College of Engineering Diversity Report

Submitted to the Office of the Executive Vice President and Provost

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I. Diversity Mission/Vision Statement

The diversity of our community is critical to the College of Engineering. We know that people who come from varied backgrounds and life experiences offer new ideas and diverse perspectives for meeting the technological needs of our society in the future. The National Academy of Engineering has identified Grand Challenges, and the engineering college has articulated the 2050 Challenge vision, both of which involve using engineering to improve lives and livelihoods. To meet global needs of clean water, green energy, sustainable agriculture, and affordable healthcare, among others, the engineering profession needs to draw upon the creativity and ingenuity of people as never before. Doing so will require fully engaging communities that have previously been under-represented in the engineering workforce.

This is a resonant message. Our students – tomorrow’s practicing engineers – are the ones who will lead us to a cleaner, healthier, safer, and more sustainable world. The next generation of engineers, coming from varied backgrounds and life experiences, will offer new and diverse perspectives for meeting these technological challenges.

However, there are realities – sometimes uncomfortable ones – that we likewise acknowledge. The engineering profession is challenged because our workforce does not look like America. Only about 18% of doctoral degrees in engineering are awarded to women. The numbers for traditionally under-represented minority students are even lower. At Iowa State, we lag national averages for the participation of women and multicultural students in engineering. Our own challenges, and our progress, take place against the national backdrop where engineering is not widely-seen as an inclusive profession.

From the practical standpoint of workforce development, our country needs to expand its pipeline and production of engineers. We know that an engineering talent shortage looms over the horizon, and that the number of science and engineering retirements among the baby boomers is increasing dramatically. The press on our workforce can be met only by increasing the participation of groups that have historically been underrepresented in engineering—in particular, women and students of color. The College of Engineering administers the country’s largest engineering career fair, and so we are well-positioned to meet this demand. Recruiters and key corporate partners have indicated that they look to the college to become more diverse for this very reason.

We are making small but important steps. Especially heartening are positive trends that we are beginning to see in gender and ethnic diversity. 755 women now study in the engineering college, up from 681 last year. 80 additional multicultural students are studying with us this year. Compared to two years ago, African American freshman enrollment has doubled.

Our chemical and biological engineering department has actively worked to recruit and retain students of color. The CBE department initiated a chapter of the National Organization of Black Chemists and Chemical Engineers as one of its student groups several years ago, and it supports students to attend national meetings. The mechanical engineering department established
mentoring and networking programs within the “Women in ME” initiative. The department supports the professional success of women once they are on campus with workshops like “Being a Women in Engineering,” a program that draws freshmen through post-docs to discussions on work-life balance. In 2009, women students in cooperation with the Electrical and Computer Engineering Department initiated the “Digital Women” group, a student-initiated and -run organization dedicated to create an inclusive community of women in degree programs related to computing and electrical engineering. This past year, the college piloted a program called SPEED, with academic and research tracks, to prepare incoming students for the rigors of studying engineering, to give them hands-on experiences in the lab, and to build their 1:1 relationships with faculty. The college will continue to support this important program which is directed at the acute need to advance enrolled students to alumni. We will do more, but in the meantime, we celebrate this progress.

Broadening participation of students requires a holistic approach, including developing the prospective students in the K-12 years and then once entering ISU, providing our students with appropriate transition support and other student support programs to ensure the success and retention of students toward the goals of graduation. Likewise, broadening the participation of graduate students, post-docs, and staff requires a holistic approach ranging from partnerships with faculty at other institutions and developing the supportive environment within the colleges and departments. Consequently, the college is working to have the entire organization embracing diversity as a shared responsibility. There needs to be effort at different organizational levels – centrally, at the college level, at department levels, and at the levels of individuals and their decisions. It shouldn’t be just one person, or one office, that has the responsibility. Hence, some diversity functions vest at the college, some that we collaborate with others on campus with, and some that vest at the departmental level.

