

LEADING A CULTURE OF CHANGE AND INNOVATION

Freeman A. Hrabowski III

I recently had the privilege of chairing the National Academies (NAS) committee that produced the report *Expanding Underrepresented Minority Participation: America's Science and Technology Talent at the Crossroads*. An earlier NAS report had highlighted the urgent need to increase American competitiveness in science, technology, engineering, and mathematics (STEM). Our committee was charged with examining the impact of the country's changing demographics on achieving that goal.

Members of the committee were not surprised that only a fifth of underrepresented minority students who begin college in STEM majors complete degrees in those areas. We were, however, surprised to learn that only 32 percent of whites and 42 percent of Asian

Americans who start as STEM majors graduate in these disciplines. Ultimately, only 6 percent of the bachelor's degrees earned in America each year are in science or engineering. It's generally been accepted that many students who begin in pre-med or pre-engineering change their majors. While people often assume that the reason is that these students are thinking about careers that pay more money, the truth is that many who leave STEM fields change their focus after struggling in first- and second-year STEM courses. These classes are commonly known as "weed-out" or "barrier" courses.

This is my 25th year at the University of Maryland, Baltimore County (UMBC), and my 20th year as president. When I first started as the vice provost

responsible for the undergraduate academic experience, I was struck by the poor performance of many minority students, particularly in science and engineering. After analyzing the data, I realized that many of the majority students also were not succeeding in these disciplines. My colleagues and I decided to start with the students with the weakest backgrounds to develop the strategies that might lead to greater success. With the support of Baltimore philanthropist Robert Meyerhoff and a number of national agencies and other foundations, we started the Meyerhoff Scholars Program in 1989 to provide academic, social, and financial support to African American males interested in research careers in science and engineering. The program has broadened to include women, other minority students, and majority students interested in

diversity issues, and it has been widely recognized as a national model in preparing students for research careers. UMBC is now the nation's leading predominantly white institution in the number of African American bachelor's degree recipients who go on to complete STEM PhDs and MD/PhDs.

The program also has led to wide-ranging changes focused on the success of all students. The program and the lessons derived from it have helped us fundamentally change UMBC's culture to create an atmosphere of innovation and entrepreneurship.

First Steps

The process of culture change involves critical self-reflection, inclusive dialogue, and careful

Strategies for Developing Effective Partnerships

Partnerships have played a critical role in many of UMBC's most successful initiatives, from the launch of cyber incubators to the redesign of courses and the development of programs preparing students of all backgrounds for success in graduate studies and the workforce. Through our work with such organizations as the National Security Agency (NSA) and Northrop Grumman, we've identified key elements of the most successful partnerships.

Listen first: Successful partnerships are based on understanding each partner's needs, challenges, and goals, and using the right resources at the right time to achieve mutually beneficial results. It helps to create an environment that encourages brainstorming about the possibilities.

Think in layers: Our best partnerships are those in which we have developed meaningful initiatives and relationships across the enterprise. Senior executives understand and support the partnership, while managers and researchers collaborate with faculty and staff on initiatives. In this model, no one person drives the outcomes, and success is not dependent on any one individual.

Build on success: Partnerships require trust. Starting with important but low-barrier-to-entry projects allows partners to build key relationships, demonstrate success, and build momentum. These elements are crucial in both planning and executing more rigorous projects.

Focus on execution: It is critical that partners set meaningful goals and identify the individuals from both sides who will be accountable for the effort. The project leads for our partnership with NSA host quarterly steering committee meetings to ensure that initiatives are moving forward, to troubleshoot slowdowns, and to capitalize on new opportunities.

Continually assess: Problems can and will arise in any relationship. The best partnerships grow when we can be honest about what is working and what requires more attention.

*Wide-ranging changes
focused on the success of all
students...*

analysis. We view the culture of the institution as manifesting itself in every aspect of daily life on the campus. It is reflected in the questions we ask (and also how and of whom we ask them), the achievements we measure and highlight (and those we ignore), the way we discuss and learn from mistakes, the initiatives we support (or don't support), and, most important, the process we use for determining academic and administrative priorities. Culture shapes our perception of what is possible, both as individuals and as an institution. Institutional culture can make certain problems seem intractable. For example, at some universities, student retention is regarded primarily as a staff responsibility. As a result, it is fairly rare for faculty to focus on retention initiatives beyond fulfilling their classroom responsibilities. Similarly, in the culture of many institutions, minority student success is viewed primarily as the responsibility of minority staff members working in minority programs, rather than as a broader priority.

In my presentations on the academic role of presidents each summer at Harvard's Seminar for New Presidents, I frequently hear the question, "How do you change attitudes to make change possible?" I am convinced that you start small with a pilot project and a few people who are interested in raising questions and studying a particular problem. You also need to be rigorous in your approach. Too often, we make assumptions about what will and will not work without doing the homework of

asking hard questions, struggling to answer them, collecting data, and conducting the analysis that will inform our decisions. It's impossible to change everybody's minds immediately, but if you can get a few people to keep an open mind, you can make progress as they begin asking questions and considering different possibilities in the spirit of innovation.

