Item number	Title/reference *(academic style) name initials (year) title, publisher, volume, pages*	Name of reviewer
5	Phillips, T.B., Ballard, H.L., Lewenstein, B.V. and Bonney, R., 2019. Engagement in science through citizen science: Moving beyond data collection. *Science Education*, *103*(3), pp.665-690.	**Karl Donert**

Review of findings / main outcome

This paper focuses on citizen engagement in citizen science activities. It attempts to qualitatively characterize citizen science engagement across multiple projects and from the perspective of the participants.

They suggest engagement cannot be measured by quantifying data contribution outputs alone, as this leaves critical gaps in what engagement actually means. The participants may take part in multiple scientific activities including collecting and submitting data, formulating hypotheses, asking and answering questions, interpreting and analyzing data, and using data as evidence and even presenting results to stakeholders.

The study aims to identify the most relevant and important features of citizen engagement.

The study analyses the interviews of 72 participants from six different environmentally based projects.

TABLE 1 Summary of project description aligned with situated learning theory characteristics

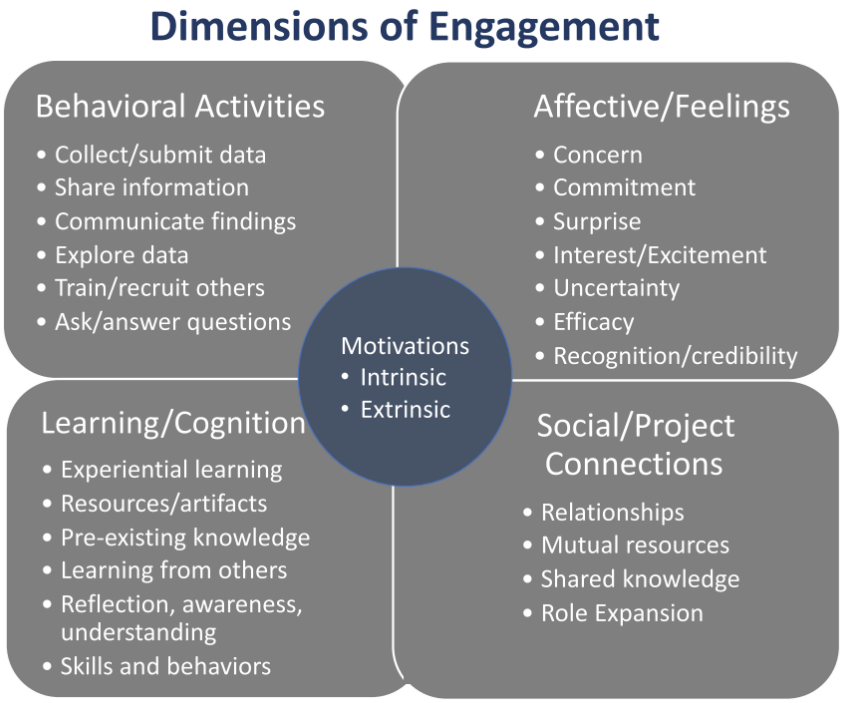
Projects (content)	Description (context)	Project type and structure (community)	Tools/materials (participation)
NestWatch (Nestwatch.org)	Contributory; monitoring bird nest boxes	Individual, some peer-to-peer interactions online	Nest boxes, binoculars, field guide; paper and online data collection, online data submission, online data retrieval, online materials and training
Monarch Larva Monitoring Project (mlmp.org)	Contributory; counting monarch larvae on milkweed plants	Individual and group, some peer-to-peer interactions online	Hand magnifying lens, field guide, ruler, paper and online data collection, online data submission, online data retrieval, online and in-person materials and training
Community Collaborative, Rain, Hail, and Snow Network (cocorahs.org)	Collaborative; measuring precipitation events	Individual, most peer-to-peer interactions online	Rain gauges, measuring sticks, online data entry and retrieval, online materials and training
Hudson River Eels Estuary Project (dec.ny.gov/lands/49580.html)	Collaborative; counting glass eels	Group, most peer-to-peer interactions in person	Waders, fyke nets, buckets; paper data collection; online data retrieval, in-person training
Alliance for Aquatic Resource Monitoring (www.dickinson.edu/allarm)	Co-created; monitoring water quality	Group, most peer-to-peer interactions in person	Water bottles, yard sticks, water conductivity meters, paper, and online data collection; online data retrieval, in-person training
Global Community Monitor (gcmonitor.org)	Co-created; monitoring air quality	Group, most peer-to-peer interactions in person	Air monitoring buckets; paper data collection, in-person training

It undertakes an examination of cognitive, affective, social, behavioral, and motivational dimensions of engagement involved in citizen science projects.

Major nodes	Description
Behavior	Observable aspects of participation—both the number and kinds of different scientific practices, tasks and/or activities that participants engage in as part of the project
Motivation	The underlying psychological need for why someone does something expressed as initial cause for participation or why they stay involved in the project
Affective/feelings	Expressions of feelings or emotions about specific activities, other people (friends, family members), or other living and nonliving things (plants, animals, places)
Social/project connections	A sense of belonging to the project or the extent to which individuals feel allegiance to a group expressed through interactions with participants, project leaders, and connections to the larger scientific community
Cognitive/learning	Thinking about the situated aspects of engagement, that is, applicable content and real-life contexts to support learning and individual reflection on their learning

The results obtained related to each of these dimensions is discussed in detail. The authors suggest that all these components are important to engagement.

The authors present a Dimensions of Engagement framework to facilitate the innovation of new approaches and methodologies for studying engagement in citizen science and different forms of informal science education.



The Dimensions of Engagement Framework highlighted the many ways that participants in citizen science projects contribute emotionally, behaviorally, cognitively, and socially to this collective endeavour.