In that view, each academic department, for instance, will establish and maintain a department-level diversity initiative, as best suited to the need of the department, which is directed at the recruitment, retention, and academic success of women and under-represented minority students. Department chairs will identify a faculty member to serve as lead of the departmental program, and these responsibilities will be included in the faculty member’s Position Responsibility Statement so that the faculty member will be duly recognized for advancing the college’s diversity mission. Collaboration among departments and their faculty and staff members to improve the diversity of our student body is encouraged, as is collaboration with Dr. Rollins in his role as Professor-in-Charge of Community Based Recruitment and Retention. Each Chair will identify goals, benchmarked relative to their peer programs, with key performance indicators including enrollment, retention, and success to graduation. As part of the college’s overall strategic approach to improvement, the college is developing Key Performance Indicators (KPI’s) which are defined at the college and departmental levels. In addition to KPI’s such as the number of women and minority faculty hired and promoted, the number of women and minority PhD students enrolled and graduating, a set of KPI’s are being developed to measure the underlying activities which are known to support these outcomes.

In short, each of the college’s departments and research centers, and the energy of our faculty and staff, must be marshaled as resources. Our approach is to build bridges and interdependencies between diversity programs at the department, college, and university levels. We will also engage industrial advisory councils and corporate recruiters. We know that they share our commitment to a diverse workforce, and we will ask for their help.
Our world is changing rapidly, and we understand that for U.S. engineering to provide the technology to meet future world demands, it will require critical cultural changes in the present that make engineering the destination of choice regardless of gender, ethnicity, or income level. Our college is committed to broadening participation in engineering fields as we work diligently to become a destination of choice for underrepresented students, faculty, and staff. The work will require collaboration, resources, and hard work, all that must be tracked and success rewarded. The development of these systems is an ongoing effort.

II. Diversity Efforts

In the following section, the diversity efforts are organized by the five implementation goals set forth in the “Implementation Plan for Diversity, Equity, and Community, 2006-2011.”

**IMPLEMENTATION GOAL 1.** Institutional Commitment: Achieve a just environment on campus where everyone feels welcomed, respected, and safe.

1. Two departments are participating as ADVANCE focus departments.
2. College Equity Professor is funded with continuation promised for the next five years.
3. Safe Zone emblems are posted in appropriate areas of each department.

**IMPLEMENTATION GOAL 2.** Curriculum and Pedagogy. Develop a curriculum that guides students to think critically about social justice issues and provides faculty with the tools to teach inclusively.

1. Leadership Through Engineering Diversity (LEAD) Skills Development Workshops – over 75 undergraduate women and multi-cultural students attended annually. The workshops provide students with opportunities to increase their success in the classroom as they build on problem solving skills that are needed in the major core-courses in engineering.
2. Engineering Leadership Program is a 4-year co-curricular, program at ISU that creates a values-based learning community of engineering students committed to making a difference in the world. Diversity, as defined by Cultural Adaptability, is an element of the leadership model.
3. Engineering Experiential Education Work Place (Co-OP and Internships) around 65 percent of our students receive formal, in-workplace training for EEO compliance (Discrimination & Harassment). Also 65%-70% of students receive formal Company Orientation/Culture training that frequently addresses embracing the principles of diversity in the workplace, frequently as a performance metric.
4. Engineering departments are using OPAL tools in Eng 101 and Learning Communities to introduce these concepts of Cultural Adaptability and diversity of thought within Analysis & Judgment.

**IMPLEMENTATION GOAL 3.** Research and Scholarship. Creating an academic environment that appreciates and values cultural/social differences through supporting and valuing research/scholarship that focuses on social justice/multicultural issues.
1. Dr. Monica Bruning collaborated on a funded NSF project titled “High School is Not Too Late,” with Dr. Margret Eisenhart.

2. Larry Hanneman and his colleagues developed a Cultural Adaptability measure that has been published in ABET National Meetings, ASEE National and CIEC meetings, ABET Rose-Hulman Best Assessment Practices Symposia, National Association of Colleges and Employers National Meeting, and Cooperative Education and Internship Association National Meetings.

**IMPLEMENTATION GOAL 4.** Increase the representation of historically underrepresented populations among faculty, staff, and students.

1. Engineering Diversity Affairs has worked to establish relationships with high school teachers and administrators in Kansas City. Visits were made to their schools and a group of high school students and parents were brought for an experience Iowa State event.

