

U-FUTuRES: *University of Florida Unites Teachers to Reform Education in Science*

U-FUTuRES provides sustained support for transforming middle school science through Science Teacher Leaders (STL) trained to lead district-wide implementation of a recently developed, NSF-funded, coherent and comprehensive middle school science curriculum. The project will be supported through a core partnership agreement between University of Florida Center for Precollegiate Education and Training, UF College of Education and Division of Continuing Education, UF's K-12 laboratory school P.K. Yonge Developmental Research School, and the Northeast Florida Educational Consortium (a support organization for poor, small and rural north central Florida school districts). U-FUTuRES project goals are as follows: (1) Design, implement, and institutionalize a job-embedded Science Teacher Leadership Institute (STLI) graduate degree program co-facilitated by UF College of Education and UF STEM partners; (2) Support STLs through monthly cadre meetings as they lead transformative professional development through carefully designed professional learning communities and a summer Teacher Transformation Series; (3) Assist STLs as they organize district leadership to support reform-oriented science instruction in middle school; and (4) Continue development of UF cross-departmental partnerships dedicated to supporting improvements in K-12 science achievement.

U-FUTuRES will adopt an iterative process for designing, developing, and evaluating the effectiveness of the STLI and STLs focused on reforming teaching practice and increasing science achievement among economically disadvantaged and underrepresented minorities in STEM. The proposed research will contrast two reform-oriented approaches to instructional support practices used by science teacher leaders—1) structured classroom observations and lesson study, and 2) analysis of student work and curriculum-based formative assessments to inform instructional planning. Specifically, we seek to identify pathways to accelerate and sustain shifts in teaching practice that increase science achievement, classroom engagement, and academic competence, particularly among underrepresented student populations. Our research questions focus on the impact of STL-facilitated professional learning communities and instructional support strategies: (1) What is the effect of the STLs on middle school science teachers' practices? How do differences in STL approaches to professional learning communities impact science teaching practice? (2) How do differences in approaches to professional learning communities influence science achievement outcomes? How are students' levels of academic engagement and academic competence impacted by the STL's approach to instructional support? (3) Are there differences in achievement and engagement of traditionally underrepresented students in science that varies by STL approach to facilitating professional learning communities?

Intellectual Merit: The proposed project will provide evidence to substantiate the effectiveness of STLs in supporting shifts in science teacher practice and student outcomes. Specific evidence-based STL strategies for facilitating equitable growth in middle school students' science content knowledge, classroom engagement, and academic competence will be identified to support our nation's efforts to increase diversity and capacity in the STEM pipeline. U-FUTuRES will contribute new insights regarding STLs' development as nested in district-wide science reform efforts focused on improving middle school science achievement. **Broader Impact:** Our research will inform the development of innovative, effective, and efficient IHE/LEA partnerships dedicated to improving middle school science teaching and learning in poor, small and rural school districts. It is expected that the proposed IHE/LEA partnership will develop a district-based infrastructure for leading, supporting, and sustaining middle school science reform that will directly impact 58,500 economically disadvantaged, underrepresented middle school students in the partnering districts. Additionally, as promising strategies for building district capacity to support improvements in science teaching and learning are identified and institutionalized among the IHE/LEA partners, the potential for facilitating and supporting improvements in other school districts is possible. Our focus on 6th-8th grade science reform will translate into increased science participation in secondary schools thus impacting the level of K-12 science achievement and igniting future interest in STEM-related careers. Finally, up to 120 STEM graduate students will participate in developing and training middle school teachers, thereby better preparing them for an active and ongoing role in supporting K-12 science education improvement efforts and communicating research to the public.