

**ITEST Program Component:** Strategies Project; **Project Title:** Nanotechnology Experiences for Students and Teachers (NEST); **Host Institution:** Indiana University-Purdue University Indianapolis (IUPUI); **Target Community:** Indiana high school students and teachers within high-needs metropolitan school districts; **Number of Participants:** 60 high school students and 45 high school teachers over 3 years with an additional ~3,000 students participating through teacher-developed classroom modules

**Overview:** The *Integrated Nanosystems Development Institute* (INDI) and the *STEM Education Research Institute* (SERI) at IUPUI propose the establishment of NEST, an ITEST Strategies program designed to introduce high school students and teachers to the field of nanotechnology via a concentrated 2-week summer program coupled with academic-year mentoring, support, and research opportunities. IUPUI's urban location and local workforce demands create an ideal platform to impact surrounding high-need schools and boost STEM interest within underrepresented groups. The multidisciplinary nature of nanotechnology will allow NEST to inspire students in science, technology, engineering and mathematics. NEST's intensive program consists of three parts: *WEEK 1*: introducing nanotechnology concepts, applications, career options (students and teachers), and instructional practice strategies (teachers) through hands-on learning activities; *WEEK 2*: immersion in academic research (students and teachers) and module development (teachers) by working with faculty researchers in laboratory-based experiences and participating in workshops and oral presentations; *POST-CAMP*: both students and teachers will be linked to support networks comprised of their peers, faculty mentors, graduate assistants, and local industry in order to facilitate the production of independent research projects (students) and the design and implementation of nanotechnology modules (teachers). NEST programming and deliverables will be researched to identify outcomes and reviewed to ensure that program aims and objectives are met.

**Intellectual Merit:** The collaborative environment offered through INDI, with faculty from IUPUI's Schools of Science, Engineering & Technology, Medicine, and Dentistry, is well-suited to introduce secondary students and teachers to nanotechnology. The partnership between INDI and SERI provides a strong foundation to create a successful ITEST program and to expand knowledge on productive pedagogical strategies for fostering effective STEM learning. NEST personnel and INDI faculty, with substantial experience working with K-12 students and teachers, will provide seminars, workshops and hands-on laboratory activities to participants during the 2-week summer programs. Upon completion, participants will then be connected to INDI faculty mentors who will support the completion of follow-up activities, including independent research projects (students) and the development and implementation of integrated STEM modules (teachers). Working with the external reviewer, the SERI research team will produce publishable social scientific research, ensure program efficacy, and identify methods to improve STEM learning, retention, and opportunities for traditionally underserved students.

**Broader Impact:** The proposed ITEST site will implement an approach to STEM education that will effectively reach underrepresented minorities, innovatively address the needs associated with secondary STEM teacher development, increase the scientific literacy and interest of the nation's future STEM workforce, and contribute to an enhanced infrastructure for research and secondary STEM education. The NEST program will be rigorously researched, under the guidance of an external reviewer, to ensure that outcomes, such as those listed, are locally realized at the ITEST site and, upon program completion, appropriate for national expansion. The feasibility of creating such impacts will be ensured by: 1) conducting program research informed by the goal, aims, and objectives of the NEST intervention and, in turn, using that research to refine future programmatic configurations; 2) cataloguing program logistics, student project summaries, teacher-developed nanotechnology modules, including their associated rubrics, and teacher accounts of module implementation to make these materials widely available to all educators through the NEST website, the *TeachEngineering* digital library website, the I-STEM network, and the Hoosier Association of Science Teachers, Inc. (HASTI) website; 3) creating cost-effective modules (along with no-cost virtual reality modules) to overcome socioeconomic implementation barriers, enabling widespread use of the catalogue; and 4) expanding NEST's effectiveness, reach, and influence through the publication of social science critiques of its intervention.