2. Engineering LEAD program:
   a. Works with 354 engineering undergraduate multi-cultural students and 681 engineering undergraduate students.
   b. LEAD Learning community for 30 first year undergraduate multicultural students
   c. Summer SPEED program supported 12 entering freshman on an academic track and 12 entering freshman on a research track.
   d. Diversity welcome event – 158 engineering undergraduate multi-cultural and women students.
   e. LEAD Study Center – over 75 undergraduate women and multi-cultural students use the center.
   f. Homework and Help Center is used by 40 to 65 multicultural students.
   g. Support tutoring for over 50 women through the Program for Women in Science and Engineering.
   h. Skill Development Workshops (SDW) help students learn the skills needed to problem solve and breakdown engineering problems, mentor peers and ultimately find higher levels of success.

3. Engineering Enrollment Services and Pre-Collegiate Programs sponsors and “Evening with Engineers” a program for prospective groups who are under-represented minorities and collaborates with the Society of Women Engineers on the “SWE Sleep Over”, a program for women who are prospective undergraduates.

4. Female Recruits Explore Engineering (FREE) – A research and intervention project exploring and documenting how academically-able diverse, high school-age young women come to know engineering and what they come to know about it.

5. The Engineering Diversity Affairs office has developed a Strategic Recruiting Initiative (SRI) program to help broaden the awareness of engineering fields to high school women and multicultural students. we are taking a strategic approach in our recruiting efforts to increase women and underrepresented students in the College of Engineering. This includes expanding the SRI program to Omaha, NE and Peoria, IL along with continued efforts in Kansas City, MO and in-state areas. Key components of the SRI program include building relationships with industry partners to provide ongoing presence in each targeted area, identifying ‘champions’ at each high school, getting into the classroom, and educating
students about engineering and what it means to our nation and world through the 2050 Challenge.

6. College of Engineering 1st Annual Diversity fair – in fall 2009 – focused on the success of undergraduate under-represented minorities. The goal was for a nationally recognized speaker, Dr. Freeman Hrabowski, the President of University of Maryland at Baltimore Country to provide motivation and ideas on mentoring and then for a poster session of various efforts from all departments and units in the college and units outside of the college, to raise awareness of programs and broaden the networks that each programs collaborates with. There were over 30 posters and over 100 participants.

7. The College of Engineering Diversity Committee completed the evaluation and training of ADVANCE resources for unintended biases, wrote a position memos on how candidates for the Dean of Engineering and Department Chairs can be evaluated at the initial stage of evaluating candidates application materials for evidence of strong support for diversity, and wrote a position memo recommending how all engineering faculty can be expected to contribute to diversity efforts in the college and examples of each faculty member being held accountable for individual efforts.

8. ISU COE faculty members are working with faculty from minority serving institutions to build collaborations based on research and teaching collaborations. These collaborations are designed to lead to increase the participations of under-represented minorities in engineering PhD programs. Faculty from the University of Arkansas at Pine Bluff, Prairie View A&M University, Tuskegee University, and the University of Puerto Rico at Mayaguez. Examples include the Bioeconomy Institute hosting faculty from three of these schools to discuss education and research collaborations, the EPSCoR proposal including support for a student at Prairie View A&M University, and the ISU Bioeconomy Institute being included in an NSF CREST center proposal from Prairie View A&M University.

9. Dual-Degree (3/2) engineering degree agreements are currently being negotiated with the University of Arkansas at Pine Bluff, and the Atlanta University Center (Spelman College, Morehouse College, and Clark Atlanta University).

10. Electrical and Computer Engineering
   a. In 2009, ECpE created a set of special scholarships for women and underrepresented minority undergraduate students.
   b. ECpE supported the creation of the “Digital Women” group, a student-initiated and -run organization dedicated to create an inclusive community of women in ECpE and related degree programs.
   c. The annual IT-Olympics program seeks to increase the number of Information Technology (IT) professionals in Iowa through a two day event involving over 400 Iowa high school students per year. The program seeks to increase diversity in IT-related degree program enrollment through early exposure to IT-related concepts. The proportion of women participating is significantly higher than the proportion of women currently in our IT-related degree programs.

