Mid-Phase Competition Absolute Priority 3 (STEM)
Sonoma State University
S411B230042
Scaling an innovative STEM And Computing Education Support (STEMACES) Model for Improved Science Learning

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Applicant Name: Sonoma State University
Project Title: Scaling an Innovative STEM+C Education Support Model for Improved Science Learning
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 3-- Promoting STEM Education
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
Total number of students to be served by the project: 920 students and 46 teachers (evaluation); 26 teachers 3860 students additionally served
Grade level(s) to be served by the project: Eighth and ninth grades
Definition of high-need students: Students with at least 50% eligibility for Free or Reduced-Price Lunch (FRPL).
Brief description of project activities: This project will meet the need of rural, high poverty, and emergent-bilingual Spanish-English communities to increase student achievement in science by scaling a moderate-evidence-based, three-component model. The components are i) three units of hands-on, inquiry- and standards-based STEM curriculum, ii) evidence-based Professional Development (PD), and iii) sustainable teacher supports. To these components, this project adds innovative evidence-based Technology-EngineeringCoding (TEC) open-educational resources, developed by SSU with early-phase funding; TEC elements within teacher PD, and student support that led to a scaled Networked Improvement Community (NIC), and the development of a computational thinking TEC-embedded science assessment instrument. Additionally, teachers and support staff will work with local rural communities to align the vision of the program and curriculum with the rural community's vision for success and prosperity.
Summary of project objectives and expected outcomes: The project objects and outcomes are grounded in our goals to scale the model with fidelity, overcoming barriers to scale and to evaluate the model to meet Tier 1 strong evidence based on What Works Clearinghouse criteria. Project objectives and outcomes related to the two goals are as follows: (1.1) Revising the LbyM curriculum for eighth grade will improve student math and science learning outcomes and be pilot-tested and implemented with fidelity. (1.2) To scale the program, WestEd personnel, LbyM master teachers and coaches will be trained to implement the PD model. (1.3) From there, student and teacher support will be scaled up with the PD providers, augmenting the Networked Improvement Community. This community will enable on-demand help both online and through phone calls, utilizing assetbased practices to support emergent-bilingual students. (2.1) When Goal 1 is complete, we will recruit and implement a study with rural schools that fit our selection criteria. This process will consist of in-person meetings with rural school admins and teachers, implementation of Memorandums of Understanding (MOUs), student engagement in all three curriculum units, and teacher participation in PD and teaching of the curriculum. (2.2) Next, the STEMACES Program will be assessed through the comparison of eighth-grade science results to seventh-grade math and ELA baseline data, and students taking the CT-TEC-Sci and Unit-end assessments. (2.3) Finally, cost data will be collected and analyzed for cost-effectiveness. This will enable the creation of a cost model and allow us to understand the cost per student.

Summary of how the project is innovative: We propose to add Open Education Resources to enhance students' Technology, Engineering, and Computing (TEC) skills in science classes as well as supporting computational thinking practices and knowledge in the context of TEC-embedded science. The three-dimensional science learning approach from the 2012 National Academies of Sciences "A Framework for K-12 Science Education" is currently being implemented by state education departments. Assessments are needed to determine
if students are increasing their practice and knowledge of scientific and engineering practices, especially computational thinking, as education professionals are still determining how best to teach and assess this practice. In addition, we propose to develop a computational thinking TEC-embedded science assessment instrument.
Other studies related to the proposed project: AMSTI (Alabama Math, Science, and Technology Initiative study (Newman et al., 2012) and the Crafting Engaging Science Environments (CESE) study (Schneider et al., 2022).
Proposed implementation sites: Sonoma State University (CA) and Angelo State University (both HSIs) as well as at least 40 high-need Rural LEAs in California and Texas