Chapter 54
Enhancing Diversity in STEM Interdisciplinary Learning

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ABSTRACT

The Science, Technology, Engineering, and Mathematics (STEM) disciplines have traditionally been woefully unsuccessful in attracting, retaining, and graduating acceptable numbers of Underrepresented Minorities (URMs). A new paradigm of STEM practices is needed to address this vexing problem. This chapter highlights a novel interdisciplinary approach to STEM education. Instead of being siloed and mired in their respective STEM disciplines, students integrate real world, inquiry-based learning that is underpinned by a strong foundation in mathematics and a myriad of other pillars of STEM activities. These activities include Peer-Assisted Learning Workshops, Mentoring Programs, Undergraduate Research Experiences, STEM Exposure Trips, Conference Participation, and Peer Leadership. This strategy enhances STEM education among URMs by purposefully connecting and integrating knowledge and skills from across the STEM disciplines to solve real-world problems, by synthesizing and transferring knowledge across disciplinary boundaries, and by building critical thinking skills in a manner that is relevant to their experiences and yet transformative.

ORGANIZATION BACKGROUND

New York City College of Technology (City Tech) is a minority-serving institution and designated college of technology of the City University of New York, currently offering STEM baccalaureate and associate degree programs in Applied Mathematics, Chemical Technology, Computer Information Systems, Computer Science, Telecommunication and various Engineering Technologies. Although it is a federally designated Hispanic Serving Institution (HSI), of the 15,000 plus student population, 31.7% of students identified themselves as Hispanic, 34.0% as Black (non-Hispanic), 18.5% as Asian/Pacific Islander, 11.0% as White, 0.5% as Native American, and 4.3% as other. Sixty-seven percent (67%) are the first in their families to attend college. Fifty-two percent (52%) reported a

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household income of less than $30,000 and 74% of incoming first-year students received need-based financial aid. Sixty-eight percent (68%) are the first in their families to attend college (New York City College of Technology, 2011).

U.S. STEM PLIGHT AND MINORITIES

The United States remains in grave danger of losing its global competitive edge in Science, Technology, Engineering, and Mathematics (STEM). Recent concerns were propelled into the national spotlight with the *American Competitiveness Initiative* of the Bush Administration in 2006 and the *Rising Above the Gathering Storm* report of the National Research Council (2008). Yet the concerns are nothing new. It was in 1980 that Congress first mandated the National Science Foundation (through the Science and Engineering Equal Opportunities Act) to diligently seek to develop the STEM talents of the country's citizenry irrespective of gender, ethnicity, race and economic background. The 32-year battle that begun last century against poor representation among students and in the science and technology workforce continues on. Many–if not most–of our 21st century challenges will coalesce around STEM. Solutions to these challenges will require a new scientific workforce armed with a skill-set that engenders technological sophistication and interdisciplinary thinking. Therefore, it is critical to train and engage a diverse workforce in STEM and to provide foundational STEM education for the nation's citizenry in all of its inherent diversity. This is absolutely critical, and it must be seen as an urgent matter of national security.

To maintain its global leadership and competitiveness in STEM, the United States must invest in research, encourage innovation, and grow a strong and talented science and technology workforce (Expanding Underrepresented Minority Participation, 2011). A strong, diverse STEM workforce is essential in keeping America innovative and competitive. According to the book, *Expanding Underrepresented Minority Participation* (2011), STEM will lead the projected growth of the U.S. labor market at rates that outpace and outaccelerate all other sectors in the coming years, thus making minority participation in STEM education at all levels (K – 20) a national priority. These daunting projections are being made in conjunction with other projections that show that minorities are the fastest growing segment of the U.S. population and that minorities are grossly underrepresented in STEM. In the past, U.S. economic growth and its global leadership have been inextricably linked to access and attainment in STEM education. Therefore, as we embark on a new century, it behooves the federal government, industry, and K – 20 institutions to re-think and to find innovative strategies to significantly boost minority participation in STEM.

All demographic studies indicate that the country's current minority population will this century become its majority. Yet statistical data (Huntoon & Lane, 2007; and www.nsf.gov/statistics/degrees/) confirm recalcitrant underrepresentation of minorities in STEM disciplines. In 2005, African Americans, Hispanic Americans, Native Americans (American Indians and Alaskan Natives), Native Pacific Islanders (Polynesians or Micronesians), and persons with disabilities constituted nearly 30% of the general population, but earned only 17% of the total number of bachelor's degrees granted in STEM disciplines. According to Shirley Ann Jackson (2002), the U.S. would not experience a talent gap and a downward spiral in attracting, retaining, and graduating in STEM if women and minorities became active STEM participants in proportion to their percentage of the general population. Chubin and Babco (2003) emphasized that even though underrepresented minority students make up 30 percent of the school-age population, White non-Hispanic and Asians dominate the U.S. engineering workforce, African Americans, Latinos, and American Indian have minimal participation. Although women make up