

Design Principles

There is no cookie-cutter approach to developing programs that serve the cause of diverse participation in STEM. One can look at the experiences of others, distill documented programs and processes, but in the end, each must be crafted and configured anew. Because of this need to create programs in context, we offer a set of design principles rather than recipes. Much of this may seem like “common sense.” Yet in addition to programs that are known by research and evaluation to have exhibited success,¹ we’ve utilized the discussion of the participants at the January 2004 conference—many of them diversity program architects—to array the design principles. They serve as a template for constructing programs and projects that will fit the needs, challenges, and context of the particular offering institution.

The design principles are grounded in the discussion contained in the Legal Primer, so that program managers may draw on legal precedent to bolster their efforts. Taken together, these principles represent strategies for coping on campus rather than back-pedaling from “what works” in response to allegations and criticisms that may be unfounded, distorted, or without legal precedent.² They are meant to encourage conversations between those who lead and administer programs that assist students and faculty, and institutional officials, especially university counsels, who may be inclined to modify or abandon those programs in the face of intimidation without examining their design or performance.

As a recent article on higher education lawyers put

it, “‘competent representation’ today means *preventive* advice.”³ Think about what your university counsel can do for you. To help, we offer an assortment of antidotes, templates, or checklists—take your pick—for assessing current practices that may be challenged on the grounds that their design is flawed or legally indefensible.

Finally, we should remain mindful that STEM fields represent pathways to 21st century careers, not only in the U.S. but world-wide. Preparing as many students who are both interested in, and of demonstrated capability to pursue such careers is an imperative, especially if viewed against a backdrop of heightened national security here and challenged economic vitality abroad. STEM can either be an equalizer through access—to information, networks, and other global resources—or a wedge that widens the gap between those with “knowledge” and those in perpetual “ignorance.” The opportunity to acquire and use STEM skills underpins a robust workforce and particularly emboldens its leaders in government, industry, education, and the media.

What’s different about STEM is that: (1) participation in science and engineering vis-à-vis other fields is a national priority and should be treated as such; and (2) the *under*participation of women, minorities, and persons with disabilities in STEM—regardless of employment sector—continues as a structural problem, almost 40 years of policy and practice notwithstanding.

The eight design principles presented below

encompass both theory *and* practice. They are offered as reinforcement for institutions of higher education committed to building STEM capacity as a human and technical resource to stand their ground.

1. Mission: How do diversity efforts fit into the larger institutional mission?

Theory: Student-oriented programs are usually created in response to an overarching concern—the competition for talent. STEM disciplines are prominent in this competition because they pride themselves on attracting the “best” talent, both high school graduates and baccalaureate recipients. But the appeal of STEM careers to U.S. students has eroded in the last generation. Cost combined with high attrition rates and protracted professional preparation (notably, serial postdoctoral appointments) has diminished the attractiveness of pursuing STEM degrees. The impacts of these factors are even more profound on the decisions of those who are disadvantaged, first-generation, students of color and/or women. Their history of participation in STEM has been limited not by choice alone. Increasing awareness of and academic preparation for STEM as an option has served as a fundamental rationale for “intervening” through campus programs to improve both precollege student competitiveness for admission as well as performance and knowledge/skills acquisition once enrolled. The problem is not only *how to attract more*, but assuring that those electing STEM are equipped with the tools to succeed. This is achieved in many ways, but they all begin with the campus “mission statement.” By articulating what the institution values, all of its members have a focus for their commitments and actions. The institution, in short, can be held accountable for what it promises to deliver.

Practice: Justice O’Connor’s opinion in *Grutter* explicitly reaffirms a university’s first amendment right to include in its mission statement a commitment to diversity. A recent survey by the National Association for College Admission Counseling found that of the 451 colleges and universities who responded, 74 percent included a commitment to diversity in their mission statements. Sixty-eight per-

Sample Mission Statements

Below are excerpts of actual university mission statements and one professional society mission statement, with the institutional identifications removed. These mission statements illustrate (1) an explicit racial and ethnic diversity commitment, (2) a commitment to diversity without mention of race and ethnicity, and (3) a more oblique reference to student development and society.

UNIVERSITY 1: “...The University counts among its greatest strengths and a major component of its excellence the diversity of its faculty, students, and staff. It is committed to equal educational opportunity. It strives to hire a diverse faculty and staff of exceptional achievement through affirmative action, to celebrate diversity in all of its programs and activities, and to recruit and retain qualified graduate and undergraduate minority students...”

UNIVERSITY 2: “The mission of [This Institution] is to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century... [This Institution] is dedicated to providing its students with an education that combines rigorous academic study and the excitement of discovery with the support and intellectual stimulation of a diverse campus community...”

UNIVERSITY 3: “The mission of [This Institution] is to expand human knowledge and benefit society through research integrated with education. We investigate the most challenging, fundamental problems in science and technology in a singularly collegial, interdisciplinary atmosphere, while educating outstanding students to become creative members of society.”