11. Mechanical Engineering, supported by a faculty member and staff member, continues to grow the Women in ME program. Recruiting and retention efforts include a mentoring program which engages industry representatives. Funds from the industrial partners are being used to support the program and scholarships. Efforts are being extended to a faculty mentoring program for under-represented minority students during their first and second year.
12. Agriculture and Biological Systems Engineering:
   a. USDA Multicultural Scholars Program designed specifically to train multicultural engineers and technologists for the bioenergy workforce,
   b. Annual Multicultural Student Meet and Greet Dinner for multicultural students focused on building a support network by fostering cultural awareness and connections among students, faculty and staff
   c. Women of ABE Dinner: foster a sense of community and build connections between undergraduate and graduate students, faculty and staff
   d. Program presentations/demonstrations for SPEED, PWISE, Taking the Road Less Traveled, Science Bound
13. The Department of Industrial and Manufacturing Systems Engineering has been active in developing articulated community college transfer programs for community colleges both within Iowa and surrounding states. Many of these targeted community colleges have high enrollments of under-represented minorities and it is the goal of the department to use this mechanism to increase the diversity of the graduates.
14. The Civil, Construction, and Environmental Engineering Department has established several methods to encourage and support the female students in ConE. These include networking opportunities that allow for peer-to-peer and student-to-industry interactions. Peer-to-peer events include “Girls Night Out” and an end of the semester gathering to recognize graduating seniors. Student-to-industry events include company and job site visits, as well as sponsored membership to the National Association of Women in Construction (NAWIC). Currently, the ConE undergraduate program is made up of approximately 12% women, this is up from approximately 7% in 2006.
15. The NSF STEP SEEC project’s 2009 retreat for ISU and DMACC team members focused on diversity. It was intended to inform one another (ISU and DMACC) about each of our perspectives on diversity, and to incorporate diversity outcomes in our project planning.
16. The 12th Annual Colloquium on International Engineering Education was hosted at ISU in Fall 2009. This included a session with noted scholars from Howard University discussing “Developing Best Practices to Increase Diversity in International Engineering and STEM Academic, Research, and Professional Communities.”
17. Dr. Krishna Athreya served for 2 terms (6 years) on the Committee on Opportunities in Science (COOS) of the American Association for the Advancement of Science (AAAS). This committee is one that advises the AAAS Board on issues of inclusion of underrepresented populations in STEM, and students and scientists with disabilities comes under its purview. As a result, Dr. Athreya has worked to create some awareness of disabilities within the diversity programs.
18. Engineering Graduate Programs:
   a. Recruiting events are attended nationwide to increase the number of women and under-represented minorities who apply to graduate school.
   b. Supplemental funds are given to faculty and departments to augment the first year assistantship offered to women and under-represented minority graduate students.
   c. Workshops are given for undergraduate students and first year graduate students on applying for fellowships, such as the NSF graduate fellowship.
   d. Coordinate GEM Fellowships offered by the National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc.
**IMPLEMENTATION GOAL 5.** Inter-group and Intra-group Relations. Create a just environment that recognizes and celebrates cultural differences and socially constructed differences (i.e. gender, race, disabilities, sexual identity, etc.) by enhancing relations within and among groups.

1. LEAD Diversity Network Reception – 97 engineering undergraduate women and multicultural students attended in 2009 – Showcases ISU diversity related engineering student organizations.
2. LEAD Annual Awards and Networking Banquet – over 300 women and multicultural students and families attend.

**III. Best Practices/Final Comments**

The efforts within LEAD have shown that focused programs on women and under-represented minority students increases the recruitment and retention of these students. While all areas of diversity needs additional work, there are several areas in particular that need increased efforts:

1) participation of women in graduate school, post-doctoral positions, faculty and college leadership positions
2) participation of under-represented minorities in graduate programs, faculty and college leadership positions
3) programs and efforts focused on persons with disabilities

These efforts need to be holistic in that they include all members of the college, with clear leadership from the top and participation from all faculty and staff. When attached to excellence, efforts generally succeed. To continue forward on increasing the participation and success of those traditionally under-represented in engineering, diversity will be part of how the college measures and defines excellence.