In the '80s, no African American educated in this country had ever earned an A in an upper-level science course at UMBC. Our goal was to create a comprehensive, research-based initiative based on specific factors associated with student success. The change process started with focus group discussions on minority student underachievement involving students, faculty, and staff. While institutional culture represents subjective values, changing culture requires rigor in both quantitative and qualitative analysis, making these inclusive conversations essential. Change is possible when institutions look carefully at themselves, identify strengths and weaknesses, recognize challenges, and understand how responses to those challenges can lead to desired outcomes.

These campus conversations and research into other programs across the country informed the development of the Meyerhoff Program. Key components include focused recruitment of academically prepared students, a summer bridge program for academic enrichment and community building, scholarship support, faculty involvement, substantive research experiences for students, academic advising and mentoring, active involvement of the entire campus, a strong sense of community among the students, communication with students' families, continuous evaluation, and emphasis on high achievement, study groups, tutoring, and preparing for graduate school.

Through our experience with the Meyerhoff Program, we learned more generally about the importance of having students work in groups and the value of tutoring. STEM faculty recognized a benefit in giving students feedback earlier in the

semester so they could make necessary adjustments, and also began emphasizing clear expectations. For more than two decades, the program has been a community of scholars who work together in labs, form study groups to master coursework, and consult closely with faculty and staff.

Regular assessments have been invaluable as well. From the start, the program's strengths, weaknesses, and outcomes have been rigorously assessed by teams of independent experts. In these evaluations, there has been no substitute for specificity—knowing how individual students and groups of students are performing in specific classes and majors. We have learned, for example, that we need to examine different groups based on such factors as gender, race, major, socioeconomic background, level of high-school preparation, and college performance.

People

One of the most important lessons I've learned over the years is that institutions with strong leadership appreciate the importance of empowering a cadre of people to lead, bringing different perspectives and strengths. My colleagues and I focus on identifying good thinkers who have similar values and who bring both analytical skills and passion to the work. For me, after 20 years as president, nothing has been more important than identifying other people who can work together to shape the vision and direction

of the institution. I often remind colleagues about the importance of transparency. When people trust leaders, those leaders can admit to mistakes and be forgiven. When leaders attempt to hide mistakes, people lose all confidence in them.

As we established the Meyerhoff Program, some of our colleagues thought it was unfair to have a program for minorities, arguing that whatever we did for one student we should do for all. However, we were able to build support for the program both by carefully documenting our success and by providing opportunities for others to become involved. In this and other efforts, we've had to identify faculty and staff who were willing to keep an open mind and envision different ways of doing things.

Students at UMBC were closely involved in the development of the Meyerhoff Program, and, with the program's success, students of all races began to ask for expanded support in science and engineering. In addition to encouraging group work and expanding tutorial centers, we started broader curricular and pedagogical initiatives. For example, in chemistry, faculty members rethought the first-year curriculum to facilitate active learning through collaborative interactions. They developed the Chemistry Discovery Center, a facility where students work in small groups during two-hour weekly "discovery learning" sessions on worksheets crafted to guide them in the development of central ideas and principles. Students rotate through such roles as supervisor, recorder, and communicator. Instructors in discovery sessions act as facilitators, guiding students as they develop theories and solve problems.

The results since the Discovery Center opened in 2005 have been striking. The rate of students failing the course has been cut in half, and the department has seen a dramatic increase in majors (a 70 percent increase in chemistry and a more than 40 percent increase in biochemistry). In other disciplines at UMBC, including psychology, similar efforts relying

*Culture shapes our
perception of what is
possible.*

“How do you change attitudes to make change possible?”

on group study and collaboration, technology, and active learning have yielded positive results, including higher retention, improved grades, and increased coverage of content during the semester. (These course-redesign efforts are part of an overall University System of Maryland initiative.) Building on lessons learned in chemistry, we opened a new facility in 2010 to encourage active learning and collaboration in physics, mathematics, and biology as these departments redesign their introductory classes. The college is providing ongoing training and support to encourage the development of novel and innovative instructional approaches that make full use of this facility.

We are assessing what works and making adjustments where necessary. For example, with National Science Foundation (NSF) funding, we are evaluating the impact of various approaches on the performance of first-year STEM majors. First-year students participating in the study have been randomly assigned to one of four different treatments. The results will enable us to answer central questions about the instructional approaches and support services that most effectively increase the probability that a first-year student aspiring to major in a STEM subject will achieve that goal. Another example involves our participation in the Howard Hughes Medical Institute’s National Experiment in Undergraduate Science Education, or NEXUS Project. The goal of this project is to develop and share effective approaches for teaching interdisciplinary science. UMBC is developing

course modules that bring mathematical modeling into introductory biology. The modules will be designed so they can be used at other institutions, and a key element will be a focus on student competencies.

