

The GLOBE California Academy Program

Background

In October 2011, WestEd and University of California Berkeley's Career Academy Support Network (CASN) received a three-year collaborative ITEST Strategies grant to improve learning and workforce development in science, technology, engineering, and math (STEM), and in information and communication technology (ICT)—especially for underserved students. The proposed strategy integrates the hands-on science pedagogy of the Global Learning and Observations to Benefit the Environment (GLOBE) program¹ into the multi-year curriculum of the California green high school academies². The GLOBE California Academy Program (CAP) engages students in research related to climate change, provides career development activities, and supports teachers in career academies through professional development and other forms of support that focus on the growing renewable energy and clean technology workforce sector.

Hands-on laboratory experiences and inquiry- and project-based learning have long been standard features of science education. Project-based learning can also be part of a multi-disciplinary strategy to engage students and prepare them more effectively for college and careers. In career academies, students implement projects that both strengthen their science practices and connect the content and practices to students' career aspirations. Furthermore, integral to career academies are opportunities for students to engage in “work-based learning”—an extension of project-based learning beyond the classroom that is linked to professional standards and transferable 21st century skills, uses employer or community interaction to engage students, and intentionally promotes learning and access to future educational and career opportunities (Darche, Bracco & Nayar, 2009). The GLOBE initiative offers students the opportunity to contribute to real science by using high-quality scientist-developed protocols, and entering their data into an international database for scientific analysis, which is consistent with this definition of work-based learning. Students not only learn, but produce outcomes of value to others beyond school. These kinds of experiences also activate adolescents' developing sense of agency (Bandura, 2006), which may produce further positive outcomes. Finally, the structure of the academies, based on cohort scheduling over three years, offers coherence and continuity for students over time, and supports academic skill-building as well as both career and socio-emotional development from one grade to the next. This structure also allows for the embedding of multi-year initiatives. GLOBE CAP will build students' knowledge and skill over a span of three years as follows:

- **9th and 10th grades:** Students focus on collecting data using GLOBE protocols and learning activities, understand science from scientists, and gain exposure to the career path of a scientist through direct interaction.

¹ The GLOBE program is a worldwide hands-on, primary and secondary school-based science and education program. GLOBE's vision promotes and supports students, teachers and scientists to collaborate on inquiry-based investigations of the environment and the Earth system working in close partnership with NASA, NOAA, and NSF's [Earth System Science Projects \(ESSPs\)](http://www.globe.gov) in study and research about the dynamics of Earth's environment. See www.globe.gov.

² Career academies are schools-within-schools that organize learning around career themes. Students typically enroll in academies for three years, in grades 10–12. Teachers also commit to their academies and work collaboratively to integrate the curriculum across disciplines. In California, the state-funded California Partnership Academy program requires that at least 50% of the students meet “at risk” criteria.

- **11th grade:** Students continue to collect data but, in addition, develop their analytical skills through data visualization and interpretation; begin collaboration with sister schools in other countries to build global awareness; and continue career exploration in STEM fields.
- **12th grade:** Students continue to collect, interpret, and create visualizations of data but also explore the links to public policy, and they apply their knowledge and skill in a service learning project or social enterprise in their local community.

Documented Results

In its first year, GLOBE CAP enrolled teachers and students; conducted needs assessments in order to customize teacher support; provided GLOBE training to teachers; built partnerships with key organizations, including the Chabot Space and Science Center, the UC Berkeley Departments of Chemistry and Earth and Planetary Science, and the GLOBE Program Office; placed college mentors in classrooms; created a three-year framework for student projects that embeds GLOBE data collection and activities; developed assessment tools; facilitated scientist visits to GLOBE classrooms; built internal and external websites; and laid a foundation for future replicability. Six northern California high schools are participating in GLOBE CAP, including 19 teachers and over 300 students. GLOBE instrument shelters have been sited and student data collection is underway. In its second year, teachers were trained to download GLOBE data for data analysis and visualization, and students are now engaged in projects to develop these skills. Graduate student scientists are supporting teachers as both career speakers and in curriculum development, bringing real-world relevance and role models to GLOBE CAP classrooms.

GLOBE CAP is undergoing a rigorous evaluation process to track students' course-taking patterns and grades in science, GLOBE-related science content knowledge, students' science-related attitudes, and the development of an array of science practices and 21st century skills. It is also examining teacher facility with GLOBE protocols and science practices, as well as programmatic outcomes. Year one results showed gains in science-related attitudes, especially "enjoyment of science lessons" and gains on the science content knowledge assessment developed for use in the study. Lead teachers in GLOBE CAP showed measureable growth on 9 of 14 items assessing their knowledge, skills, and experience with GLOBE protocols and practices.

Potential Applications

A growing number of schools are implementing career academies as a high school reform model; there are currently over 7,000 academies nationwide. In addition, the demand for professional and technical workers in the renewable energy sector is likely to grow. Occupations in this sector, from installing and maintaining new energy technologies to conducting basic research, require knowledge and skills across several STEM disciplines. Implementation of GLOBE within California's green academies will provide a proof of concept for more widespread implementation in California and across the country. Partnership with the GLOBE network, detailed documentation, and communication with national groups involved with STEM and career academies will help pave the way to broader replication.

For More Information

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