition, and fees, which frees students from full- or part-time employment (first three years paid by the FEF and two by the participating university); and (3) Annual Fellows Meetings for modeling, mentoring, bonding, and networking, including panels and speakers to help students learn to cope with or overcome environments in which professors and other graduate students might question their presence as graduate students.

McNair Scholarship Program (One of the Trio Programs): Ronald E. McNair Postbaccalaureate Achievement Program

Funded by: U.S. Department of Education. Grants awarded to institutions of higher education.

Locations: Approximately 93 sites across the country, including University of California, Davis

Subject areas: All majors

Date began: 1986

Student eligibility: Limited income, physically disabled, and first-generation college students who have demonstrated strong academic potential. Two-thirds of the students in the project at each institution must be low-income, first-generation college students. The remaining one-third must be from groups that are underrepresented in graduate education. Programs have different GPA requirements: for example, 2.8 for the University of California, Irvine program and 3.0 for UCD.

Purpose/Goal: To prepare, through involvement in research and other scholarly activities, low-income individuals who are first-generation college students and/or underrepresented in graduate education to pursue doctoral studies.

Data: No overall data for program. The first McNair annual performance reports were supposed to have been completed in late 1997. Individual institutions may track their students. For example, UCD tracks McNair Scholars for 10 years or until completion of the Ph.D. Of the 16 students who have graduated, 7 have begun graduate programs and 8 will apply for fall 1999 admission.

Program description: Part of the TRIO Programs, a set of six outreach programs designed to assist disadvantaged students through the academic pipeline from middle school to postbaccalaureate education. The TRIO programs began in 1964 with Upward Bound. The following were added later: Talent Search (1965), Student Support Services (1968), Educational Opportunity Centers (1972), Training Program for Federal TRIO Program (1976), and McNair (1986). The different projects funded under the McNair program offer a range of support services including, but not limited to: stipends of up to $2,400 a year for those who have completed their sophomore year and are engaged in research, opportunities for research, summer internships, tutorial services, academic counseling, seminars, assistance in obtaining financial aid, assistance in securing admission to graduate programs, mentoring, and participation in cultural events.

Meyerhoff Scholars Program

Funded by: The Robert and Jane Meyerhoff Foundation along with a variety of national agencies and corporate sponsors

Location: University of Maryland, Baltimore County

Subject area: Engineering

Date began: 1988

Student eligibility: Those selected to be in the program are characterized as "top math and science students."

Purpose/Goal: To address the four areas indicated in the literature as being critical for minority student success: knowledge and skills, motivation and support, monitoring and advising, and academic and social integration.

Data: 1995 report. Meyerhoff students achieving at a higher level (3.4 overall GPA vs. 2.8) than comparison group controlling for key background variables. 1998 data show 71 of 74 students from the first four graduating classes are in graduate or professional schools

and that 93 percent of these students keep their science major. Meyerhoff Scholars also demonstrate a slightly better GPA than their White or Asian peers.

Program description: The program includes several primary components which, when taken together, address the four principal needs of minority students mentioned under "Purpose/Goal." The program is based on the assumption that all selected students are capable of succeeding in the sciences if given the appropriate resources and opportunities.

Program components include: recruitment of top math and science students who are selected for the program by faculty, staff, and peers; summer bridge program, including course work in a number of areas, training in analytical problem solving, group study, and social and cultural events; four-year comprehensive support for Scholars, which is contingent on maintenance of a B average (more limited support for Meyerhoff "finalists"); strong encouragement of study groups; constant emphasis on striving for academic achievement and seeking help, including tutoring, supporting one's peers, and preparing for graduate or professional school; creation of family-like community through regular staff-student group meetings and residence of Scholars in the same halls during the freshman year; personal advising and counseling; summer research internships in science and engineering; faculty involvement with students principally through recruitment, teaching, and research mentorship; professional mentors for each student from science, engineering, and health careers; and family involvement through special counseling sessions, events, and a mutual support resource—the Meyerhoff Family Association.

Minority Access to Research Careers (MARC)

Funded by: National Institutes of Health

Locations: 62 public and private institutions nationwide

Subject areas: Biomedical sciences

Date began: 1977 at 12 sites

Student eligibility: High-achieving minority students who express a commitment to pursuing a doctoral degree in biomedical research and are college juniors or seniors.

Purpose/Goal: To increase the representation of minorities in the biomedical sciences.

