Symposium on Undergraduate Nano-Education:
"Addressing the Challenges of Nanoscale Science & Engineering Education"

Presentation:
"Rational Design of an Undergraduate Certificate Program in Nanoscience/Nanotechnology"
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Presenter Biography:
Dr. Negar Mansourian-Hadavi is currently a postdoctoral fellow at Northwestern University, Department of Materials Science and Engineering. Her main focus is the Higher Education & Degree Programs projects for the NSF funded National Center for Learning and Teaching in Nanoscale Science and Engineering (NCLT). She collaborates with Dr. Tom Mason in "conducting/contributing to" engineering education research as well as organizing faculty workshops and symposia in the area of nanoscale science & engineering education. To that end, she maintains a close tie with the education researchers at Searle Center for Teaching Excellence at Northwestern University.
Dr. Mansourian-Hadavi received her PhD degree in Materials Science and Engineers from Northwestern University in 2001. She has a master in project management and a BS in Chemistry. Her research during gradate school as well as the following few years of postdoctoral research focused on the defect analysis and electrical property studies of electroceramics, such as superconductors and transparent oxide conductors. Dr. Mansourian worked as a research scientist at Functional Coating Technology for three years designing and conducting innovative experiments in the field of Fuel Cell Technology. She has published several articles in scientific journals and presented talks in various international conferences.

Abstract:
Based upon a set of "big ideas" identified by recent workshops and a study report, a broad curricular framework for degree programs in nanoscale science & engineering (NSE) has been established, built around four essential areas or nodes in NSE—Processing (how nano-entities are fabricated), Nanostructure (how the resulting nano-entities can be imaged and characterized), Properties (their consequent size-dependent and surface-related properties), and Applications (how nanomaterials and nanodevices can be designed and engineered for the benefit of society), hereafter referred to as the "P-N-P-A Rubric." An analysis of emerging NSE degree programs in the U.S. suggests that improvements need to be made in programmatic balance (among the P-N-P-A nodes), with particular attention to essential features, e.g., the inherent interdisciplinarity of NSE and its societal impact (e.g., safety, ethical issues). A significant challenge for NSEE is how to provide student access to the necessary advanced instrumentation (i.e., the Nanostructure node). In this presentation, a prototype undergraduate certificate program is developed, which provides balance across the P-N-P-A nodes, while also providing for interdisciplinary exposure and student access to advanced NSE instrumentation (i.e., hands-on laboratory experience). Although this certificate program has yet to be approved, it provides a model for how campus-wide certificate programs can be developed at colleges and universities, where strong programs exist in traditional disciplines, but which can be augmented by targeted coursework in nanoscience/nanotechnology, leading to the NSE certificate in addition to the B.S. or B.A. degree in the traditional discipline of choice to the student.