PROFESSIONAL ASSOCIATION: “The mission of [This Society] is to advance and diffuse the knowledge of [This Discipline]...[and] to sponsor programs designed to increase the number of women and minorities in [This Discipline]. In this way, [This Society] fosters the health of the profession through its career and development initiatives...”

cent clearly mention race and ethnicity as a component of that diversity, and 64 percent added other diversity categories (e.g., socio-economic, geographic, age, religion, gender, first-generation status, international, etc.).⁴ For any program manager, knowing your university’s or organization’s mission statement is the bedrock for designing programs that serve the mission.⁵

For universities that do not explicitly mention stu-

dent/faculty diversity as a major part of their mission statements, program managers may work, in consultation with their provost, dean, or president, to ensure that their efforts are a good fit for the institution. Language in mission statements that expresses a desire to “prepare students for a changing world,” discuss the “role of the university in the United States,” or that seek to “address national needs” or “compelling state interests,” may all be used in diversity program planning.

The bottom line, however, is that universities need to take on a strong leadership role that unambiguously states a commitment to diversity in their mission statements. In addition, all universities are legally required to have an affirmative action plan in place for faculty and staff hiring (see Legal Primer). All members of the university community should review both their institutions’ mission statements and the affirmative action plan, and promote the adoption of clearly worded commitments to diversity. University counsels should also be apprised of the importance of diversity to the institution so that their advice is in accordance with the university’s mission.

2. Intent of the program: How does the program address overall university or organizational goals? What need does the program meet? What evidence led to the creation of the program?

Theory: Program intent must be translated into program *design*. How to make operational an identified need associated with a particular population, indeed one that fulfills a larger institutional goal, cannot be left to chance. Surveying what has been done elsewhere, on your own or similar campuses (see Context), helps to benchmark what should be designed into the program. This also makes clear to all who would approve and participate what is expected of the effort, how effects can be attributed to the program, and what will be measured as primary outcomes (see Operations). Declaring the core service to be offered and identifying the principal mechanism for delivering the service are essential. Evidence of success with the population(s) targeted should be defined *a priori*.

Practice: After assessing the goals of the university or organization, potential programs should clearly state the program’s mission and objectives using the same terminology, but modified to reflect its specific intent. The need for the program should also be explicitly laid out, preferably grounded in data that supply clear evidence that something must be done if valued outcomes are to be realized. Data from both your own institution, as well as national-, state- and regional-level research, can help reinforce program rationales. Clearinghouse organizations such as the Commission on Professionals in Science and Technology (www.cpst.org) look across various federal, disciplinary, and professional society databases to update trends in enrollment, degrees, hiring, salaries, and other STEM market indicators of key outcomes. These data can put institutional performance as measured by local sources into national context, as NACME (www.nacme.org) does for engineering.⁶

In STEM fields, program intent is an extension of the institutional mission, while grounded in a perspective on underrepresentation that applies to a particular discipline. Therefore, in addition to the university’s mission statement, program developers may utilize information about the specific field in which they are targeting their intervention. Reinforcing the rationale for an intervention with information on local, state, regional or national needs (changing demographics, economic development, and/or security concerns, for example) “brings the problem home.” In general, the more evidence that can be presented, the more grounded—connected to larger needs and trends—the program becomes.

3. Target population: What is the population to be served? How is this population linked to the intent of the program?

Theory: Even if the intent of the program and its delivery mechanism are sound, how to reach the desired population is a multifaceted challenge. The Thomas Kane analysis (see Appendix C) shows, based on econometric modeling, that many of the suggested alternatives to racial targeting have been largely ineffective in either admitting more students of color to universities or increasing their participation in STEM

fields. Indeed, current evidence points to little or no impact of race neutral alternatives.⁷

Kane points out that the use of race in admissions decisions “demands a tradeoff among three worthwhile goals: race-blindness, academic selectivity, and a semblance of racial diversity on selective campuses.”⁸ The alternatives herald a continuing dilemma. For example, states that have embraced “percent plans”—California, Texas, and Florida—have large numbers of African American and Latino students attending segregated high schools. Similarly, college admissions schemes based on economic disadvantage “offer a very indirect means for achieving racial diversity.” Finally, the Supreme Court’s use of “critical mass” as a gauge of how much diversity is enough to produce the educational benefits universities seek—not for “minority students alone, but the whole class”—remains nebulous. Any *a priori* percentage becomes a “quota.”

Practice: The population your program is intended to serve will be a natural outgrowth of program intent. If, for example, your goal is to diversify enrollment in a STEM field, creating awareness demands outreach (see below), some of which can be done impersonally, e.g., through web sites, but much of which requires some personal contact and the opportunity to ask questions and consult other professionals. The program should specify how these connections will be made and facilitated. If the chief outcome is increased applications for participation in a precollege program, or college admission, or a summer internship, then those should be identified. This also helps to develop a network of professionals on campuses and in employing institutions that becomes attentive to both the problem and how the program is working to remedy it. Broadening the target population runs the dual risk of not serving those with the greatest need and diluting program impacts for those who are served. Resources can only be stretched so far.

While the legal interpretation of “narrow tailoring” makes the exclusive targeting of underrepresented minority groups harder to defend, that does not mean that targeting is forbidden (see Character below). The Supreme Court ruling states only that a good faith effort must be made by any program to consider race neutral alternatives. This does not mean that you

must necessarily adopt race-neutral targets to demonstrate that they are unworkable. You simply need to consider them as they may be obviously unworkable. This consideration should be well documented, along with the claim that race-conscious targeting is needed to meet diversity goals in a certain discipline, department, school, or institution.

