

GATEWAY ENGINEERING EDUCATION COALITION: AN EFFECTIVE MODE FOR CHANGE

Dr. Dawn Person and Sunny Park Suh

Teachers College, Columbia University, New York, New York

The Gateway Coalition is a ten college collaboration designed to bring together faculty, administrators, industry, and students as the recipient of reflective, best practices in the engineering education reform that effectively function in ten different institutions over time. The National Science Foundation serves as the funding source to this project, but each institution must provide matching funds dollar for dollar. This can be in-kind services, resources, and real dollars that are direct contributions to initiatives. It is the desire of the Coalition that the National Science Foundation provides funding for additional years of support as the original funding period of five years ends this year (1991-97).

The focus of this project across the ten institutions is to develop a comprehensive model for the recruitment and retention of underrepresented populations (women, African Americans, and Hispanics) in engineering. Only innovative collaborative programs to open the "New Gateways to Learning" and to maximize development of human potential have been funded through this avenue. Interestingly enough, those programs that worked at one school did not necessarily work for all. In those cases, (the principal investigator and the executive bodies) would have to work together to decide at what level a project should be funded and for how long. Ultimately, the goal is to institutionalize each innovative program across institutions, although the program may be integrated quite differently at each school. At the time of institutionalization fewer federal dollars will support the program, and more institutional dollars. In fact, this initiative should leave each of these engineering programs teaching engineering up front, and working more closely in collaboration with appropriate offices to understand recruitment and retention programs for women and minorities in engineering.

Overall, the program innovation thus far can be categorized as Curriculum innovation and development, both technical and non-technical, Educational technology and methodology, human potential development, and Evaluation and quality assurance. The other important factor to this initiative is the goal of collaboration across

institutions teaming, commitment, and more coalition directed projects with fewer institution driven projects. Each school has its strengths and challenges, therefore some projects were more easily embraced than others according to the priorities and needs of the institution. Clearly, curriculum innovation was a strong need for all schools and one that each school could rally around with comfort and commitment.

Human Potential Development

The Gateway Coalition proposes to open new "gateways" for learning by altering engineering education from a focus on course content to the development of human resources and the broader experience in which individual curriculum parts are connected and integrated. The scope of the program includes four major parts: curriculum structure, human potential development, instructional technology and methodology, and quality assurance and evaluative measures. The ultimate goal of the program is to engage students in engineering from the day they matriculate, making the study of engineering more exciting, attractive, and fulfilling; developing students as emerging professional leaders with the knowledge base and capability for lifelong learning; increasing the diversity of academic backgrounds and the number of women, underrepresented minorities and the disabled; and drawing the engineering faculty to a dedicated investment in the teaching of the undergraduate students.

The ten engineering schools comprising the Gateway Coalition share the vision for changing engineering education. Currently they are: Case Western Reserve, Columbia University, Cooper Union, Drexel University, Florida International University, New Jersey Institute of Technology, Ohio State University, Polytechnic University, University of Pennsylvania, and University of South Carolina. The schools represent a diversity of institutions: private, public, large, small, new, and old, and are geographically diverse. The variety assures a rich, diverse group of test sites for programs, and a synergy for innovation and new initiatives. We believe the whole will be greater than the sum of its parts.

A significant concern for Math, Science, Engineering and Technology (MSET) education is the recruitment and retention of underrepresented minorities and women. Under the direction of Dr. Dawn Person at Teachers College, Columbia University, it proposed to explore and expand the efforts in these two areas with reasonable success. These programs are designed to address both K-12 students as well as matriculated college students.

Gateway Programs (1996-97)

Beginning the Spring of 1996, administrators from all ten schools worked together along with the assistance of a team of graduate students from Teachers College, developed and proposed several innovative and collaborative efforts to address the

need to increase the recruitment and retention of minorities and women in engineering. These programs include: 1) Off-Campus Team Building Retreat for Engineers, 2) SUCCESS Graduate Preparation Multimedia Center, 3) Educational Learning Assistance Program, 4) Summer Program for High School Students, 5) Tutorial Network System, 6) Getting Plugged In Orientation Seminar for 1st and 2nd Year Engineering Students, 7) Faculty Diversity Training Seminar, 8) Human Development Potential - Minority Webpage, and 9) Minority Alumni Directory.

Off-Campus Team Building Retreat for Engineers

Since many minority students enroll in predominately white, male majority institutions, it is imperative that universities provide opportunities for students to work together regardless of their race or gender. An off-campus retreat can provide the opportunity to promote unity and cohesiveness among minority students. This will result in increase community and sense of shared purpose among groups, increased teamwork, and ultimately increased retention.

