



GUEST COMMENTARY

Brad Williamson

Reflections of a Citizen Scientist Educator

In my work as a biology teacher, one of my goals has been to engage students as scientists. Certainly, laboratory activities in the classroom can initiate that process, but sharing projects and strategies that students can apply outside the classroom will make a more long-lasting impact. One such strategy that I have long found engaging is citizen science.

My own contribution as a citizen scientist began with a mark and recapture project of butterflies called *Monarch Watch*, started with Dr. Chip Taylor at the University of Kansas (<https://monarchwatch.org/>). We began in the early 1990s, when the idea of citizen science was just getting started and before the term had been coined by Rick Bonney of Cornell's Lab of Ornithology. It was easy to see how working on a citizen science project might benefit students, giving them a chance to work on and contribute to an authentic scientific problem, but the professional scientific community was not quite as receptive early on. The web was the catalyst that brought citizen scientists and professional investigators together to share ideas, data, and a developing sense of community.

Citizen science projects during the past three decades have been a resounding success for students, cooperating scientists, and society. Books have been written on the subject, hundreds of scientific papers have featured data from volunteer scientists, and federal legislation now mandates inclusion of a citizen science component in some funded projects. Today, thousands of successful citizen science projects engage students and teachers with authentic scientific questions (<https://www.citizenscience.gov/#> and <https://scistarter.org/>). Of course, adults can participate in these projects, but how does involvement in a citizen science project promote student learning?

A critical factor to consider when designing biology instruction is student motivation. Projects like *Monarch Watch* can enhance that motivation directly. Students can do authentic science, make a difference in the world, and experience the excitement of discovery. For example, many student participants in *Monarch Watch*, who had little or no previous experience with capturing and tagging butterflies, found this process deeply engaging. Despite that engagement, however, release of their tagged butterflies often seemed anticlimactic – “Is that all there is?” It was obvious to me that simply tagging monarchs wasn't enough. My students responded as young scientists once they started asking their own questions. These questions came from working intimately with the butterflies, in the field and the laboratory. The butterflies themselves could inspire our students to pursue their own questions. I was amazed at how much more resilient students were as they designed and carried out investigations based on their own questions. Students developed deep emotional attraction to these insects. As you consider citizen scientist projects, be sure to look for endeavors that engender obvious student interest and ownership, along with potential for spinoff student research.

Students involved in such projects quickly learn that progress in science may be fleeting, incremental, and ambiguous even as it is cumulative. They learn the value of perseverance. Students engaged in citizen science research learn firsthand that biology involves proposing questions and seeking answers. An appreciation of how science informs our world is one of the most important takeaways for students who participate in a citizen science project.

North American monarch butterfly populations are experiencing a worrisome downward trend, and the species may soon be listed as threatened. Determining the cause of this decline is the focus of active research. There are currently two principal views. One suggests that climate change is the main causal factor in the decline, while the other points to habitat loss in the monarch breeding grounds. Arguments for both views rely on data collected from various citizen science efforts. Indeed, such data could only have been collected through large, sustained efforts by thousands of teachers, students, and other citizens. Citizen science is now mainstream.

But there is something else I would like you to consider as you think about incorporating citizen science in your classroom. Only now, as I look back in retirement, do I realize how the trajectory of my career changed when I became involved in *Monarch Watch*. The butterflies created an emotional bond with students and, in turn, inspired their parents and our school community. And that bond helped change the dynamic in our classroom – it became a research lab in which groups of students were investigating all sorts of questions. I did not start as a monarch expert (that was Dr. Chip Taylor). However, my role in the classroom gradually changed and I became a school-based principal investigator. I wrote grants and articles, and gave presentations to local groups on monarchs, milkweeds, and conservation biology. I communicated with scientists every week. And guess what – I found that I was approaching my teaching more scientifically. Seeing myself more as a biologist added to my identity as a teacher. I began to take a more active role in NABT, newly empowered not only as a teacher, but as a curriculum developer, learning coach, teacher leader, and citizen scientist.

Biology teachers are uniquely positioned to contribute to citizen science efforts both personally and as mentors. I know that both my students and I benefited by embracing the charismatic monarch butterfly. I hope you find your own monarch butterfly to escort you on your own citizen science adventure, one to share with students too.

BRAD WILLIAMSON is a retired biology teacher in Kansas. He can be reached at bwilliam@ku.edu.

DOI: <https://doi.org/10.1525/abt.2021.83.4.209>