The findings of the Texas Higher Education Opportunity Project, which examines the impacts of the Texas Top 10% Plan post-*Hopwood*, are instructive.⁹ With a rationale that grades are better predictors of college success than test scores, which in turn levels higher education opportunity, promotes access, and shifts the debate from “deserving vs. undeserving race/ethnic groups to deserving vs. undeserving schools,” Marta Tienda reports that the top 10% law benefits Asians the most and Blacks the least. In all, after three years, “nonminority excluded groups” in Texas enjoy broadened opportunity in higher education. She cautions that the limitations of so-called percent plans require massive outreach and retention investments for students from low-performing (read “segregated”) schools.¹⁰

The preponderance of such evidence cannot substitute for the generation of research on the population served by *your* program, in *your* state, and documentation of how you have considered race neutral alternatives. What, under narrow tailoring, are the potential impacts of your program on those groups omitted from the target population? If you are providing a benefit or service that is not available to those ineligible for your program, the impact of that ineligibility needs to be assessed and documented. A starting point for any program is to assess the services and benefits available to all students at your institution and examine who has not been benefiting from those services. If, for example, research assistantships have gone largely to men, instituting a program that opens up new slots for women does not harm the men who will continue to compete for the available slots. But to reserve slots for members of certain groups is a quota, and therefore indefensible. By documenting prior inequities and demonstrating the added benefit of both more slots and greater potential diversity, targeting specific groups becomes viable.

After such consideration, you might decide to incorporate a mechanism by which non-members of

Expanding the Target Population: One Program's Experiences

Following their legal counsel's review, the minority summer internship program at a research university opened up its target population in 1999 to include "low-to-moderate income" and "first generation college" students. The program had been in place since 1995, allowing for a pre-post comparison of the applicants to and participants in the program.

Changes in wording included deleting the word "minority" from the title of the program (from Minority Summer Internship Program to just Summer Internship Program). The program announcement modified language to include the new groups—in italics below:

"This summer internship program provides experience in research laboratories to *students of diverse backgrounds, including underrepresented minority students and students from economically disadvantaged and underserved backgrounds* that have completed two or more years of college."

The following table tracks applicant and participant statistics in the program from 1995 through 2003. The program manager points out that "Opening the program to these two additional categories of individuals [low-moderate income and first-generation college] did not dramatically impact our applicant/participant pool. Indeed, it increased the number of students served so that support of underrepresented minorities was undiluted. In the long run, of course, it is unclear how this one experience changed minority student outcomes in the aggregate."

Year	Total Students	African American	American Indian	Alaskan Native	Pacific Islander	Mexican Amer/Chicano	Puerto Rican	Other Hispanic	Non-URM
Participants									
1995	16	13	1	1	0	0	1	0	0
1996	17	17	0	0	0	0	0	0	0
1997	29	23	0	0	2	0	4	0	0
1998	31	16	4	0	1	2	2	3	3
1999	21	12	2	0	1	1	1	3	1
2000	21	8	1	0	1	1	4	1	5
2001	47	26	0	0	0	5	2	5	9
2002	45	30	3	0	0	4	0	3	5
2003	47	32	1	0	0	5	2	6	1
% of Participants		64.6	4.4	0.4	1.8	6.6	5.8	7.7	8.8
Applicants									
1995	56	49	1	0	0	0	2	1	2
1996	97	64	2	0	12	8	2	4	6
1997	110	77	1	0	6	6	13	0	6
1998	164	112	6	0	3	11	15	9	10
1999	140	69	3	0	3	11	11	11	32
2000	122	55	5	0	1	11	21	4	25
2001	149	89	2	0	0	8	15	10	25
2002	207	118	8	0	4	11	6	34	26
2003	212	93	9	0	3	21	12	31	43
% of Applicants		57.8	3.0	0.1	2.5	6.9	7.7	8.3	13.9

Source: anonymous research university

targeted groups can also compete if they meet certain criteria. Most programs that have broadened their selection criteria maintain wording that states that certain groups are eligible (e.g., African Americans, Hispanic Americans, and Native Americans), but also includes other categories of underrepresented groups (e.g., low income and first generation college students), or students with a demonstrated commitment to diversity goals.

It is incumbent on the program manager to pay attention to the impact that broadening the target populations has on the make up of program applicants and participants. Again, data matter. By maintaining detailed data on program recruitment, applications, enrollments and retention, program managers have a powerful tool with which to evaluate program targets and make modifications to best meet those targets.

4. Character of the program: What does the program do? Where is it located?

Theory: While there is no moratorium on targeting racial and ethnic minorities, there are still two principles to be followed no matter what the character of your intervention. The Supreme Court upheld the use of race in admissions only if it could be shown to further a “compelling state interest” and be “narrowly tailored” (see Legal Primer). The Supreme Court ruling in *Grutter* reaffirmed the *Bakke* ruling that there are two compelling state interests that can justify the use of race in admissions: remedying the present effects of past discrimination and creating a diverse student body. This acceptance of the use of race in admissions decisions supports, to some extent, the use of race and ethnicity in programs and interventions—from financial awards and scholarships to recruitment and retention programs to outreach and K-12 programming—if they represent a compelling state interest and are narrowly tailored.

