

Role of Multidisciplinary & Interinstitutional Research in Informing and Enriching Bioengineering Degree Programs

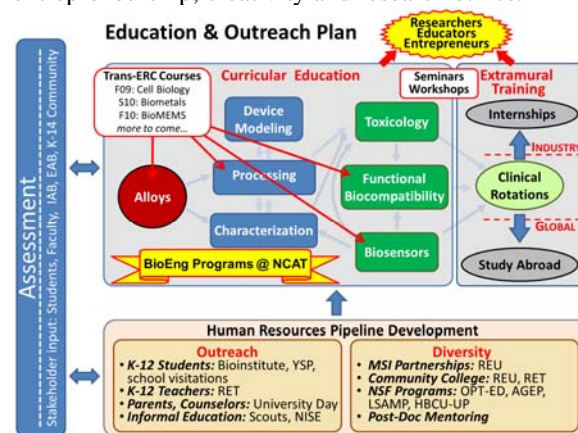
Devdas Pai, Jag Sankar

NSF Engineering Research Center for Revolutionizing Metallic Biomaterials
North Carolina A&T State University
Greensboro, NC

Statement of Purpose: Bioengineering education programs thrive in a multidisciplinary environment with easy access to medical schools and internship opportunities. Many of the nation's early leaders in biomedical engineering education are situated on campuses that also contain medical schools. However, given the rising popularity of bioengineering education programs, these programs have proliferated to schools that may not have the advantage of close proximity to a medical school. Association with a strong multi-campus research and educational collaborative can serve to strongly augment such programs. This presentation describes how recently-initiated undergraduate and graduate program in bioengineering are thriving from their association with the research and professional development opportunities offered by an NSF Engineering Research Center.

Methods: The BS and MS programs in Bioengineering at North Carolina A&T State University (NCAT), initiated in 2010, were a direct result of that University's winning an NSF Engineering Research Center (ERC) in the biomaterials domain. Specifically, our ERC, called the ERC for Revolutionizing Metallic Biomaterials (ERC-RMB) is investigating the use of magnesium-based metallic alloys for possible use in medical implants. The work is multidisciplinary (bioengineering, mechanical engineering, industrial engineering, biology, chemistry, animal science, dentistry, medicine, and education) and spans three US campuses (NCAT, the University of Pittsburgh – Pitt, and the University of Cincinnati – UC), along with a global partner – the Hannover Medical School of Hannover, Germany. The existence of a strong materials research capability within the College of Engineering and the approval of new bioengineering programs enabled the ERC team to recruit faculty members with the necessary expertise and experience for advancing the research goals as well as the dual purpose of bootstrapping the necessary labs and curricula for education. In this, the strong partnership with a highly-ranked bioengineering department (Pitt) provided great leverage for the accelerated development of the educational programs. Further, the success of the ERC's research programs hinged on the development of a well-thought-out strategic plan. The ERC education and outreach plans underlying the degree program have adopted a strategy (see figure) that mirrors the research strategic plan. The plan contains an undergraduate and graduate education plan complemented by a strong outreach and pipeline development precollege outreach program that focuses on broadening participation by recruiting actively from underrepresented populations. These include summer research experiences for undergraduates (REU), for teachers (RET) and for talented high school Young Scholars (YS), in addition to

a summer tissue engineering camp for high school students. Student professional development has been promoted through a vibrant seminar series, opportunities for inter-campus student networking through a Student Leadership Council, trans-ERC classes across all three partner campuses and global travel and research opportunities, and training on crucial peripheral issues such as intellectual property protection, patent searching, entrepreneurship, creativity and research ethics.



Results:

Four bioengineering faculty and a department chair have added to the ERC team's research and educational capabilities. The enrollment in the BS and MS programs has grown steadily since their inception in 2010. The first MS and BS student cohorts graduated in the 2012-13 academic year, with the graduate students receiving job offers from leading medical industries and graduate school admissions from very competitive graduate programs at R-1 universities. Students have had opportunities to participate and present in national and international conferences, and received recognition in national level conferences for research posters and elevator pitch competitions. They have learned to work effectively on teams across disciplines and across campuses and create win-win partnerships. Their direct involvement in our outreach programs has enriched the human resources pipeline development effort broadly in STEM and not just in their own research niche.

Conclusions: The bioengineering education and outreach programs at NCAT are a first among the nation's HBCUs and promise to contribute strongly to broadening participation in bioengineering research and education. The programs have been strongly leveraged by the existence of a well-supported and high-profile multidisciplinary and multi-institutional program.

References: ERC-RMB Annual Reports to the National Science Foundation.