



Collaborative Research: Exploring Engagement and Science Identity through Participation (EESIP)

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Introduction/About the Project

Citizen science is a form of informal science education that involves the public in authentic scientific research and simultaneously addresses specific scientific objectives. The purpose of this research is to advance theoretical and practical understanding of how participation in scientific research fosters and supports lifelong science learning. Of particular interest is examination of the connections between science learning and the concepts of engagement and science identity.

Citizen science projects vary with respect to the roles in which the public is involved (Bonney et al. 2009):

- **Contributory** projects are researcher-driven and participation is focused mostly on data collection; the roots of these projects are in disciplines that historically have embraced volunteer involvement such as ornithology, paleontology, and astronomy.
- **Collaborative** projects are typically originated by researchers, but may include input from participants in multiple phases of the scientific process from designing data collection methods to analyzing data.
- **Co-created** projects involve participants in all aspects of the scientific process including defining research questions, interpreting data, and disseminating findings.

Our research will investigate the relationship between participant engagement and individual learning outcomes both within and between projects in all three models.

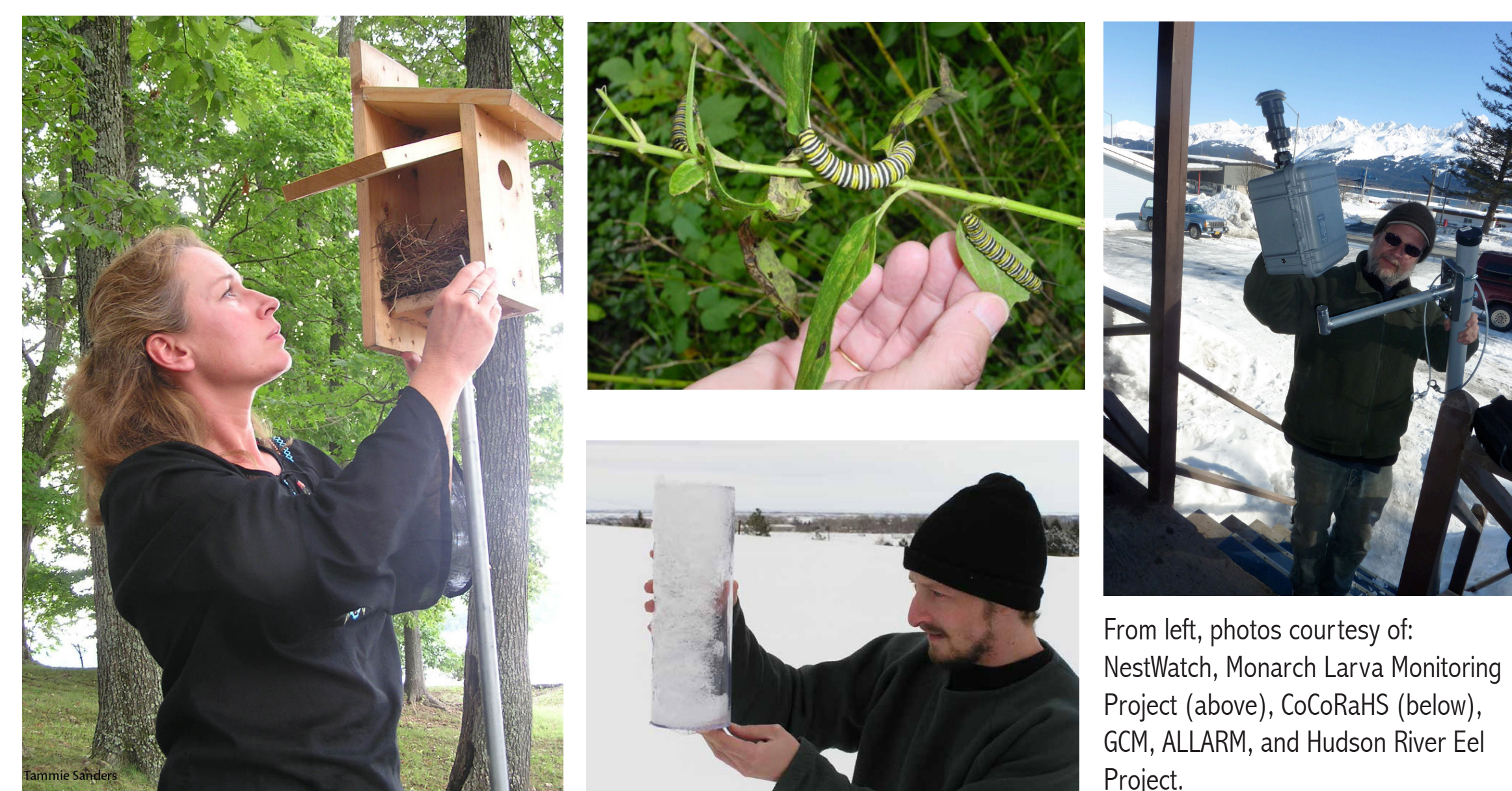
Projects

We are studying adult audiences from six purposively selected citizen science projects representing the types of projects mentioned above.

- Contributory projects include NestWatch and the Monarch Larva Monitoring Project (MLMP), which are national in scope, and primarily involve participants who observe the target taxa and submit data online.
- Collaborative projects include the Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS), a national weather monitoring program, and the Hudson River Eel Project (EELS), a regional project run by the NY State Department of Environmental Conservation, both of which involve participants in data collection, and some research design and data analysis.
- Co-created projects include Alliance for Aquatic Resources Monitoring (ALLARM) and the Global Community Monitor (GCM, includes Bucket Brigades), which are regionally focused networks of grassroots organizations involving participants in all aspects of monitoring water and air quality, respectively.