Data: 1996 evaluation report. Over 700 of 1,070 former students have already obtained research or clinical doctorates. Projecting these percentages onto all 3,062 MARC students who completed or left the program prior to 1994 yields an estimate of 400 students who will receive a research doctorate, 760 who will earn a clinical doctorate, and 40 who

will earn a combined M.D./Ph.D. Based on survey responses, MARC students represent almost 10 percent of Ph.D.'s awarded to Blacks, Hispanics, and Native Americans between 1977 and 1993. In 1992, former MARC students represented an estimated 17 percent of all Ph.D.'s awarded to Blacks awarded in the biomedical sciences and 10 percent of Ph.D.'s awarded to Hispanics in these fields. MARC students are more likely than majority students to attend graduate or medical school.

Program description: Highly qualified minority institutions receive support to provide science courses and research training for honors students who are in their third and fourth years of college.

Minority Biomedical Research Support (MBRS)—New name and rules (see below): Minority Student Development (MSD)

Funded by: National Institutes of Health. Some institutions, such as California State University, Los Angeles and California State University, Dominguez Hills, have large grants that sponsor students as well as faculty research. Others only have student support because faculty research is already funded. New rules will provide the same services as before but will allow program directors to have more flexibility and autonomy.

Locations: California State University—Fullerton, San Diego, Long Beach, Los Angeles, Fresno, Northridge, San Jose, Dominguez Hills, San Francisco, and Pomona. Under new relaxed MSD requirements regarding the numbers of minority students at a school, University of California will be able to receive MSD funds.

Subject areas: Biomedical sciences

Date began: Began with funding to historically Black colleges and universities for student research opportunities. In the 1970s, funding was extended to other schools with large numbers of minorities and offered to other minority groups.

Student eligibility: The programs "take some risks" and aim at a wide audience. They will take a student with a GPA as low as 2.3 if they see a "spark" or good laboratory skills. A judgment call is made regarding students and, so far, they report the CSUs have been lucky as shown by the graduate and medical school attendance numbers for students who participate in the program contrasted with those who do not. Students must have completed 30 units of course work. M.A. students must have been admitted to a degree program and must maintain a 3.0 or better.

Purpose/Goals: To provide minority students experience in biomedical research and to encourage students with such experience to pursue further education and, ultimately, careers in biomedical research.

Data: Thirty-one MBRS graduates over the past five years. Sixty-two percent went to graduate school and 44 percent to medical school, compared with 17 and 21 percent for Whites, 9 and 18 percent for Asians, and 10 and 17 percent for non-MBRS minorities.

Program description: Participants receive a salary of $6,000 per year for undergraduates and $7,000 per year for graduates to do part-time research, approximately 15 hours per week during the academic year with one of the MBRS faculty, and full-time during the summer for eight weeks. Graduate students are reimbursed for tuition and fees and are supported for travel to one major scientific meeting per year. Students must reapply yearly to participate and NIH hopes they will remain with the program for two to three years.

Minority Engineering Program (MEP): MEP is the higher education extension of MESA (mathematics, engineering, and science achievement), which operates in the secondary schools; MEP program directors often refer to their programs as MESA Engineering Programs.

Funded by: In California—state of California and private industry

Locations: MEP centers are located at the University of California, California State University, and private campuses. More than 20 MEP centers are located in California. Fourteen additional states have adopted the MESA model for similar programs.

Subject areas: Engineering and requisite courses for the major (math and sciences at high school and community college level)

Date began: 1973, founded by Dr. Raymond Landis at California State University, Northridge. Hewlett and Sloane foundations provided one million dollars over five years to expand MEP programs throughout the state. In 1978, corporate board chairs founded the MESA Industry Advisory Board. MEP's first state funding was awarded in 1979.

Student eligibility: The Minority Engineering Program (MEP) serves disadvantaged and underrepresented students in engineering programs at the undergraduate level, with an emphasis on African Americans, Native Americans, Mexican Americans, and other Latino Americans. Must meet institution entry requirements. The University of California MEP brochure states that it is "highly desirable" for students to have taken certain high school courses including: beginning algebra, plane geometry, chemistry, intermediate algebra, physics, trigonometry, analytic geometry, and precalculus.

Purpose/Goal: To increase the number of historically underrepresented students who graduate with university degrees in engineering and computer science.

