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Tools for Using Citizen Science in Environmental, Agricultural, and Natural Resources Extension Programs

Kathryn A. Snyder
University of Florida

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Tools for Using Citizen Science in Environmental, Agricultural, and Natural Resources Extension Programs

Abstract

Citizen science is quickly becoming a valuable tool in the Extension professional's tool kit. This is the case whether you are a 4-H agent looking to involve youth in agriscience and agriculture-related science, technology, engineering, and math experiential learning activities or an agriculture and natural resources agent seeking to help stakeholders in your county or scientific community connect to address issues. This article outlines a number of existing resources within and outside Extension to support agents, professional researchers, and communities in coming together to understand, and ultimately improve, the state of their environment.

Kathryn A. Stofer

Research Assistant
Professor
Department of
Agricultural Education
and Communication
University of Florida
Gainesville, Florida
stofer@ufl.edu

Introduction

Citizen science, or public participation in scientific research, is quickly becoming a valuable tool in the Extension professional's tool kit. Recent national spotlights on citizen science and crowdsourcing efforts for data collection, data analysis, and data-driven decision making (Kalil & Wilkinson, 2015) introduced and collated a number of tools that can support these efforts within and outside Extension, particularly for environmental, agricultural, and natural resources programs. Despite these efforts, many individual tools and even collections remain scattered across organizations and do not always explicitly involve Extension. Whether you are a 4-H agent looking to involve youth in agriculture-related science, technology, engineering, and math (STEM) or environmental experiential learning activities or an agriculture and natural resources agent seeking to help stakeholders in your county or scientific community connect to address issues, using citizen science to expand efforts to monitor and understand surroundings can lead to valuable scientific and educational outcomes for a range of participants.

Citizen Science in Extension

Often citizen science is thought of as a way for professional researchers, such as Extension faculty, to expand their capacity to gather data over space and time by involving volunteers in the data collection process. Although citizen science these days is a much broader endeavor, data collection certainly is one entry point for people who want to contribute to existing projects. Leaders of existing projects may provide protocols for data collection, lists

of equipment needed, training materials, and, occasionally, grants or resources to obtain specialized equipment.

Faculty and other research project leaders asking for data collection assistance may not require a great deal of new effort from you or your clientele beyond sharing data that are already being collected. For example, gardeners may already collect data on rainfall in their gardens and could easily contribute those data to the Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) precipitation monitoring project (<http://www.cocorahs.org>). Producers of specialty crops, such as fruit trees, could report timing of the appearance of leaves, flowers, and fruits to Project BudBurst (<http://budburst.org>). Or existing groups can decide on their own to collect new data in the context of their current activities. For example, an urban agriculture or 4-H group could begin observing birds in their neighborhoods by participating in the Cornell Lab of Ornithology project Celebrate Urban Birds (<http://celebrateurbanbirds.org>). Some master gardener trainers incorporate the USA National Phenology Network Nature's Notebook project (Posthumus et al., 2013) in their programs. In turn, facilitators of projects such as these often provide data back to anyone wishing to access the project data.

Although this top-down design approach is one way to involve yourself and your group in research, there are now many tools agents can use to help a variety of people participate in citizen science from different entry points. Beyond data collection, those working on existing projects may seek input on designing research questions and protocols, analyzing data, or even making inferences and conclusions from collected data. The resources described in this article are a sampling of tools Extension professionals can use to facilitate and benefit from citizen science.

For Professionals New to Citizen Science

For a soup-to-nuts introduction to the field of citizen science, peruse the Federal Toolkit for Crowdsourcing and Citizen Science (<https://crowdsourcing-toolkit.sites.usa.gov>). This site offers how-to guides for starting your own project, case study models, legal resources, and a database of federally sponsored projects. In addition, the European Citizen Science Association has published the online resource Ten Principles of Citizen Science (http://ecsa.citizen-science.net/sites/default/files/ecsa_ten_principles_of_citizen_science.pdf), which also can serve as an introduction to the field.

Tools for Managing and Creating Your Own Projects

Citsci.org (<http://citsci.org>) lists existing projects that you or your stakeholders can join or use as examples or resources. However, it also has functionality to support creating your own projects to answer questions of interest to you; specifically, this functionality involves database tools for housing, curating, and sharing your data. A number of other specialized database sites, including CyberTracker (<http://cybertracker.org>) and AnecData (<http://www.anecdata.org>), also have tools to support new projects.

4-H/Youth Curricula

Participation in citizen science projects can be a powerful STEM experience for youth (Meyer et al., 2014). 4-H and other youth groups can easily join existing projects or create their own protocols or access existing data to answer questions of interest. In addition, some projects have curricular activities to help provide background on the topics studied; these include the Cornell Lab of Ornithology's Bird Sleuth tool kit (<http://www.birdsleuth.org>), YourWildLife.org's School of Ants curriculum (<http://schoolofants.org/more-about-ants>), and Nature's Notebook (Posthumus et al., 2013). The Bird Sleuth team recently released an online course for teachers interested in integrating the group's inquiry-based activities in classrooms (<http://www.birdsleuth.org/integrating-inquiry>).

Communities

Several online and in-person networking opportunities exist to support Extension practitioners in using citizen science in their programming. For example, eXtension has a community (<https://people.extension.org/communities/1404>, free sign-up required) designed to facilitate knowledge sharing among Extension professionals, with a mailing list and a resource curation area. The nascent Citizen Science Association (<http://citizenscience.org>) brings together people from all areas of citizen science online and at a biennial international conference. Several regional international organizations also exist. Finally, the USA Volunteer Water Monitoring Network (<http://volunteermonitoring.org>) brings together a variety of people and groups working on all aspects of water.

Project Listings

At least three major listings of programs exist for people interested in getting involved in established projects: Citsci.org (mentioned previously), SciStarter (<http://scistarter.org>), and Zooniverse (<http://zooniverse.org>). SciStarter lists a variety of projects searchable by category, including in the category of agriculture. SciStarter also contains information on costs of participation and links to resource materials to support project participants. These listings include ways to participate in many aspects of projects—not just in data collection but also in analysis, question development, and even drawing of conclusions from data. *Scientific American*, among other publications, provides lists of citizen science projects organized around smartphone and tablet apps developed for the projects (Malykhina, 2013).

Writers

Popular science bloggers and Twitterers Caren Cooper (@CoopSciScoop) and Chandra Clarke (@ChandraClarke) each highlight programs on a regular basis. Cooper's #CitSciChat series (<http://www.carencooper.com/citscichat.html>) presents resources on a variety of content areas and emerging topics related to citizen science. She also developed a cartoon to tell the story of citizen science (<http://www.carencooper.com/the-cartoon-story.html>). Clarke's writings can be found at <http://www.popsci.com/popsci-authors/chandra-clarke-0>.

Conclusion

These examples represent a small fraction of the tools existing for supporting citizen science in environmental, agricultural, and natural resources Extension. A more complete list of resources can be found in a blog post I wrote for eXtension (<https://extension.org/2016/08/29/citizen-science-resources-for-cooperative-extension>). One set of resources currently lacking for all of citizen science is tools for measuring participants' learning, including knowledge gains, behavior changes (Pratt & Bowman, 2008), and affective changes. Additionally, standards of data quality—especially for data used for government regulatory purposes, such as monitoring of water body quality—are under discussion by the citizen science community at large. The Citizen Science Association formed a working group on research and evaluation, and these issues are currently under its purview. The group is seeking new members as of this writing. In short, the world of citizen science continues to evolve, and Extension professionals have many tools from which to draw and also to which they can contribute their expertise.

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