

# Pioneer Valley Citizen Science Collaboratory: A CSCL Approach to Designing Citizen Science Projects

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**Abstract:** The recent explosion of citizen scientist (CitSci) projects has led researchers to call for their broad use as a tool for improving science learning (Bonney, et al., 2014; Wals, et al., 2014). We highlight the CSCL design features of our PVCS Collaboratory and outline a research program for measuring CitSci's understanding of the nature of science, content knowledge changes and shifts in Science 2.0 practices as participants move from novice data collectors to competent practitioners.

**Keywords:** citizen science, Science 2.0, technology integration, authentic science collaboration

## Introduction

Involving the general public in scientific data collection efforts has occurred for over 100 years. In the past 15-20 years, these efforts, often called citizen science (CitSci) projects, have exploded in popularity (Bonney et al., 2014) under the guise of opportunities for science learning and engagement for social change. However, scholars recently highlighted the need for leveraging theoretical perspectives of learning and engagement if we wish to truly move from citizens as data collectors to citizens as creators of new knowledge who can effectively address socioecological challenges (Wals, et al. 2014). Important to the CSCL community, these scholars call for leveraging technology tools toward these ends. We describe a new CitSci platform, the Pioneer Valley Citizen Science Collaboratory (PVCS), that leverages theoretical constructs from the collaborative learning literature, innovative integration of technology tools and existing CitSci projects and seeks to teach participants deep environmental conservation concepts. This platform engages CitSci participants in Science 2.0 practices such as real-time data, geospatial mapping, the use of social networking tools, and collaboration across time and space. Our work combines research on best practices for teaching nature of science (NOS) ideas, community knowledge construction, and the design of mobile (Zimmerman, 2011) and web-based (Peters & Slotta, 2010) technology platforms for promoting deep content learning.

Several CSCL researchers have begun partnerships with CitSci projects as a context for their research. Polman studied citizen science journalism as a way of engaging students with infographics and peer critique (Polman, Newman, Farrar, & Saul, 2012). Martin and Barron (2013) investigated a CitSci project that networked schools and teachers as an example of "mass collaboration." Price & Lee (2013) examined CitSci participants' understandings of the nature of science (NOS). However, the *design* of an integrated CitSci platform, driven by research on learning, is lacking. We designed for learning opportunities by combining crowd sourced materials, peer review and feedback, public engagement in Science 2.0, and distributed technology environments, all guided by the CitSci, CSCL, environmental and science education literature.

## Methods

### Participants

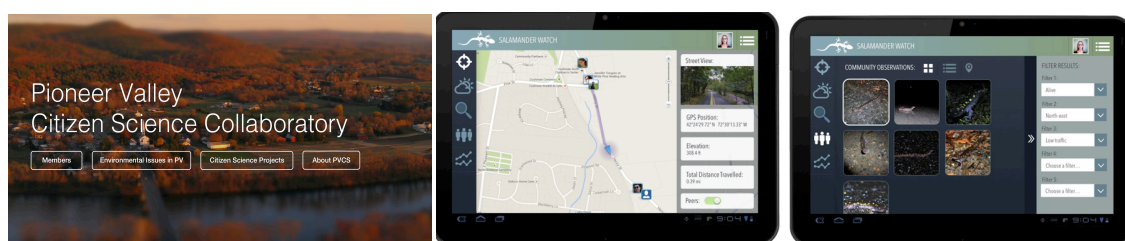
In the spring of 2014, the PVCS Collaboratory, began through a partnership between Hampshire College and the Hitchcock Center for the Environment (Hitchcock Center), a local environmental education center. The Hitchcock Center provides environmental education programs for in-school K-12 students, homeschoolers, families, and the general public all seeking to increase participants' environmental literacy. Included are training and opportunities for engagement in CitSci projects. From this original partnership, more partnerships developed allowing for a greater number and variety of participants across a greater geographic range and set of demographic (age, ethnicity, economic class, etc.) categories.

## Materials

The PVCS portal features both public and member-only spaces and is designed to be the primary location where citizen scientists can learn about the PVCS collaborative and, if interested, register as members and participate in local CitSci projects. Each local PVCS project contextualizes science through four environmental issues: climate change, biodiversity, habitat loss, and invasive species. These issues frame PVCS and its projects, emphasizing the convergence of citizen science, environmental issues, and Science 2.0 practices within the collaborative (see Figure 1). This deliberate emphasis reminds participants to link their data collection efforts to underlying environmental issues, scientific practices and community knowledge.

PVCS projects are the main venue for citizen scientists' involvement in data collection and/or analysis. PVCS projects are often seasonal and run for a specific time frame each year. Scientific data collected in each run, however, can be accessed for analysis, comparison, and visualization after the run is complete, thus, expanding citizen scientists' opportunities for involvement beyond the actual active period of the projects. Current projects include: Salamander Watch; Neighborhood NestWatch Springfield; and Leaf Drop and we are in discussion with project managers for local versions of Firefly Watch and Monarch Watch.

PVCS fosters collaboration through integrated CSCL tools both embedded within data collection webforms (see Fig. 1) and the PVCS web portal. Participants needn't switch between individual platforms (e.g., data collection) and collaborative platforms (e.g., separate social networks; shared data) but can fluidly work individually and collectively toward both individual and collective goals with local and/or global significance, lowering barriers to entry and incentivizing collaboration. Iteratively-designed data collection webforms for the Salamander Watch, Neighborhood NestWatch, and Leaf Drop projects that will run for the first time on a large scale in 2015.



**Figure 1.** From left, PVCS portal; Salamander Watch mobile collaborative geolocation tool; Salamander Watch mobile community observation collaboration tool.

## Findings and implications

Starting spring of 2015, we will collect data on participants' incoming, in-progress and follow-up notions of Science 2.0, target species (e.g., salamanders), environmental issue, ideas about NOS, and shifts from mere data collectors toward knowledgeable practitioners. We will present preliminary findings at the CSCL conference.

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