Early-Phase Competition Absolute Priority 3 (STEM)
New York Hall of Science
S411C230141
Your Light and Air: Leveraging Civic Science to Advance High Need, Grade 6-8 Students' Science Learning Through Investigations

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Applicant Name: New York Hall of Science
Project Title: Your Light and Air: Leveraging Civic Science to Advance High Need, Grade 6-8 Students' Science Learning Through Investigations
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: 14,828
Grade level(s) to be served by the project: 6, 7, 8
Definition of high-need students: Students attending schools in districts where enrollment includes at least 70% of students eligible for free or reduced-price lunch, 20% English Learners, and at least 65% of students from racial and ethnic groups historically underserved in science and engineering (e.g., Black, Hispanic, and American Indian or Alaskan Native students; see NCSES, 2023).
Brief description of project activities: The New York Hall of Science, in collaboration with the American Institutes for Research, New York City Department of Education School District #24 (NYC- 24) in Corona, Queens and Chicago Public Schools, will carry out an early phase research and development project to improve the science achievement of middle-grade students, focusing on highneed students who are underrepresented in STEM career pathways. The project partners will develop and rigorously test Your Light and Air (YLA), an intervention that will introduce students to the purpose and practices of civic scientific investigation, an inquiry process that invites learners to draw on their curiosity and prior knowledge to explore and improve the conditions of their everyday environments. It will also provide sustained PD experiences that prepare science teachers in underresourced schools to build the instructional competencies and the classroom culture that are necessary to effective implementation of high-quality science learning opportunities. Project teams will develop the intervention (supplemental curricula and professional development in partnership with teachers from the target districts, conduct a pilot test of the supplemental curriculum (6 teachers), pilot test the full intervention (12 teachers), and field test the full intervention (18 teachers). They will then conduct a randomized controlled trial to test the impact of the intervention on student and teacher outcomes. The teams will share project findings and intervention resources with both research and practitioner audiences, participate in IES-sponsored PI meetings and TA opportunities, and manage the project to meet timelines and budgets.
Summary of project objectives and expected outcomes: Goal 1: Develop and evaluate the YLA intervention Objective 1: Develop, pilot test and field test YLA units and PD Measurable outcomes: ⅔ of teachers recruited for implementation design cycles persist throughout their R+D cycles; Pilot and field

test are conducted on schedule and with 5/6 of participating teachers (N=6, 12, and 18 for the three cycles) implementing. Objective 2: Conduct an experiment assessing YLA implementation and impact. Measurable outcomes: Recruitment is completed on schedule; 90% of planned summer workshop and CFG activities are provided; teachers and students meet evaluation thresholds for implementation; data collection and analysis are completed on time and on budget. Goal 2: Maximize the impact of the project by sharing its findings broadly and managing the project responsibly Objective 3: Develop and implement knowledge mobilization plan. Measurable outcomes: 2 conference presentations on the field test findings and/or the R+D process; 2 conference presentations, 2 articles published in practitioner journals and 1 in a peer-reviewed research journal on the results of the experiment. Objective 4: Manage project effectively and efficiently Measurable outcomes: Team participation in 80% of offered technical assistance (TA) events and EIR-sponsored workshops; 100% participation in EIR PI meetings.

Summary of how the project is innovative: The project uses two innovative strategies 1) An emphasis on a "civic science education" approach to scientific investigation. The intervention helps students link exploration of scientific phenomena to their experience of their everyday environments and uses the practices of investigation to explore how the quality of their immediate environment, such as the light and air in the classroom, could be improved. 2) Ongoing professional development to leverage the supplemental curriculum materials. Teachers will participate in a summer workshop and school year online critical friends groups. The PD will draw on the Ambitious Science Teaching framework, which emphasizes giving teachers the tools to support rigorous student thinking and rich student discourse regardless of the particular curriculum they may be required to follow.

Other studies related to the proposed project: Borman, G. D., Rozek, C. S., Pyne, J., & Hanselman, P. (2019). Reappraising academic and social adversity improves middle school students' academic achievement, behavior, and well-being. Proceedings of the National Academy of Sciences of the United States of America, 116 (33), 16286– 16291. https://doi.org/10.1073/ pnas.1820317116 . Also: https://ies.ed.gov/ncee/wwc/Study/88768

Condon, M., & Wichowsky, A. (2018). Developing citizen-scientists: Effects of an inquiry-based science curriculum on STEM and civic engagement. The Elementary School Journal, 119(2), 196-222.

Friedman, L.B.; Margolin, J.; Swanlund, A.; Dhillon, S.; Liu, F. (2017). Enhancing Middle School Science Lessons with Playground Activities: A Study of the Impact of Playground Physics. American Institutes for Research. Retrieved from: https://eric.ed.gov/?id=ED574773 . Also: https://ies.ed.gov/ncee/wwc/Study/85767

Grigg, J., Kelly, K. A., Gamoran, A., & Borman, G. D. (2013). Effects of Two Scientific Inquiry Professional Development Interventions on Teaching Practice. Educational Evaluation and Policy Analysis, 35(1), 38–56. https://doi. org/10.3102/0162373712461851

Halpern, D., Aronson, J., Reimer, N., Simpkins, S., Star, J., and Wentzel, K. (2007). Encouraging Girls in Math and Science (NCER 2007-2003). Washington, DC: National Center for Education Research, Institute of Education Sciences, U.S. Department of Education. Retrieved from http://ncer.ed.gov. Also: https://ies.ed.gov/ncee/wwc/PracticeGuide/5

Schneider, B., Krajcik, J., Lavonen, J., Salmela-Aro, K., Klager, C., Bradford, L., Chen, I.-C., Baker, Q., Touitou, I., Peek-Brown, D., Dezendorf, R.M., Maestrales, S., & Bartz, K. (2022). Improving science achievement - Is it possible? evaluating the efficacy of a high school chemistry and physics projectbased learning intervention. Educational Researcher, 51(2), 109-121. https://journals.sagepub.com/doi/abs/10.3102/0013189X211067742.

Snyder, C., & Stevenson, O. (2021). Girls and Guys Realizing Opportunities with STEM. Retrieved from: https://eric.ed.gov/?id=ED613865 . Also: https://ies.ed.gov/ncee/wwc/Study/90290

Proposed implementation sites: New York City School District #24 and Chicago Public Schools that serve students in grades 6-8