Practice: Remedying the effects of past discrimination has proven extremely difficult to establish empirically. The evidence needed to demonstrate that current low numbers of minorities are due to past discrimination is almost impossible to assemble.¹² Therefore, most interventions will likely use the diversity rationale for designing specific programs. This rationale, however, also requires a level of evidence to justify using race in interventions beyond admissions practices. We have emphasized throughout this document the need to gather research and data to support mission statements, program intent, and target populations. The design and character of programs should also cite evidence that supports whatever is planned as a means of advancing campus diversity and must be narrowly tailored to accomplish that goal.

Narrow tailoring has several requirements, all of which are data- and research-based. First, any consideration of race in programming should not be mechanical, but flexible. In other words, race should be one factor among others used to determine eligibility for program activities, whether they are financial or other kinds of support activities. Second, there must be a good faith effort undertaken to ascertain if race-neutral alternatives could be implemented

instead in achieving diversity goals. Evidence should also be marshaled to show that the impact of program activities does not unduly burden non-minorities. Finally, narrow tailoring demands substantial ongoing review and evaluation to determine if a program’s activities to promote diversity are still necessary.¹³

The act of configuring programs to support diversity, then, must always take into account the requirements of compelling state interest and narrow tailoring. They must build in mechanisms that take race into account in a flexible way, and include “real time” mechanisms to evaluate the context within which the program operates and the outcomes of program activities. By doing so, they defend against anti-affirmative assaults, such as attacks on summer research programs, special scholarships, and outreach activities.

At the nuts-and-bolts level of program configuration and operation, program designers and managers should keep an eye on narrow tailoring requirements and build them directly into the program. Programs must have an identity, a leader, a staff, campus home, budget, and a constituency of participants. Wherever the program is housed (in a department, a college, or institution-wide), evidence should be gathered that supports program aims and creates buy-in at all levels. Program activities should be designed to address specific diversity needs, be justified with research into past and present practices, and take into account the positive and possible negative impacts on other students (minority and non-minority alike). Expected behavior on the part of the students served and the professionals who contribute their time and knowledge should be made explicit in program documents. Data, research, and reporting on promising practices should be incorporated so as to influence the character of the program and its operation on campus and perhaps elsewhere.

Narrow Tailoring Requirements:

- The use of race in program or institutional admissions must be **flexible**.
- There must be consideration of whether workable **race-neutral alternatives** exist, and whether program activities will unduly burden other groups.
- **Review and evaluation** of program activities and outcomes must be ongoing.

5. Program Context

Theory: Context matters. One size does not fit all. Any program to promote diversity in STEM fields is located in myriad contexts. It is first and foremost located in a particular institution that has a history that should be taken into account throughout the design and implementation of the program. At the institutional level, establishing context should involve collecting yearly data from throughout the institution, as well as in the STEM discipline(s) in which you are working.

Collecting baseline data and data over time will help shore up your rationale for locating your project at your institution, college, department, etc. These data are especially important for deciding on “critical mass”—the size of the community of students from different groups that is necessary for minority students to feel comfortable and, at the same time, that will attract a number of other students, through recruiting efforts. In the words of a student at a private research university who has greatly benefited from the chance to learn from and participate in ethnic student organizations, “these groups are among the most unifying, as they generate cross-ethnic support and force us to develop racially sensitive practices. That’s what education should be about: diverse people challenging each other to be more responsible to the community as a whole.”¹⁴

What constitutes a critical mass of students sustainable over extended periods through successful retention and recruitment is currently amorphous—and left intentionally so by the Supreme Court. Gathering good data may go a long way to establishing what that number, both the order of magnitude and the range of possibilities, might look like.

Practice: Instituting programs within an institutional context involves reviewing specific policies and practices at your institution that might impact the presence of underrepresented groups in STEM fields. If there are documented instances in which you are interested in designing interventions for groups that have historically not received services and benefits, this provides a well-grounded basis for adding them, without necessarily taking anything away from those who had benefited before. In addition, looking across your institution, you might find that other schools,

colleges or departments have adopted interventions that have had a measure of success in diversifying their talent pools. Basing your program on that success, while adapting it to your particular needs, grounds your intervention in the same context, and could produce institution-wide “best practices” that are flexible, or identification of “worst practices” that should be avoided. It might also serve to open up a dialog across your institution, developing a network of program administrators that could then join university or organization counsels to ensure that programs are well-designed and legally defensible.

Programs to diversify the talent pool in STEM disciplines are also located within the context(s) of those discipline(s). Data-collection should look across your discipline to ascertain the need for diversity in the field as a whole. For some fields this is more obvious than for others. In addition, making connections with your discipline’s professional societies may open up more information for you about diversity in the field, “best practices” that have worked at other institutions, or initiatives that you might tie into. There may also be specialized organizations within your discipline or field that have programs for specific groups. Partnerships with these organizations may provide even more resources to enhance diversity efforts.¹⁵

Finally, your program also fits into a regional and national context that cannot be ignored. Where your institution is located is important when looking at diversity rationales. If you are an urban campus, for example, diversity becomes a matter of educating those “in your backyard.” Diversity on a rural campus, on the other hand, might look at the necessity of providing students with a broad background, including the experience of interacting with a cross-section of students and faculty from many different backgrounds, which they might otherwise not get. Within the context of your state or region, diversity goals could tie into the populations, employment opportunities and workforce needs that are found in your area.