Data:

- University of Colorado: Shows trends in: number of MEP students, percentage of MEP students in the College of Engineering, average GPA, retention, and grades in gatekeeping courses vs. non-MEP students.
- Colorado School of Mines: Data sheet shows average GPA for all engineering students in first-term calculus, minority engineering students (including Asians), and MEP students. Report provides number of students in various categories.
- CSU, Sacramento: The retention rate of MEP students increased 10 percent per year over four years—it began at 50 percent in 1991, grew to 80 percent by 1994, and has remained there. Overall MEP retention rate at CSUS is still 50 percent.

Program description: "Community building/collaborative learning" model pioneered by Raymond Landis. Services offered include academic advising, group study, learning and study centers including computers and necessary software, career exploration, parent involvement, and other services depending on the institution. MEP seeks to create a community of learners in order to help the student adjust and adapt successfully to the institutional learning environment.

Services at UC and CSU include: MEP freshman orientation class that teaches effective learning techniques and provides an introduction to the engineering major; the MEP study center, which provides a site for participants to meet, study, share information, and develop long-standing academic support groups; MEP students are clustered in the same sections of core sources so they can study and prepare together; students participate in Academic Excellence workshops based on Uri Treisman's model—the workshops teach key technical concepts and techniques through a unique curriculum and group support and study; and students participate in professional development through summer jobs and internship and scholarship opportunities offered by companies that recognize MEP as a valuable source for future employees.

MEP Project Success at California State University, Sacramento

Program description: Started in 1987 at CSUS in response to the protracted time MEP students were taking to graduate due to the many hours they were working outside of school because of economic necessity. Project Success is a collaboration among MEP, the Cooperative Education Program at CSUS, and industry sponsors. Through Project Success, employers provide summer, vacation, and co-op employment, plus funding of student services through a membership fee. The university provides recruitment, instruction, and orientation. Monitoring and counseling of students are important facets to the pro-

gram since each student has a close one-on-one relationship with instructors and counselors who learn of their personal and academic situations and needs.

Project Success works with industry sponsors to provide students with ample economic support through paid work and study opportunities before the freshman year, full-time summer and break employment, and a semester of co-op employment during which students are on leave from their studies and work full-time at the company. This translates to about 26 months of full-time employment in an industry where they will work as professionals when they have completed their degrees. An estimated income of $40,000 is paid directly to a student over a six-year period. Coupled with scholarships and financial aid, this funding allows students to forgo additional employment. The result is a significant reduction (2 to 3 years) in the average time to complete the engineering degree, despite the addition of the co-op assignment.

Minority International Research Training (MIRT)

Funded by: National Institutes of Health

Locations: Universities nationwide. We spoke to informants at Cornell (Eloy Rodriguez) and CSU Fullerton (Bruce Weber).

Subject areas: Biological sciences

Date began: Approximately 1996

Student eligibility: University students interested in biological sciences with the desire and ability to earn a graduate degree in biology or biomedical research who, based on their professors' judgment and other academic criteria, have the ability to succeed in this unique program.

Purpose/Goal: To provide field experience in a foreign country to students interested in biology or biomedical research in order to enhance student skills and incentive for graduate study.

Data: NIH is in the process of collecting nationwide data. Jeanne Flagg-Newton (director at NIH) and Bruce Weber at CSUF said there are likely to be some changes in the program.

Program description: Qualified university students interested in these fields accompany professors to a foreign country to participate in an intensive nine-week summer research program in related fields. Students participate in a training program, including seminars in the necessary areas—for example, at Cornell these seminars are in biology, conservation, ethnobotany, phytochemistry, zoopharmacognosy, ecology, plant systematics, and tropical biology—to prepare them for work in the rain forest in the state of Amazonas, Venezuela.

Minority Medical Education Program (MMEP)

Funded by: American Association of Medical Colleges and Robert Wood Johnson Foundation

Locations: Several schools of medicine in the United States and consortia: University of Alabama, Baylor/Rice, consortium of University of Chicago Pritzker, Northwestern, Loyola, and Rush, Case Western Reserve, United Negro College Fund at Fisk and Vanderbilt, University of Virginia, University of Washington, consortium of University of Arizona; Yale

Subject area: Pre-med

Date began: 1989

Student eligibility: Participants must be members of one of the following minority groups: African Americans, Mexican Americans, mainland Puerto Ricans, American Indians, Alaskan Natives, and Native Hawaiians. They must have completed one year of college, have an overall GPA of 3.0 (2.75 in the sciences), achieve a combined SAT score of 950 or ACT score of 20, and demonstrate serious interest in a career in medicine.

