Project Summary

Overview

This proposed Exploratory Learning Strand study will provide evidence on the confluence of school, classroom, teacher, and student factors that shape elementary school science learning trajectories for students identified as English learners (ELs). Our goal is to broaden ELs' participation in STEM learning by investigating how these factors shape their success in elementary school classrooms. The nation's schools are becoming increasingly diverse (National Center for Education Statistics, 2019a; 2019b). Unfortunately, existing research suggests that ELs lag behind other students in science, and this disparity emerges as early as elementary school (Morgan et al., 2016). To date, there has been limited research at a national scale that looks at individual, classroom, and school level inputs (instructional practices, learning environments, characteristics of school personnel, etc.) that are most predictive of EL elementary school science learning gains. The objective of this study is to address this need by exploring the relationship between (1) a series of science inputs (time on science, content covered, availability of lab resources, teacher training in science instruction, etc.), and (2) EL-specific inputs (classroom language use, EL instructional models, teacher certification and training, availability of EL support staff, etc.), in relation to ELs' science learning outcomes for a nationally representative set of students followed from kindergarten through fifth grade. We propose a comprehensive analysis of the nationally representative Early Childhood Longitudinal Study (ECLS-K:2011) using latent class analysis and a regression framework to identify promising inputs that promote early science learning for ELs.

Intellectual Merit

This work brings together a multi-disciplinary team to address an important and timely topic in elementary science education. The team possesses expertise in science education, education policy and leadership, and EL education. To date, the bulk of the work in elementary science has centered around the evaluation of specific curricular and instructional practices in limited geographic settings. The research proposed here advances knowledge and understanding of the broader structural inputs that shape elementary science learning outcomes for ELs. Conceptually, this work pulls together the practice of science education at the classroom level while situating such practice in a structural trajectory of school level inputs that students experience while progressing through elementary school. The use of nationally representative data to explore these questions and bring empirical evidence to bear on this conceptualization represents an advance to the approaches that have to date been characteristic of studies of elementary science education.

Broader Impacts

The proposed work has the potential to have meaningful impacts for educational practitioners and policymakers at both the macro-level state and policy levels, as well as the micro-level classroom program and instructional level. For example, if ELs in dual-language classrooms perform better than those in English-medium instruction, it suggests that innovations at the state-level are needed, as well as opportunities for teachers to use students' home languages within class instruction. Such impacts, in turn, have the potential to improve science learning outcomes for students and substantially reduce disparities in elementary science education among ELs. To the extent that such early science learning serves as a predictor of later life interest and performance in science, such gains may, in the long run, contribute to greater representation in science fields and a more efficient and equitable science workforce. Our team is well situated to disseminate the findings to a wide range of stakeholders through our relationships with local schools, state policymakers, academic audiences, and national organizations. The proposal includes funding to train a graduate student from an underrepresented background to conduct research on science education, thereby furthering the goal of building diversity and capacity among the next generation of science education researchers.