

**Symposium on Undergraduate Nano-Education:  
“Addressing the Challenges of Nanoscale Science & Engineering Education”**

**Presentation:** “Self-Assembly and Cell Encapsulation: A ‘Top-Down’ Challenge-Driven Learning-through-Research Module for Undergraduate and High School Students”

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**Presenter Biography:**

Yubing Xie is assistant professor of Nanobioscience at the College of Nanoscale Science and Engineering, University at Albany. She establishes an active research program in stem cell nanotechnology, including regulating embryonic stem cell fate decision using nanoengineered microenvironment and applying stem cell technology in breast cancer modeling. Her research is supported by NSF CAREER Award, UAlbany Faculty Research Award, and NSF NSEC. Professor Xie has authored and co-authored over 40 peer-reviewed journal papers and 2 patents. She has co-chaired and organized A Symposium on the Convergence of Bio/Nanotechnology and Medicine in 2008. Dr. Xie is also enthusiasm for education. She is developing Biomedical Nanotechnology course for graduate students and senior undergraduate students. She creatively integrates education into her cutting-edge research and actively engages graduate, undergraduate and high school students into research and research training activities. These research findings haven been widely disseminated into K-12 students and general public through CNSE’s established outreach programs or partnerships, such as NanoCareer Day, NanoHigh Class, Excelsior Scholars Nanotechnology Summer Institute, Tech Valley Summer Camp, Adventures in Science Program at the Schenectady Museum, and National Nano Days program at the Children’s Museum of Science and Technology, and NanoCommunity Day.

**Abstract:**

Nanobiotechnology is to apply nanotechnology to understand biological systems or use biological materials to create nanosystems. The integration of nanotechnology and biotechnology has advanced the development of life science and medicine and expected to accelerate in the next decade. Education and training in nanobiotechnology is demanding to provide multidisciplinary workforce in this field. However, there is a significant knowledge gap between nanoscience/engineering and biology education and interest in science and engineering needs to be inspired in students. To address these challenges, we establish a “top-down” challenge-driven learning-through-research approach to integrate teaching, training and learning of nanobiotechnology. We develop a Self-Assembly and Cell Encapsulation lab module to inspire high school students’ passion for learning science and engineering and to teach concepts of nanoscale, polymer, hydrogel, self-assembly, nanoporous membrane, cell encapsulation, cell therapy, and tissue engineering. The lab module has been offered to high students through established outreach programs at the College of Nanoscale Science and Engineering. The graduate, undergraduate and high school students are integrated into the project. We found that all students showed interests in these hands-on activities and were fully engaged in the project. In this way, graduate, undergraduate, and high school students will be trained, motivated, and prepared for life-long careers in multidisciplinary science and engineering fields by gaining nanobiotechnology knowledge and skills.