Institutional Change

Building on its success at the undergraduate level, UMBC has developed a number of programs focused on increasing both access and success in our graduate programs. Multi-campus initiatives funded by NSF and the National Institutes of Health focus on increasing minority student success in STEM programs. Additionally, our work with the Council of Graduate Schools on the PhD Completion Project is providing new insights on the factors associated with doctoral completion and attrition in STEM fields, humanities, and social sciences.

One of the most transformational initiatives in recent years has been the implementation of the NSF-funded ADVANCE Program, which resulted in a 50 percent increase in female tenure-track STEM faculty in a four-year period after the program started in 2003. The program, which applied best practices identified in our initiatives to produce minority scientists, created a framework that includes revising and institutionalizing policies and practices, and allocating resources, in ways that support the recruitment, hiring, and advancement of women—particularly minority women—for the faculty at all ranks; engaging the campus broadly in ongoing discussions, informal and formal, that address issues of racial and gender diversity in STEM fields; and establishing a system of targeted mentoring programs designed to create a clear and understandable pathway for STEM women to achieve tenure and promotion, and to make the transition to academic leadership positions at the university.

Whether talking about improving the performance of students or increasing the number of women faculty, our approach has been the same. It involves

Emphasizing civic engagement at all levels...

starting with a small group, asking hard questions, learning as much as possible from working with that group, and building from there. By encouraging robust and honest conversations, gathering different points of view, and empowering people to think differently, even radically, we have been able to make progress and change the culture.

Another effective strategy has been setting aside money for small grants that can help in the development of new ideas. We've established an Innovation Fund using the grant attached to the Carnegie Corporation of New York's Academic Leadership Award, which I recently received, and other funds we are raising. Faculty are developing proposals for a competition this fall focused on renovating and redesigning other courses across the curriculum.

Next Steps

Fifteen years ago, my greatest challenge going around the country was explaining what UMBC stood for and the value of our campus. I knew that we had strong faculty and were bringing in increasingly prepared students, but it was hard to make that point. In recent years, we have had an amazing amount of national visibility. For three years in a row, UMBC has been recognized by *U.S. News & World Report* as the no. 1 "Up and Coming" university in the country—a distinction that recognizes innovation—and *U.S. News* in 2011 also ranked UMBC 4th nationally for "Best

Undergraduate Teaching," in a tie with Yale. CBS News *60 Minutes* focused attention on the Meyerhoff Scholars Program and innovation at UMBC in a segment that aired in late 2011, and *Time* magazine in 2012 called the Meyerhoff Program "perhaps the most envied science program in the country."

Our efforts to reshape the curriculum and help our students succeed continue, with course redesign efforts progressing in the humanities, social sciences, and STEM disciplines. For example, we are placing strong emphasis on developing writing skills through an initiative that supports writing-intensive courses across disciplines. We continue thinking about the academic climate on campus, placing greater emphasis on students supporting students, peer tutoring, and living-learning communities in residence halls that bring students with similar interests together. We are emphasizing civic engagement at all levels, with members of our student government taking active roles in the American Commonwealth Partnership, a national effort to expand civic engagement at colleges and universities across the country. A UMBC initiative called BreakingGround will provide additional opportunities for student engagement by supporting faculty as they incorporate community service into courses and conduct research related to civic engagement at UMBC.

Our campus has both domestic and international diversity, with students from 150 countries studying and learning together. We have a great reputation in science, but also have very strong research programs in public policy and the human services areas, and considerable strengths in undergraduate arts and humanities from theater to ancient studies. With all of the awards and recognition, it's become increasingly important to appreciate the value of humility—while remaining confident—in making sure the public understands that credit for this success extends across the campus community and reflects strong leadership within the University System of Maryland and from Maryland elected

officials. We are using the positive visibility to build momentum, whether we are talking about raising funds, recruiting students, or attracting other talented faculty and staff, and we continue highlighting the stories that paint the picture of a young and vibrant university that has become a model of innovation for the nation.



Dr. Freeman A. Hrabowski III has served as president of UMBC since 1992. His research and publications focus on science and math education, with special emphasis on minority participation and performance. Time magazine named him one of America's 10 Best College Presidents in 2009, and one of the 100 Most Influential People in the World in 2012. He was recently selected by President Obama to chair the newly created President's Advisory Commission on Educational Excellence for African Americans. UMBC has been recognized as a model for academic innovation and inclusive excellence by such publications as U.S. News & World Report, which in 2009, 2010, and 2011 ranked UMBC the #1 "Up and Coming" university in the nation.