At the same time, your location may also constrain what you can or cannot do (see “Lawyers Predict...”). The Supreme Court ruling did not impact institutions in those states that are still under court ordered desegregation, for example. Institutions in those states must still comply with the federal court order. At the same time, the Supreme Court ruling did not nullify state

Lawyers Predict the Shifting Context for Higher Education Programs in the Next Five Years

In a supplement to *The Chronicle of Higher Education* (June 25, 2004, pp. B4–7) 10 legal experts offered their views on the most pressing issues that higher education institutions will confront in the next five years. Eight of the 10 mentioned “diversity” in various guises. All should be seen as catchphrases that signal the sites of future battles. Indeed, some are already underway: “maintaining academic standards,” “inclusion of minority students,” “enrollment management,” “the meaning of discrimination,” and “access and economic diversity.”

An anonymous lawyer consulting on this project offers the following illustration of why two lawyers might give conflicting advice regarding the legality of race-exclusive terms in financial aid based on the language of California Proposition 209, which stipulates that “The state shall not discriminate against, or grant preferential treatment to, any individual or group on the basis of race, sex, etc.”

The sustainability of such financial aid depends upon whether providing the aid constitutes “discriminat[ing] against” or “grant[ing] preferential treatment.” A strict statutory constructionist (or a very risk-averse lawyer) might argue that any decision giving a benefit (i.e., anything of value) based on race or gender would satisfy the definitions and therefore be illegal. However, a less risk adverse attorney would, indeed, have a credible argument that you have to look at the context. If a university administers large pots of financial aid with different criteria depending on the pot, it might be the case that providing aid on the basis of race to Student A is neither “preferential” to that student nor does it “discriminate against” Student B because Student B will simply receive financial aid from a different pot of money.

In this case, the counsel for the private scholarship donor should look at state judicial decisions to research whether a California state court has ever further defined either of these Proposition 209 terms under California law. If not, the counsel still might be able to extrapolate from other areas of state and federal law to bolster the argument that under Proposition 209, this situation is neither discriminatory nor preferential. It may be an uphill battle with a risk adverse university counsel because the desired result is not so clear cut here.

laws that forbid the use of race and ethnicity, for example, in institutional programming, such as those currently enacted in California and Washington State. In addition to the Legal Primer offered here, some knowledge of the laws and rules that guide affirmative action in your state or locality, as well as the authorized federal exceptions, is also essential (see Legal Primer for notable state-level laws).

6. Evaluation and Research

Theory: By now it should be obvious that your program or project should have research, evaluation and data collection components. It is through these types of painstaking evaluative efforts that the future of diversity efforts can be sustained to their obsolescence. In other words, prove that you are making a difference so that you can continue to make a difference until there is no need because there is no difference.

Project or program evaluations can be either formative or summative. Formative evaluations involve gathering data before and during the project or program to assess if what you plan to do and are doing is effective. Formative evaluations can lead to program or project changes or changes in emphasis as successes and failures occur. Summative evaluations, on the other hand, look at project and program activities over time to assess their overall impact retrospectively.¹⁶ Both are necessary for project or program documentation that assists in managing, monitoring, and manifesting what makes a difference with whom.

A recent report from the U.S. Government Accountability Office reviews the systems in place at four federal agencies to ensure that the universities receiving federal financial assistance from each agency are fully compliant with Title IX of the Education Amendments of 1972, which bans gender discrimination not only in women’s sports programs but in academic programs as well. The report concludes that the science agencies fell far short of the oversight that is directed by government-wide Title IX regulations, and that they must do more to ensure that universities benefiting from STEM funding guarantee women’s participation in university STEM programs.

In the Sciences, Agency Compliance with Title IX Lags

“Federal science agencies have made efforts to ensure that federal grant recipients comply with Title IX in the sciences by performing several compliance activities, such as investigating complaints and providing technical assistance, but most have not conducted all required monitoring activities. Specifically, according to [the Department of] Energy, NASA, and NSF officials, each agency referred complaints involving educational institutions to [the U.S. Department of] Education and those involving employment to EEOC for investigation.... However, agency officials told us that they could not determine whether grantees have investigated Title IX sex discrimination complaints they have received, since grantees are not required to report on their activities.... [O]nly Education has monitored its grantees by conducting periodic Title IX compliance reviews [those who already have received grant funding]... In this report, we are making recommendations to the Administrator of NASA, the Secretary of Energy, and the Director of NSF that they take actions to ensure that compliance reviews of grantees are conducted as required by Title IX regulations.”

Source: U.S. Government Accountability Office, Women's Participation in the Sciences Has Increased, but Agencies Need to Do More to Ensure Compliance with Title IX, GAO-04-639, July 2004.

Practice: An overall assessment of your university's or organization's diversity efforts is recommended. Dialogue should be open across the different schools and departments, involving program managers, faculty, department heads, and administrators through the sharing of evaluations and outcomes. Through these efforts, a meta-analysis of institutional programming could result that could broaden the scope of efforts as “best practices” are identified. In addition, at the institutional level, some efforts should be undertaken to evaluate the impact of diversity efforts on non-targeted populations.