Purpose/Goals: To provide promising minority students who are interested in becoming physicians additional educational and practical experiences in order to enhance their competitiveness in the medical school application process. To ultimately increase the number of physicians from the target minority groups mentioned above that are underrepresented in the field.

Data: As of the fall of 1997, MMEP participants comprised 14 percent of all underrepresented minority medical students. Since its inception in 1989, there have been 6,400 participants. To date, 2,601 have applied to medical school and 60 percent were accepted.

Program description: Based on the Robert Wood Johnson Foundation's 20 years of experience in funding projects to increase the numbers of minority health professionals. Features include: Participation in a six-week summer enrichment program designed to help students compete successfully for acceptance into medical school; laboratory experience, including exposure to clinical and research aspects of medicine with an M.D. or Ph.D. mentor; academic enrichment in the biological sciences, math, and problem solving; preparation and review for MCATs; counseling on selecting medical school, the application process, costs of medical school, etc.; subscription to the MMEP newsletter, listserve, and MMEPCHAT as ways of staying in touch with cohort and faculty; stipends; and, if necessary, travel assistance.

Minority Undergraduate Research Participation in the Physical and Mathematical Sciences (MURPPS)

Funded by: University of California, Davis in conjunction with NSF and private foundations and industry

Location: University of California, Davis

Subject areas: Math and physical sciences

Date began: 1993-94

Student eligibility: Students already admitted to UCD who are interested in science. To stay in the program students must maintain a GPA required for entrance to graduate school and have a satisfactory performance evaluation from their research mentor.

Purpose/Goals: To enhance the undergraduate experiences of outstanding underrepresented students who have expressed interest in, and demonstrated an aptitude for, the physical and mathematical sciences and, ultimately, to encourage these students to pursue Ph.D.'s.

Data: Very small and new program—29 enrolled as freshmen the first year (1993-94), 45 in 1994-95, and 54 in 1996-97. No enrollees listed for 1996-97 or 1997-98. Five graduates in math and science so far.

Program description: Students are paired with professors in their fields who are doing state-of-the-art research. Students receive a $600 per quarter stipend for 10 hours per week of participation in research with their mentors. MURPPS also attempts to arrange summer internships abroad and in the U.S. for students who qualify. During the first two quarters of their freshman year, students are required to participate in a weekly mathematical and physical sciences seminar in which they learn how scientists use their knowledge to solve real-world problems. Participants present their research findings at the annual undergraduate research conference at UCD. In addition, MURPPS participants serve as mentors to students in local high schools. MURPPS also has a community college and high school training and outreach component.

MURALS

Funded by: University of California

Location: University of California, Davis

Subject areas: All, except engineering

Date began: 1988

Student eligibility: Undergraduates interested in pursuing graduate study. Focus on underrepresented minorities.

Purpose/Goal: To increase size of pool of interested and qualified minority students eligible for graduate study with view that these students will ultimately take faculty positions on college and university campuses.

Data: Extensive longitudinal study of student outcomes for 300 graduates of the program from 1989 to 1997, plus comparison of 1993 and 1996 MURALS graduates with all non-MURALS minority and nonminority graduates of the same institution within the same GPA range for one-year postgraduation enrollment in professional and graduate schools.

Program description: The program provides a research mentorship opportunity for undergraduate students in their junior or senior years. The commitment is for a two-quarter time period, and the students work closely with a faculty adviser on a project of their joint choosing. Students are paid a stipend of $400 per quarter, must attend a MURALS seminar where they discuss their research, and are strongly encouraged to present research at the undergraduate research conference. Some students present their research in other venues as well, and some publish their research with their mentors. Mentors oversee the research as well as advise students generally on graduate school options and help students to make applications to graduate school as requested.

Package Course Experience

Funded by: University of Minnesota

Location: University of Minnesota

Subject areas: All majors

Date began: Fall, 1992

Student eligibility: Developmental students

Purpose/Goals: To enhance students' first-year experiences by allowing them to establish a sense of community, increasing their sense of competence in both subject mater and study skills, introducing them to college survival skills, fostering frequent advising contacts, helping them develop educational and career goals, and permitting immediate intervention when needed because of increased participation by and increased improved communication among various faculty and advising staff. An additional goal was to achieve longer term goals that included improved performance over time and increased course completion, retention, and transfer to degree programs.