SUCCESS Graduate Preparation Multimedia Center

Due to the financial opportunities of post graduate employment and decrease in financial support, many undergraduate students do not consider advanced degrees in MSET fields. Graduate education represents a crucial aspect of improving the pipeline of employable professionals. The underrepresentation of economically disadvantaged students in graduate school is most pronounced in science and engineering. Therefore the goal of the SUCCESS program is to provide a multimedia resource center to inform and encourage undergraduates to pursue a graduate degree. This center will provide resource materials including workbooks, video tapes, a webpage, graduate admissions material, and coalition electronic bulletin board, graduate school prep workshops, student counseling, and student/faculty mentoring and research opportunities. The goal of the center is to facilitate students' graduate school acceptance and interest in the value of research early in their academic career.

Educational Learning Assistance Program

Summer programs for matriculated entering engineering students play a critical role in their successful transition to the college campus. To provide a structured living and learning environment, the availability of Resident Assistants can provide a vital link for students to remain in contact with the activities and policies of summer programs throughout the academic year. Student Resident Learning Assistants serve to continuously outreach and follow up with new students and second year students on probation in conjunction with the traditional resident assistants in the halls through increased communication and support; and increase campus programming on topics such as cross-cultural awareness and study skills. In addition, field trips and other activities are organized to enhance the leadership potential of students and their overall academic experience. Increasing the student development component of the residential program can assist the administration and improve the retention rates of students of color.

Summer Program for High School Students

The purpose of this program is to provide talented high school students with six week individual research projects in the laboratories with college faculty. Laboratory experiences emphasize a cooperative, hands-on approach and increase the enthusiasm about engineering disciplines. By providing students with an introduction to the career opportunities in this field along with administrative support, it will encourage more students to enter MSET programs.

Tutorial Network System

With the increasing demand on engineering students' ability to focus and incorporate interdependent learning skills, providing accessible tutoring can be critical to their success. The use of the MEP T-Net computer system provides 24 hour tutorial assistance and interactive participation with case-based approaches to skill building development. This system allows us to provide students with additional academic support and strengthen their academic motivations.

Getting Plugged In (GPI) Seminar

With increasing frequency the quality of meaningful faculty/student interaction has been cited for its positive influence on student persistence. Improving the quality and quantity of interaction with faculty improves persistence in three very important ways. First, quality interaction outside the classroom with faculty role models helps students see themselves as part of the academic community. Secondly, increased interaction increases the likelihood of effective monitoring and mentoring. Lastly, faculty develop a better understanding of students of color and may examine their assumptions and expectations. The GPI Seminar is designed to facilitate quality faculty/student relationships and introduce students to the practice of building networks. The seminar includes a full day of exercises designed to teach students how to initiate interaction with their professors and to increase their awareness of pre-professional MSET opportunities.

Faculty Diversity Training Seminar

Excellence in teaching the current generation of students demands the skill to manage and promote the value of diversity, the ability to communicate effectively across cultural, ethnic and gender boundaries, and the facility to resolve conflict. The Diversity Seminar hosted a series of highly interactive workshops that explore individual biases and gender lines. The seminar strived to build skills in teaching and counseling so that each faculty member's interactions with students become positive, productive, and effective. By enhancing the undergraduate classroom climate, we feel it creates a more stimulating intellectual environment for students and faculty which will result in improved retention and reduce ethnic, cultural, and gender tension on campus.

Human Development Potential - Minority Webpage

There is a comprehensive webpage that contains the following information: a) descriptions of each of the programs in more detail and a contact person; b) a contact

list of each college's representatives in the Human Potential Minority area; c) an interactive game based on Jeopardy with all answers and questions engineering specific; d) future pages include Aspiring Engineers and Resource List-Serve for Human Potential Development.

Minority Alumni Directory

It is our hypothesis that creating a formal structure for students to interact with Engineering alumni will significantly impact the retention of students. Role models and mentors can play a powerful role in improving the educational experience and academic success of minorities since alumni can assist with mentoring, campus programming, and general academic and career advisement. By providing the directory and webpage it will provide an increased visibility and participation of alumni, and bridge a partnership for their collaborative efforts. It is our feeling that this resource has enormous long-term opportunities.

Next Steps/Future Directions

Should additional funding be made available, the Coalition will continue to function as a coalition and work to establish institutionalization plans across each institution for those projects that seem reasonable for each school. Consultants will be available as needed, especially for the evaluation component, and the human potential development for women and minorities. We recognize that change should be systemic in nature and requires a critical mass of women and/or minority faculty to be internal catalyst for change. In future years, it will be the strengths of each component that will live long beyond this initial funding period.