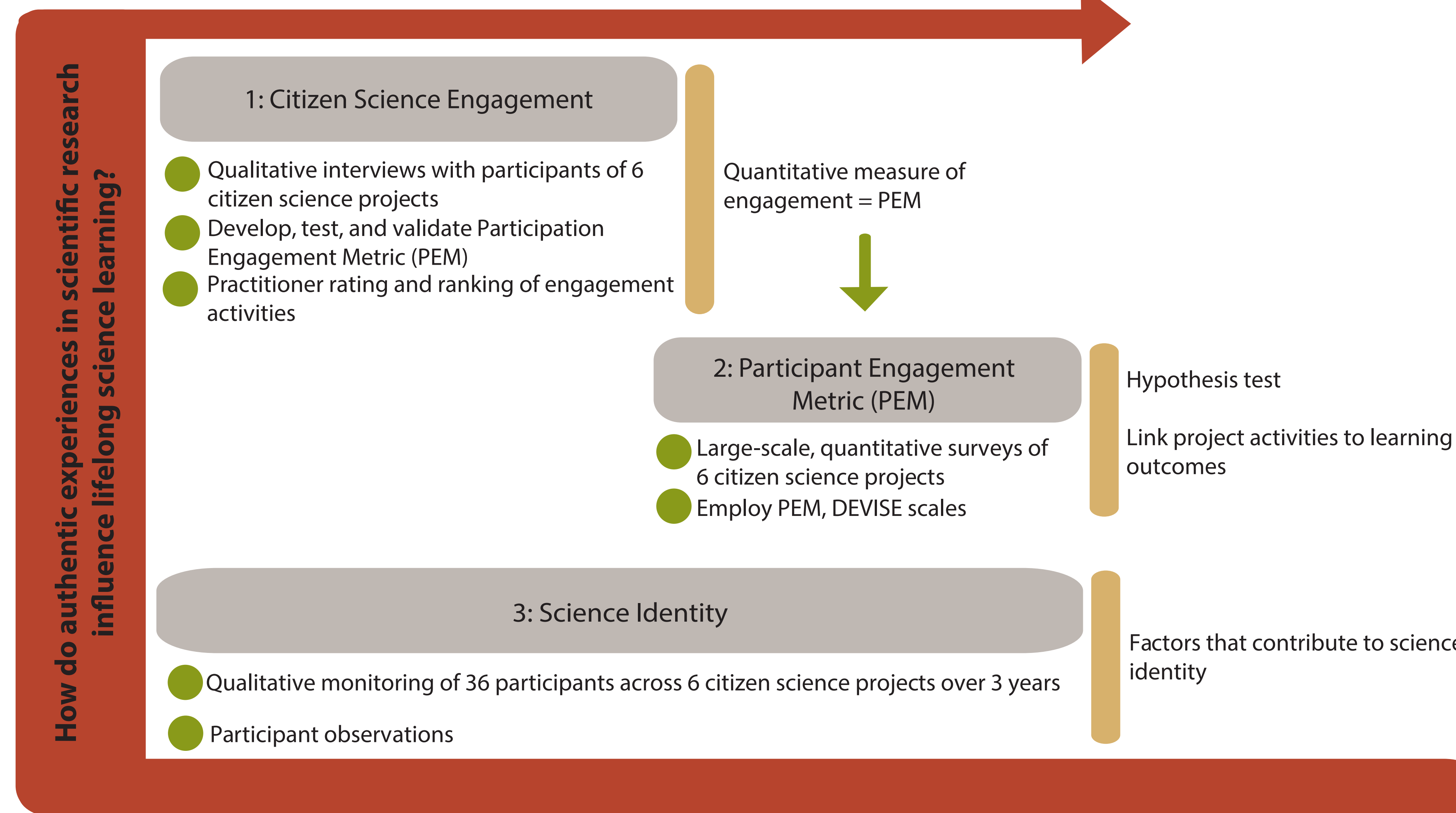
Research Questions

1. What are the dimensions of citizen science engagement and how can we measure them across different project types?
2. Within and among projects, what is the relationship between participant engagement and individual learning outcomes?
3. How does degree and quality of participation in scientific research develop and/or reinforce individual science identity?



From left, photos courtesy of: NestWatch, Monarch Larva Monitoring Project (above), CoCoRaHS (below), GCM, ALLARM, and Hudson River Eel Project.

PROJECT DESIGN



Question 1: What are the dimensions of citizen science engagement and how can we measure these dimensions across different types of projects?
 Question 2: What is the relationship between participant engagement and science learning outcomes?
 Question 3: How does degree and quality of citizen science participation develop and/or reinforce science identity in participants?