Data: Enhances students' grades only during 10-week duration of program. Does not appear to increase credit completion or retention.

Program description: The program is based on the "learning community" model, a common feature of which is the coregistration of participants in at least two courses during a given semester. Three packages were offered. Each package consisted of a content course, the first or second of a two-course first-year composition sequence, and an academic success/study skills class. Some packages added relevant math classes. Students registered for all classes in a package so they were together for three and sometimes four courses during a quarter. In addition, all participants were assigned to professionals and/or peer advisers working with the package program.

Project Preserve

Funded by: Participating institutions

Locations: City College of the City University of New York (CCNY), California State University, Northridge, Xavier University of Louisiana (chosen for their records of basic support services, willingness to augment or restructure those services, and for variation among institutional variables)

Subject area: Engineering

Date began: 1991-92

Student eligibility: Chosen for the project were approximately 100 minority students who had been dismissed from freshman engineering studies at other schools, or placed on academic probation, but whose high school grades and SAT scores were indicative of their potential for success.

Purpose/Goals: Despite the efforts begun in 1972 to increase the numbers of minorities in engineering, the attrition rate for these students is still estimated at 70 percent. Project Preserve was a two-year research program designed to confirm, by demonstration, the results of previous research showing that the combination of explicit cognitive development, close relationships with faculty, and strong bonds to an institution can raise the performance and retention of minority engineering students and to investigate the extent to which these practices can be fostered within institutions of varying characteristics.

Data: Among the 100 minority engineering students, two institutions achieved very high retention rates: 80 and 79 percent (higher than the normal retention rate for minority or White students who have no history of academic failure). CCNY produced only a 35 percent retention rate. Xavier and CSUN had more positive outcomes with regard to how students bonded with the institution than CCNY. Overall, 64 percent of the would-be

dropouts had achieved junior status after two years, and students demonstrated a greater degree of institutional support, greater social participation, closer relationship with faculty, and cognitive growth on basic memory skills. However, overall, none of the students showed improvement in their academic performance as measured by grades.

Program description: Programmatic activities for achieving program goals were suggested but not mandated. Project directors were strongly urged to meet regularly with each student individually and in groups, to monitor student concerns, and to promote close student/faculty interaction. Directors were also urged to provide workshops and consultants on topics to promote cognitive growth and academically supportive behaviors and attitudes. Written materials, including literature reviews of cognitive development strategies, were provided. To promote bonding to the institution, students were required to live on campus (except at CCNY where no housing is available), limit their employment to campus jobs (facilitated by program-arranged financial aid packages), and participate in organized minority engineering and student professional experiences.

Science Career Opportunity Programs for Excellence (SCOPE): Three affirmative action programs—Summer Undergraduate Research Achievement Program, the U.S. Department of Agriculture Research Apprenticeship Program, and the Junior Assistant Scientist Research Program

Funded by: Three programs directed by the College of Agriculture and Environmental Sciences, University of California, Davis, and the U.S. Department of Agriculture

Location: University of California, Davis

Subject areas: Sciences

Data: Telephone interviews of 53.3 percent of the 211 alumni of the program. Questions addressed: relationship of experience in program to present status, personal growth in the program, impact of program on family and friends, mentor relationship, and other comments.

Program description: We were unable to get a program description—just the executive summary of the evaluation study.

Spend a Summer with a Scientist (SAS)

Funded by: National Science Foundation

Location: Rice University

Subject areas: SMET

Date began: 1989

Student eligibility: Underrepresented undergraduates and graduates from Rice as well as from other U.S. campuses. Selection is competitive, but no strict criteria are listed. Students are selected on the basis of grades, test scores, experience, desire to do research, and demonstrated interest in the program.

Purpose/Goal: To stimulate the pool of underrepresented students continuing into graduate school and successfully completing graduate degrees in the SMET areas.

Data: Evaluation conducted by the LEAD Center at the University of Wisconsin-Madison. Collected data on the postgraduate outcomes for 52 of the 68 program graduates through April of 1998. Twenty-nine of the 53 returned surveys assessing the program and its impact on students, and another 25 students were interviewed by telephone to provide in-depth commentary on their experiences. No control data are presented.