Too often, however, studies fail to get beneath the surface of the “numbers” to assess the impact of cultural dynamics as success (or failure) indicators. So-called cultural studies look at the campus and classroom environment. They can identify attitudes, behaviors, and cultural variables—both institutional and group-based—that facilitate or inhibit the attainment of a desired “future state.”

The importance of such changes is evident on cam-

puses today. Offices of “quality improvement” and “institutional assessment” are common, as responses both to accountability demands of federal sponsors (as embodied by the Government Performance and Results Act of 1993) and the Baldrige quality movement that migrated from the corporate sector.¹⁸ Above all, “Environmental and experimental components of a diverse campus have positive affects on retention, overall college satisfaction, college grade point average, and intellectual and social self-confidence.”¹⁹

Over and above evaluation, we also need race-conscious action research—research that explores the impact of diversity on students, institutions, disciplinary fields, cities and regions, and the nation as a whole. Many scholars have been working for decades on the impact of diversity on both underrepresented and majority groups. This research should be used to inform decision making at all levels. We need to explore what has worked, why it has worked, and where it has worked to ascertain what is adaptable and scalable to a variety of circumstances. Currently, this research is scattered, with very few attempts to synthesize what we know in a meta-analysis type structure.²⁰

A clearinghouse for information on studies and ongoing action research efforts would provide ready references to program managers, college administrators, and university counsels who may feel under siege by groups targeting diversity efforts. No federal agency/department or nonprofit organization plays this role on a consistent basis, though organizations such as ACE, College Board, NSF, Sloan Foundation, and some corporate foundations try to fill these gaps. The more evidence that is presented, both on particular programs and projects and on the effect that diverse learning communities have at all levels, the more convincing will be arguments to maintain diversity efforts.

7. Faculty Recruitment and Retention

Theory: If there is one area where universities are on solid legal ground in promoting diversity efforts, it may be faculty recruitment and hiring. As federal contractors, universities are still bound by Executive Order 11246, which carries a requirement to develop

Diversifying the STEM Faculty

The need for a more diverse population of STEM faculty is compelling. According to NSF data, women Ph.D. scientists and engineers employed in educational institutions were less likely than men to hold the rank of full professor or to be tenured, even after adjusting for age or years since the doctorate (*Characteristics of Doctoral Scientists and Engineers in the United States: 2001*, Detailed Statistical Tables, National Science Foundation, 2003).

Doctoral faculty who are minority are barely visible regardless of field—less represented at the highest ranks and less likely to be tenured. African Americans and Latinos comprise about 3 percent of the engineering faculty, with even less representation at the full and associate professor levels (see the 2003 faculty surveys of the American Society for Engineering Education, www.asee.org).

Some strategies for building and maintaining a diverse STEM faculty include increasing the number of women and persons of color who are tenured and in upper level administrative positions. After all, tenured professors and department heads control resources, change values, promote excellence, and reward performance. Moreover, they wield influence by modeling faculty behavior. There is now research recognition of this, but solutions to making more of it happen—for the good of both the candidate faculty and the institution—remain elusive.

an Affirmative Action Plan that includes an analysis of the utilization and underutilization of minorities and women (see Legal Primer). It also requires that contractors reach out to a diverse pool of candidates, although the actual selection of an employee should be done regardless of race or ethnicity. In other words, not only are universities able to recruit based on diversity, they are required to do so!

Practice: Recruitment is the first step in the process of producing a diverse faculty. Single position searches differ from cluster recruitment, and specifying subdisciplinary areas of specialization further delimits the pool of eligibles. Retention efforts are also needed, especially when your “diversity hire” is the only one in a department or college. Once a new faculty member is hired, keeping track of her/him as s/he moves through the tenure process is of critical importance, especially so for women and minorities. Faculty searches are expensive and represent a net drain on

ever dwindling resources for colleges and universities. Those funds would be better spent trying to retain faculty by successfully moving them through the tenure process and then providing necessary resources to keep them.

Retention efforts, however, may challenge current university cultures by setting up different reward structures and changing the expectations of faculty and administrators. Experimenting with support measures such as making the tenure clock more flexible, and increasing the family-friendliness of university support structures, for example, may challenge existing notions of acceptable workloads and time commitments. Such efforts, however, have proven beneficial to both female and male faculty members.²¹

The concept of “critical mass” at the faculty-level is also important, though this may be of a different magnitude than “critical mass” in the student body. Hiring one faculty member from an underrepresented group may not be sufficient, and the likelihood of retention is greatly reduced. Building a community that includes professionals from all backgrounds and that is supportive is more likely to maintain successful diversity efforts at the faculty level.

8. Leadership

Theory: Everything we have discussed in these design principles is predicated on the need for a leadership willing to take risks in order to realize the rewards inherent in a more diverse campus or organization. But leadership at what level, and even if people want to do the right thing, do they know what to do?

There has always been a debate over whether change is more effective if it comes from the top down or the bottom up. The answer is that change must come from both directions—or risk failure. The Physics Department Head, the Dean of Engineering, the Chancellor or President may have a vision for where s/he wants the organization to go, but without convincing those below of the necessity of the vision, it is likely to go nowhere. Similarly, efforts to effect change by working hard “in the trenches” without the support of those above are equally futile. Leadership at all levels, therefore, must want the change if it is to be realized, sustained, institutionalized, and recog-

nized as an exemplar for the support of STEM in other educational settings.

