How citizen science transforms passive learners into engaged scientists

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A ladybug pollinates. Credit: UC Davis

Third-grader Jessica was quiet in group discussions and did not see herself as a strong science student. But after an eight-week unit in school where she was able to read, write about, collect data on and even draw and photograph ladybugs for a project, she began to see herself as scientist in her own right—explaining the life stages and lifestyles of ladybugs to grownups with conviction.

Jessica became a citizen scientist.

In a new UC Davis article, "Real Science in the Palm of Your Hand: A Framework for Designing and Facilitating Citizen Science in the Classroom," co-authors Emily Harris and Heidi Ballard explain that youth participation in citizen science—activities where members of the public contribute to the generation of real scientific knowledge—can support youth to learn and identify with science, as was the case for Jessica.

"In these moments," the authors wrote, "she was seen—and started to see herself—as an expert. For months afterward, she and her peers continued finding and documenting ladybugs at home and school and helped the garden manager consider new plants to provide a year-round ladybug habitat."

Try these methods with your students

Harris is a research scientist at BSCS Science Learning in Colorado Springs and a graduate of the UC Davis School of Education. Ballard is an associate professor of environmental science education in the School of Education, and founder and faculty director of the Center for Community and Citizen Science at UC Davis. The article was published in April in *Science and Children*.

The authors share a research-based framework intended to help classroom teachers think beyond what Citizen Science activities to do and consider how to design and facilitate those activities for meaningful student learning. Their research focuses on the specific outcome of how young people develop agency to use environmental science to create change in their lives and communities. They examined in 10 case studies of youth participation in citizen science in Northern California, including groups monitoring bird populations, butterfly life cycles, water quality in urban creeks, or land use.

Students learned how to collect and analyze data, evaluate data quality to contribute to real scientific research, draw conclusions and communicate findings through essays and presentations. For example, Jessica learned about the stages of ladybug life cycles (egg, larva, pupa, adult) and analyzed ladybug data from the garden, presented to school stakeholders and wrote about their findings. She even took her research to the practical level of making recommendations to school staff to promote ladybug-friendly habitat in the school gardens.

The real-life investigation, data collection, learning and presentation was key to the project—and important for building a framework for teaching youth to be citizen scientists, Ballard said.

"We found this helps students realize that impacting the environment is not a choice, but impacting it positively can be. Through garden visits and classroom conversations, Jessica, for example, came to see that she could play a role in improving ladybug habitats at school through garden management decisions."

Leading international study of youth learning

Research continues at the Center for Community and Citizen Science, which is now leading an international study of youth learning in the field and online, in projects facilitated by natural history museums. The LEARN CitSci project includes principal investigators from the United States and United Kingdom. Citizen Science practitioners from The Natural History Museum in Los Angeles, The Natural History Museum in London, the California Academy of Sciences in San Francisco and education researchers from UC Davis, the Open University and the University of Oxford are participating.

The Center is also offering professional development opportunities for educators interested in exploring how community and citizen science can help them meet their goals for learning.

Provided by UC Davis