

DEC 2018



NEW KNOWLEDGE BRIEF

Preparing Educators to Teach Science

THE BIG PICTURE

As the global economy grows and evolves, there is an increasing need for skilled workers in the science, technology, engineering, and math (STEM) fields. In the United States, STEM fields pay workers 1.7 times higher than the national average and represent some of the fastest growing career paths.¹ [Jobs in biomedical engineering, software development, and mathematics are all expected to grow by more than 15 percent by 2020.](#)² Yet there is a significant gap between the need for skilled workers in STEM industries and the number of students graduating from high school and college with the skills for or interest in STEM careers.

The federal government has created [dozens of programs designed to foster interest and achievement in STEM for students in high-need communities.](#)³ Countless philanthropies and nonprofits across the country, including the [Gates Foundation](#)⁴ and Iridescent Learning, also work to promote STEM opportunities for young people and, while progress has been made, there is still a long way to go: [only 11 percent of scientists and engineers in the workplace are people of color and less than one third are women.](#)⁵

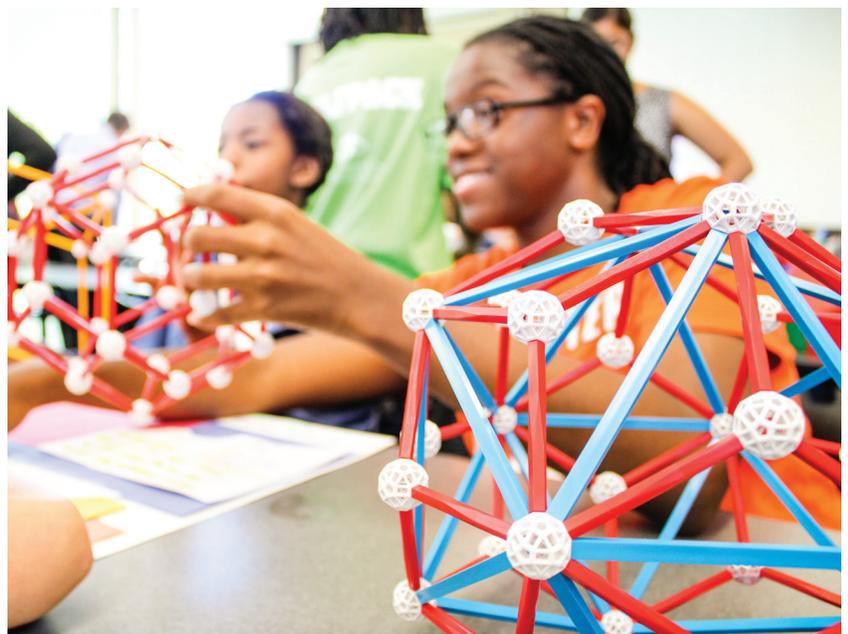
One of the most significant challenges associated with engaging the next generation in STEM is finding and training teachers to help foster the scientific curiosity and creativity necessary to succeed in STEM careers. Nearly every state in the country reported a [shortage of science teachers in 2017-18,](#)⁶ pointing to the need to build a stronger pipeline of science teachers that can nurture students' interest in STEM from an early age and build a new bulwark of skilled scientists.

NEW UEI KNOWLEDGE

New research shows that teachers trained in science are more likely to be successful in the classroom with inquiry-based instruction models,⁷ Inquiry-based science instruction involves challenging students with questions and giving them the opportunity to apply scientific methods to experimenting and problem solving rather than lecturing. The National Association of Science Teachers, the National Science Education Standards, and Next Generation Science Standards all encourage K-12 teachers to use an inquiry-based approach to science instruction, yet it remains an exception rather than rule in many science classrooms throughout the country.

In light of this, the UChicago Urban Teacher Education Program (UChicago UTEP) is training aspiring teachers to lead their classrooms in inquiry-based science instruction by integrating all content courses with scientific inquiry experiences. For example, UChicago UTEP's students are given an assignment that involves examining the anti-bacterial properties of certain common herbs. Teacher candidates are required to work through the entire scientific process, from developing a research question and establishing a hypothesis, to conducting an experiment, to producing and analyzing data, and reporting research results. UChicago UTEP pairs this experiential learning with traditional coursework that prepares aspiring teachers to practically incorporate inquiry-based science instruction into lesson plans — and all of UChicago UTEP's candidates take inquiry-based science coursework, regardless of whether or not they will end up teaching science once they enter the workforce.

Ultimately, evidence suggests that pedagogy needs to intersect with scientific inquiry to be most effective and, by teaching science as an exercise in creative thinking, testing, and problem solving rather than drilling in facts, teachers can promote students' enthusiasm for science in the classroom.



DEVELOPMENTS TO WATCH

Many states and districts have recognized the impact of inquiry-based science learning and the need to train teachers in applying it to more deeply engage students in STEM. The Arizona Science Center launched the [Science Teacher Residence \(STAR\) Program](#).⁸ It provides intensive, inquiry-based professional development for science teachers from around the state, but especially those working in high-need schools. The week-long program introduces teachers to subject-specific activities in the life sciences, physical sciences, and environmental sciences and connects them to local leaders in the STEM fields who can be resources for engaging classroom visits or field trips. Teacher residency programs such as [UTeach at the University of Texas Austin](#) also place a strong emphasis on student-led inquiry in the classroom with programs for undergraduates like Hands-on-Science and opportunities to host elementary school students in science classrooms for its pre-service teachers.⁹

To download the University of Chicago Urban Education Institute's full New Knowledge Report, visit: <https://www.ueiknowledge.org/2018-new-knowledge-report>

SOURCES

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