Practice: Convincing those either below or above of the need for change requires clear and open communication. It also requires that positions and new initiatives are well-thought out and based on substantial evidence of the benefits of change. Finally, those who would effect change must be in a position to deal both with those who relish legitimate opposition and those who simply resist the need for change.

The need for research and evidence that makes the case for change is compounded when the political leadership of the region, state or nation does not support it. Standing one's ground becomes infinitely more difficult in situations in which there is little guidance

or outright opposition from the political leadership. Experience teaches that such opposition is never benign. Thus, joining together with leaders from other universities and organizations that support your change efforts, sharing convictions as well as information, and building a nation-wide community for change may go a long way to counteract reticent political leadership.

Summary

Design principles clarify the differences, often subtle, between intention and action, design and implementation, individual and group benefit. Above all, these principles remind us all of the tradeoffs inherent in

An Academic Leader Reflects on Leadership NACME's 2003 Reginald H. Jones Distinguished Service Award: An Excerpt from Acceptance Remarks by Charles M. Vest, President, Massachusetts Institute of Technology

During the last decade, the federal government has diluted its commitment to creating opportunity for minority citizens, but by and large, America's great corporations have stood strong and filled the leadership gap. Corporations have long supported both our admissions policies and our outreach programs. They have not done so because they are liberals or conservatives, Democrats or Republicans. They support them because they understand that the world is racially diverse—and that if they are to know their customers, produce well-designed, relevant products, and market them effectively, they need the perspectives and experiences of a diverse workforce and leadership.

As I stand before you today, I would like to give you a sense of where I have come from. I attended racially segregated schools until I was in junior high school. Our schools were desegregated in one fell swoop a year or so ahead of *Brown v. Board of Education*.

I came quickly to value and learn from the new classmates who joined us... My first science teacher was black. My high school physics teacher was a woman. My closest friend in graduate school was from India. My PhD advisor was from Turkey. My closest colleagues as a young professor were from Taiwan, Hungary, and Turkey. My own father grew up in a German-speaking household.

And yet, when I began my teaching career as a graduate student teaching fellow and then as an assistant professor at the University of Michigan in the 1960s, it was extraordinary if I had more than one African American student in my classes every couple of years. In fact, it was extraordinary if I had more than one or two women students in a class. And if I had either, it was a lead pipe cinch that they would be one of the best two or three students in the class, because only through unusual drive and commitment would these students have come to study engineering.

In that context, when I look today at an MIT student body whose undergraduates are 42 percent women, 6 percent African-American, 11 percent Latino, and 2 percent Native American—a student body that is remarkably diverse in so many other dimensions as well—it seems to me that a miracle has happened.

But it is not a miracle. It is the result of determined, conscientious effort, over more than three decades, often against seemingly insurmountable odds. It is the result of institutional leadership and occasional courage. It is a result of the determination of innumerable families and communities.

I know that I am richer, that my world-view is more balanced, and that my ability to do my job and live my life has been greatly enhanced because of my own experiences that can be filed under the heading of diversity. We must all work to ensure that the generations to come can experience the value of diversity as I have, and that they have a field of opportunity as broad as I was given.

Source: Daryl E. Chubin, ed., "Affirmative Action and the Future of Higher Education: A Collection of Remarks," Delivered at the NACME-GEM Conference, May 29, 2003, Houston, TX (www.nacme.org/).

decisionmaking. Yes, we want to preserve what works for students in certain contexts, subject to programmatic and legal constraints. Others would rather act as if higher education is context-free, color-blind, and “race-neutral” with academic preparation and opportunity distributed more or less equally. We can debate such assumptions endlessly—and fruitlessly.

While we sit and argue within our national borders, we must not forget two intrusive realities: the world is a dangerous and uncertain place, and science and technology play increasingly important roles in it. Who assumes those roles is not a benign question. We cannot turn back the population clock. Massive immigration may have slowed, but those who come to our shores, our cities, our universities, will only add to the rich diversity already residing within the student population. On what bases we afford opportunity will determine the breadth of the yield in educated talent. So long as we gauge—not pre-judge—potential along with accomplishment, we honor merit and advantage as well as history.

Epilogue

Since its founding, America has faced the challenge of navigating the mine fields of power, representation, and rights. Separation of powers and two separate chambers of Congress were devised to reflect public and state interests. The courts constantly reconsider the Constitution in light of changing circumstances. Just as the Constitution finds a path between rule of the majority and rights of the minority, so must we recognize rights of the individual and compelling interests of the State. For example, the military academy that makes an affirmative choice of a minority candidate may be exercising the right of weighing the individual against the compelling state interest to have an officer corps that is more reflective of its enlisted corps.

The rights of a person must be subservient to the compelling *national* need for good order and discipline within the military. Thus, the compelling arguments spelled out in the *amicus* brief submitted by retired generals and admirals in the Supreme Court admissions cases against the University of Michigan urge us to step back from individual rights long enough to consider collective state interest.

Education in and for a democracy; education in and for a multi-racial, multi-cultural society; education in and for global context; education in and for a world transformed by science and technology demand that we seek and find ways to negotiate power, representation, and rights.

