

## **Engineering for Biology: Multidisciplinary Research Experiences for Teachers (MRET) of Elementary Grades**

The University of Florida Multidisciplinary Research Experiences for Teachers (MRET) is an integrated program to bring together K-5 teachers, engineering faculty, engineering students, and industry professionals to cultivate the next generation of STEM professionals and catalyze North Central Florida's STEM education ecosystem. Elementary educators influence fundamental skill development and disposition of students toward math and science from the youngest ages, but a recent report by Epstein and Miller, "Slow Off the Mark: Elementary School Teachers and the Crisis in STEM Education" (2011), details the lack of attention paid to preparing elementary educators in STEM fields. The goal of MRET is to alleviate this gap in K-5 teacher preparation. MRET will include four distinct elements designed to heighten elementary educators' STEM awareness and expertise, including: (1) **a 7-week immersive research experience** for K-5 teachers; (2) **curriculum development assistance** through weekly summer meetings led by elementary education experts; (3) **exposure to STEM careers** through weekly summer seminars from local industry professionals; and (4) **engineering student involvement in K-5 classrooms** during curriculum development and throughout the school year. Our ability to meet our overarching goal through these programmatic elements will be carefully evaluated by College of Education faculty.

The *intellectual merit* of this program is bolstered by our focus on K-5 educators, multidisciplinary themes, and novel assessments. MRET is unique in its focus on STEM for K-5 educators, requiring us to develop our own observation tools to gauge improvement of K-5 students in STEM content. These will be disseminated along with each STEM lesson developed to further encourage elementary engineering education. We also emphasize multidisciplinary themes throughout MRET, incorporating multidisciplinary research topics by "engineering for biology" and also in development of lessons and incorporation of state standards. Elementary educators have the unique opportunity to teach engineering and STEM content in an integrated way that mimics how real STEM is practiced because their day is not disciplinarily divided like upper grades. Encouragingly, new state standards in Florida reinforce this integrated view of learning and problem-solving, and our multidisciplinary emphasis offers a new approach for elementary teacher training in STEM.

MRET will have a *broad impact* on engineering and STEM education on many levels. We will recruit 12 teachers from Alachua County schools that encompass a diverse population of students, including >40% under-represented ethnic/racial minorities and >50% eligible for free/reduced lunch. Ten potential faculty mentors (including five women) have identified real engineering research problems with applications in biomedicine, the environment, agriculture, and more. Twelve engineering students (including 5 women and 5 URMs) have been identified as day-to-day mentors for the teachers. Teachers will develop K-5-appropriate lessons and then register inclusive kits for their lessons in UF's Center for Precollegiate Education and Training (CPET) "Equipment Lockers", available for checkout to teachers across the state. Teachers will develop two additional lessons during their academic year professional development meetings (three sessions total), and all three lessons will be disseminated through the *TeachEngineering* digital library. The culminating activity for MRET will be an Elementary STEM Education Showcase at the Cade Museum for Creativity and Invention. MRET teachers and engineering students will have stations to present their academic research as a conference-style poster and to display their K5 curriculum projects. Instructions to access online repositories, CPET Equipment Lockers, and other vital resources will also be on display. Exhibits will be invited from additional resources at UF, the Alachua County School Board, non-profits, and companies. The superintendent of Alachua County has committed to supporting teacher attendance at the Showcase during pre-planning each fall.

**Through these comprehensive activities, MRET will increase student interest in and preparation for STEM careers by increasing STEM concepts, practices, and role models in K-5 classrooms.**

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