



## ENHANCING THE COMMUNITY COLLEGE PATHWAY TO ENGINEERING CAREERS (2005)

While recognizing the multiplicity of roles that community colleges already play in higher education, it is important also to better utilize the community college resource in the pursuit of important national education and workforce objectives. According to the U.S. Congress, building a larger and more diverse science, technology, engineering, and mathematics (STEM) workforce is among the most critical national imperatives of the 21st century (DoD, 2001). Science and engineering jobs, critical to many of the most dynamic sectors of our economy, are expected to increase three times faster than the rate of growth for all occupations in the coming decade. The potential for tapping the community college population to address this critical workforce issue is substantial.

At the request of the National Science Foundation, the president of the National Academy of Engineering and the chair of the National Research Council appointed an ad hoc committee to design and oversee the study. The primary fact-finding activity was a workshop exploring the exemplary approaches of 24 transfer partnerships between two- and four-year colleges. The focus of the workshop was on transfer and articulation (policies and programs designed to foster transfer); recruitment and retention; curriculum, quality, and standards; diversity; and data collection. The committee's deliberations, reflected in this report, were based on the results of the workshop, expert testimony, and a survey of the relevant literature. The final document also reflects the personal and professional experience and judgment of committee members.

Communication between two- and four-year transfer partners is critical to second-level articulation. Successful transfer partners communicate frequently to discuss curricular changes, and even share faculties. Currently, communication between two-year and four-year faculty members varies from campus to campus and department to department, often depending on personal relationships among faculty members or administrators.

Better articulation also requires cooperation between two- and four-year transfer partners in the recruitment of engineering students. Four-year institutions can promote and support the community college pathway as a viable, even attractive, route a baccalaureate degree in engineering. Individualized counseling and coaching can be provided early and often to students in both types of institutions.

Exemplary articulation and transfer initiatives are characterized by clear, accessible information for parents and students who are candidates for community college engineering science programs, and transparent, accessible documentation regarding the transfer mission between partners. To increase the number of students who embark on the community college

pathway to engineering, four-year schools will have to use their brand images to promote community college programs, perhaps by developing joint admission and recruitment programs with two-year schools.

Organizations in the engineering educational and professional communities could work together to increase the awareness of the importance of diversity in the engineering workforce and to educate state and federal legislators. State and federal funding for community college students and incentives for four-year engineering institutions to reach out to community colleges and their students could eventually lead to increases in the number of underrepresented minorities in engineering. Another area for future activity is the collection of comparative data to identify factors associated with the retention and persistence to the B.S. degree of women, minority, and nonminority male community college and transfer students.

The lack of information (especially longitudinal and comparative information that can be disaggregated by gender, race/ethnicity, and other background variables) on the successes and failures of students who begin their engineering educations in two-year and four-year programs presents serious problems for an analysis of the transfer function of community colleges. Most often, community colleges lose sight of students once they transfer to four-year institutions, precisely when they should begin tracking their educational and career trajectories. Compiling and publicizing data on transfer students' success in obtaining B.S. or advanced engineering degrees would demonstrate the effectiveness of engineering studies in community colleges and improve their recruitment rates.

A comprehensive, systematic strategy for data collection on educational and career outcomes for community college and transfer students would require leadership in the engineering profession and from funding agencies to define the most relevant data items, to encourage collaboration between two- and four-year educational institutions, to ensure the privacy of students, and to develop vehicles for dissemination.

Finally, the committee notes that the engineering education community, and the profession as a whole, would benefit from further discussion of the feasibility and desirability of accreditation for engineering science programs at community colleges.

Although this study examines partnerships between community colleges and four-year engineering programs, the primary focus is on the needs of community colleges and their students related to articulation agreements and transfer processes. Research on the perspectives of four-year educational institutions would also be helpful, as would an in-depth examination using both quantitative and qualitative data-collection methods of the experiences of a cohort of students entering and progressing through the community college pathway to engineering careers.

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