Research Methods

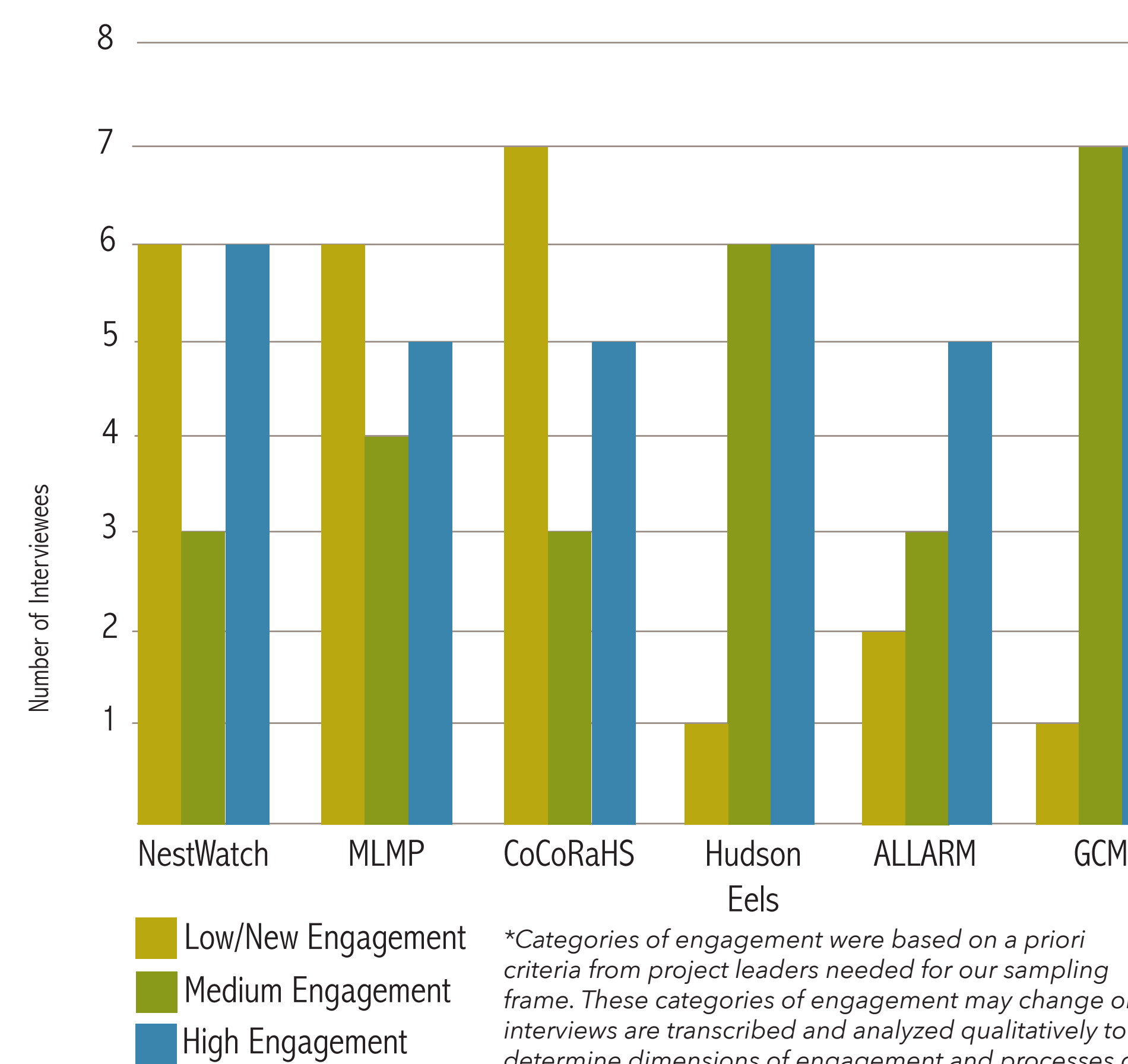
Data Collection

To characterize engagement and understand the natural variation in the population, we interviewed citizen science participants representing a broad range of engagement levels. We asked the six project leaders to provide us with approximately 20 names of participants representing an even distribution of low-, medium-, or high-engaged participants. In particular, we asked project leaders to consider certain criteria such as each participant's frequency of monitoring, the number of sites monitored, the diversity of activities in which they participated, the types and amount of communication in which they engaged, and their level of leadership within the project when assigning participants to the low, medium, or high categories for our sampling purposes.

Findings from this phase of research will inform Research Question 2.

Research Findings to Date

We conducted and digitally recorded interviews (ranging in length from 45 to 120 minutes) with 83 citizen science participants from the six projects.



Theoretical Framework

Citizen science is often regarded as a collective social activity and community of practice involving many actors engaged in science-based activities. Our research is focused on understanding the lived experiences of participants as they engage in various aspects of the scientific process. Situated Learning Theory (SLT), first introduced by Lave and Wenger (1991) provides a framework for examining production and transformation of personal identities, practical skills, and communities of practice through engagement with everyday activities. Here, learning is embedded within the lived experiences of the individual as part of social practice (Lave and Wenger 1998). Increasing practice of an activity within a community using similar tools and procedures leads to changes in practice, and changes in participation from novice or peripheral, to expert or core participation. In this project, we use Situated Learning Theory, Communities of Practice, and theories of science identity development (Carlone and Johnson 2007, National Research Council 2009) for examining the role of practice in citizen science as it relates to learning, engagement, and identity.

Dissemination and Broader Impacts

Deliverables from this collaborative research include evidence-based findings for operationalizing engagement and science identity, a valid and reliable Participant Engagement Metric, and best practices for sustaining science interest throughout the life course, both in citizen science and other ISE settings.

Results of this research will help practitioners, project developers, and ISE researchers better understand the links between project activities that promote different types and levels of engagement, and observed science learning outcomes. This work will also inform design of projects that achieve the greatest impacts for both new and existing audiences.

These findings will be widely disseminated to citizen science practitioners and ISE researchers through a variety of channels including peer-reviewed journals, professional conferences, and the citizenscience.org website.

Acknowledgments

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