Program description: Students are assigned to an advanced graduate student or faculty member with whom to conduct research project over the summer. Both students and faculty receive stipends. Students also meet weekly as a group and discuss issues related to research as well as issues of students of color and women in the SMET disciplines. There is a structured discussion of racism and how to deal with it. Students may participate for multiple summers and the close connection with faculty (chiefly with Dr. Tapia who runs the program) is considered to be an important role in guiding, encouraging, and helping students to attend and successfully complete graduate programs.

Student Achievement in Research and Scholarship (STARS)

Locations: Consortium of Ohio public and private universities and community colleges

Subject areas: All majors

Date began: 1992-93

Student Eligibility: High ability minority (African-American, Hispanic, and Native American) undergraduate students who are preparing for graduate school and ultimately for academic careers. Students must be college sophomores or juniors with at least a 3.0 GPA.

Purpose/Goal: To increase the pool of minority doctoral degree recipients who would be eligible for faculty positions in Ohio's colleges and universities.

Data: Survey information based on focus group interviews of students. Reports contain no summary or comparative data on GPA, retention, or graduate school enrollment.

Program description: The program is grounded in research on the reasons minority student drop out of the higher education pipeline. The critical feature of STARS is the fac-

ulty-based mentoring program. Students and mentors sign a contract outlining their advising, research, and professional activities. Program services/features include: undergraduate research assistantships that pay the student $800 per quarter or $1,200 per semester for work on a research project with a faculty mentor; assistantships are awarded competitively, on the basis of research proposals; travel scholarships to enable students to attend academic or professional conferences; GRE workshops; seminar on preparing applications for graduate school; campus visits to several neighboring universities; statewide conference built around student research presentations; and early admission to graduate school with assurance of financial aid.

Summer or Academic Year Research and Mentoring Programs at University of California

Funded by: University of California and various collaborative sources

Locations: University of California campuses

Subject areas: All majors

Date began: Varies

Student eligibility: Varies by program

Purpose/Goals: To provide undergraduate underrepresented minority students with research experience and, through this experience, a mentoring relationship with a professor and/or a graduate student. The purpose is to encourage capable minority students to earn their undergraduate degrees and proceed to graduate studies.

Data: One survey of program at University of California, Berkeley

Program description: Typical programs include an eight-week summer program or academic year internship in which students participate in research with graduate students and professors and receive college credit for their participation. Students also participate in activities designed to develop the academic skills necessary for success at the graduate level, including workshops on topics such as graduate level writing and presentations, test-taking strategies, time-management skills, research of—and application to—graduate schools and fellowship programs, and GRE preparation.

21st Century Program

Funded by: Joint sponsorship of College of Literature, Science, and the Arts and University Housing

Location: University of Michigan

Subject areas: All majors

Date began: 1991

Student eligibility: First-year students in all schools and colleges with an approximate 20 percent oversampling of Black students and similar oversampling of non-Black minority students.

Purpose/Goal: To address academic identification and mental health of minority college students and thereby improve minority academic achievement, retention, and close the gap between White students and students of color.

Data: Two articles present alternate views of the program's success. Steele presents arguments in favor of 21st Century and against the "remedial" program at UM. Collins presents a plausible challenge to Steele's presentation of the data.

Program description: The 21st Century Program is based on the research by Dr. Claude Steele and others on stereotype vulnerability and factors that lead to student achievement and persistence in higher education. Steele posits a social psychological explanation for lower rates of achievement for women and minorities based on students' vulnerability to stereotypes based on their own suspicions of inferiority, which leads to "disidentification" with school and achievement. The program seeks to mitigate the effects of this stereotype vulnerability through several elements that create a support network at the university, foster a sense of community among the students, and provide special academic preparation. The elements include: a nonremediation focus; a 21st Century seminar—small groups of students explore topics addressing personal, academic, and community issues that first-year students are likely to encounter, and learn about university resources that might help them meet first-year challenges; subject mastery workshops based on Uri Treisman's "challenge" workshop model, emphasizing collaborative learning and mastery of concepts beyond requirements in order to prepare students for advanced courses and future careers—participants choose to participate in workshops in calculus, chemistry, physics, or writing; the program creates a supportive community by housing all program students in the same wing of the residence hall (all of the program's activities take place in the hall) and staffing the hall with upperclass students who have received training in issues that first-year students face; participants may register for some course sections designated as 21st Century Program sections and participate in enrichment workshops associated with these sections; and students may choose to participate in community service as part of one of the 21st Century course offerings.