ENDNOTES

1. The most recent, notable inventory is the report of the public-private partnership Building Engineering and Science Talent, or BEST, *A Bridge for All: Higher Education Design Principles to Broaden Participation in Science, Technology, Engineering, and Mathematics*, February 2004. For a summary of earlier literature on best practices and what works in the higher education arena, see p. 21 of this report.
2. For example, see Peter Schmidt, “Not Just for Minority Students Anymore,” *The Chronicle of Higher Education*, Mar. 19, 2004; and “Foes of Affirmative Action Push Colleges to Reveal Policies on Race-Conscious Admissions,” *The Chronicle of Higher Education*, Mar. 23, 2004; and Linda Bean, “Undoing Diversity: Profs, Students Join Anti-Affirmative Action Coalition,” *DiversityInc.com*, Apr. 1, 2004.
3. Robert D. Bickel and Peter H. Ruger, “The Ubiquitous College Lawyer,” *The Chronicle of Higher Education*, June 25, 2004. The authors go on to say “lawyers must collaborate with their clients throughout the institution to achieve institutional goals, a process that sometimes requires a balancing or reconciliation of competing rights and interests.”
4. National Association for College Admission Counseling, *Diversity and College Admission in 2003: A survey report*, September 2003, p. 1.
5. While institutions of higher education are the primary reference group to which these principles are oriented, most apply to other organizations dedicated to STEM education, especially national nonprofit and community based organizations (i.e., 501c3s). “Universities” are used here to encompass these various organizational types.
6. The difference is between data sources, e.g., NSF or the Bureau of Labor Statistics, and the interpretation of the numbers. How one displays the data can help impart or obscure significance. Unlike the aphorism, “data do not speak for themselves.”
7. For an excellent site that lists myriad sources on the research on alternative admissions practices and the benefits of diversity, see the University of Michigan’s site on the Admissions Lawsuits at www.umich.edu/~urel/admissions/
8. Thomas J. Kane, “The Long Road to Race-Blindness,” *Science*, vol. 302 (Oct. 24, 2003), p. 571.
9. Marta Tienda, “Affirmative Action and its Discontents: Lessons from the Texas Top 10% Plan,” U. of Michigan, Oct. 29, 2003 (www.texastop10.princeton.edu).
10. For other analyses that reach similar conclusions about percent plans as viable alternatives to race-conscious college admissions, see The Civil Rights Project (www.civilrightsproject.harvard.edu/).
11. Note that use of the word “Minority” is not in and of itself problematic. If the context indicates that underrepresented minorities will be targeted or encouraged to attend, then use of the word minority does not necessarily raise a red flag. However, in this case the context sounded as if the program were limited to minority students, which may be more problematic.
12. Some states (e.g., Mississippi) and universities are still under court order to desegregate. They do not need to justify special programs to promote minority admissions or services.
13. For specific information on the requirements of narrow tailoring and compelling state interests, consult the Legal Primer.
14. Kelly Wells, “An Unnecessary Slam at Stanford [letter],” *Washington Post*, May 15, 2005, p. A21.
15. There are many “minority-serving” and advocacy organizations—such as NSBE, SACNAS, AISES, GEM, and HENAAC; the discipline-specific professional societies; and the cross-cutting membership organizations with standing committees dedicated to increasing participation of scientists and engineers from underrepresented groups. For a guide, see the National Coalition of Underrepresented Racial and Ethnic Groups in Engineering and Science (www.ncourages.org).
16. A good overview of program and project evaluation is offered in NSF, Directorate for Education and Human Resources, Division of Research, Evaluation and Communication, *User-Friendly Handbook for Mixed Method Evaluations*, available in pdf format at http://www.ehr.nsf.gov/EHR/REC/pubs/NSF97-153/pdf/mm_eval.pdf.
17. This report was requested by Senators Ron Wyden and Barbara Boxer after a hearing on Women in Science conducted by the Senate Commerce Committee’s Subcommittee on Science, Technology and Space. See Legal Primer, *supra*, n. 6. Had a study been conducted under Title VI or Section 504 of the Rehabilitation Act to examine whether science agencies are ensuring that universities receiving federal funding do enough to guarantee nondiscrimination against racial and ethnic minorities and persons with disabilities, respectively, the results would have no doubt been similar. They may have shown even less compliance.
18. For example, see the National Consortium for Continuous Improvement in Higher Education (www.ncci.org).
19. Daryl G. Smith & Associates, *Diversity Works: The Emerging Picture of Student Benefits*, Washington, DC: Association of American Colleges and University, 1997.
20. The University of Michigan has compiled a very useful web site based on the Supreme Court cases that includes information on research done on diversity at the university (<http://www.umich.edu/~urel/admissions/research/index.html>). Also see the aforementioned reports from Building Engineering and Science Talent (BEST) at www.bestworkforce.org.
21. See Donna J. Nelson, “Diversity in Academia: A Look at Gender and Race/Ethnicity in Science and Engineering Departments,” *The FASEB Journal*, 2002, vol. 16, (4), p. A524; “Faculty Diversity in Mathematics Departments at the “Top 50” Research Universities,” *AWIS Magazine*, vol. 31, Summer 2002, pp. 42–46; and for data on women in top 50 doctoral-granting departments in U.S. universities, “A National Analysis of Diversity in Science and Engineering, May 2004, <http://cheminfor.chem.ou.edu/faculty/djn/djn.html>.

