Early-Phase Competition Absolute Priority 3 (STEM)
University of Texas Foundation
S411C230191
Preparing High-Need Students For Success in Early Science Instruction: An Early Phase Project

Applicant Name: The University of Texas Foundation
Project Title: Preparing High-Need Students for Success in Early Science Instruction: An Early Phase Project

Type of Grant Requested: (select one) ☒ Early-Phase ☐ Mid-Phase ☐ Expansion
Absolute Priorities the Project Addresses: (select all that apply)

☒ Absolute Priority 1-- Demonstrate a Rationale (Early), Moderate (Mid), Strong (Expansion)

☐ Absolute Priority 2-- Field-Initiated Innovations—General

☒ Absolute Priority 3-- Promoting STEM Education

☐ Absolute Priority 4-- Meeting Student Social, Emotional, and Academic Needs

☐ Absolute Priority 5-- Educator Recruitment and Retention

Competitive Preference Priorities the Project Addresses: (select all that apply)

☒ Competitive Preference Priority 1— Promoting Equity in Student Access to Educational Resources and Opportunities: Implementers and Partners

☐ Competitive Preference Priority 2—Supporting a Diverse Educator Workforce and Professional Growth to Strengthen Student Learning* (FOR EARLY-PHASE AP5 APPLICANTS ONLY)

Total number of students to be served by the project: This project will serve approximately 1,200 high-need kindergarten students from 60 kindergarten classrooms in central Arkansas.

Grade level(s) to be served by the project: This project will address the kindergarten year.

Definition of high-need students: In this proposal, we operationally define high-need students as kindergarten students from low-income backgrounds who enter the school year at significant risk for low academic performance and are members of groups traditionally underrepresented in the Education Innovation Research program based on race and ethnicity.

Brief description of project activities: The project's primary activities include developing the Scientific Scouts – Kindergarten science (Sci-K) program and testing its impact in kindergarten classrooms. In collaboration with local kindergarten teachers, we will design the Sci-K program to comprise three "bundles" of science instruction (physical science, life science, and Earth and space science) that promote the three-dimensional nature of the Next Generations Science Standards.

Following development of each bundle will be a Rapid Activity Testing Experiment (RATE) used to test for feasibility. Each RATE will involve 200 kindergarten students from 10 classrooms. The project's final years will involve an impact study with 600 students from 30 kindergarten classrooms in 20 schools from districts located in central Arkansas. A final activity is supplying participating schools with all Sci-K teaching and professional development materials to promote sustainability of practice.

Summary of project objectives and expected outcomes: The major objective of this project is to develop three "bundles" of NGSS-aligned science instruction (physical science, life science, and Earth and space science) and integrate them to form an 18-week kindergarten science program (i.e., Scientific Scouts – Kindergarten; Sci-K) by summer of Year 4. We will conduct a Rapid Activity Testing Experiment (RATE) with each bundle, testing for feasibility in 10 kindergarten classrooms with 200 students. A major outcome of each RATE is formative data (e.g., teacher interviews) used to refine each bundle and prepare them for integration into the full Sci-K program. To test the impact of the full Sci-K program, an objective is to recruit a new sample of 30 kindergarten classrooms and randomly assign them to treatment (Sci-K) or control (business-as-usual) conditions. Teacher and student outcome data will be

collected at multiple time points and project findings will be disseminated to relevant audiences. A final outcome is the distribution of Sci-K materials to participating schools, free of charge.

Summary of how the project is innovative: Our project is novel and innovative for several reasons. First, the Sci-K program will adhere to the Next Generation Science Standards by promoting a "three-dimensional approach" to science learning. This three-dimensional approach vastly differs from current practice, where science is scarcely taught, and when instruction is delivered, science ideas, concepts, and practices are often taught in isolation. Second, we will ground the Sci-K program in validated principles of instruction. Research suggests students' science achievement is aided by intentional instructional support. Yet, few science programs align with the current research base. Third, we will use science instruction to concurrently build students' academic language and early number sense skills. This integrated approach is expected to maximize student learning opportunities. Finally, evidence-based kindergarten science programs are in short supply. This project will build from prior research by leveraging an existing set of activities that our team validated in two recent studies involving 500 students from low-income backgrounds and underrepresented communities.

Other studies related to the proposed project: The proposed research is highly related to an NSFfunded development project conducted by Dr. Christian Doabler and Dr. William Therrien (Doabler et al., 2017-2023) that developed a second-grade science program. Features of this science program will serve as guideposts for developing the proposed Sci-K program. The NSF-funded CrowdSource Science project (Therrien, Doabler et al., 2022-2026) also has direct relevance given its focus on instructional interactions in science. The work of Dr. Doabler and Dr. Leticia Martinez in the NSF-funded Precision Mathematics project (Doabler, Martinez et al., 2020-2025) also brings relevance given it focuses on integrated STEM instruction. Also, Dr. Martinez's work on an IES-sponsored R&D center (Francis, Vaughn, Martinez et al., 2020-2025) will support efforts to develop the Sci-K academic language component. Finally, Dr. Doabler's two IES-funded research projects (Clarke, Doabler et al., 2020-2024; Turtura, Clarke, Doabler et al., 2023-2028) focused on kindergarten mathematics interventions are also strongly related since both involve high-need kindergarten students in low-income communities.

Proposed implementation sites: Three school districts from central Arkansas (Pine Bluff, White Hall, and Friendship Aspire Academy) have agreed to participate. These districts serve many students who are from low-income backgrounds and groups traditionally underrepresented based on race and ethnicity.

Organizations partnering with this project: Our project will include a cadre of multidisciplinary researchers from The University of Texas at Austin, which is designated as a Hispanic-Serving Institution (HSI); the University of Arkansas at Pine Bluff, a public institution of higher education recognized as a Historically Black College and University (HBCU); the University of Virginia; and WestEd. The Meadows Center for Preventing Educational Risk at The University of Texas at Austin will also support the Sci-K project. MCPER is a leading multidisciplinary research center that manages numerous federally