

Inclusion in citizen science: The conundrum of rebranding

Does replacing the term citizen science do more harm than good?

By Caren B. Cooper^{1*}, Chris L. Hawn², Lincoln R. Larson³, Julia K. Parrish⁴, Gillian Bowser⁵, Darlene Cavalier^{6,7}, Robert R. Dunn^{8,9}, Mordechai (Muki) Haklay¹⁰, Kaberi Kar Gupta¹¹, Na'Taki Osborne Jelks¹², Valerie A. Johnson¹³, Madhusudan Katti¹, Zakiya Leggett¹, Omega R. Wilson¹⁴, Sacoby Wilson¹⁵

As the scientific community, like society more broadly, reckons with longstanding challenges around accessibility, justice, equity, diversity, and inclusion, we would be wise to pay attention to issues and lessons emerging in debates around citizen science. When practitioners first placed the modifier 'citizen' on science, they intended to signify an inclusive variant within the scientific enterprise, one that enables those without formal scientific credentials to engage in authoritative knowledge production (1). Given that participants are overwhelmingly above median income, white adults, with a college degree (2,3), it is clear that citizen science is typically not truly an egalitarian variant of science, open and available to all members of society, particularly those underrepresented in the scientific enterprise. Some question whether the term "citizen" itself is a barrier to inclusion, with many organizations rebranding their programs as "community science." But this co-opts a term that has long referred to distinct, grassroots practices of those underserved by science, and is thus not synonymous with citizen science. Swapping the terms is not a benign action. Our goal is not to defend the term

citizen science, nor provide a singular name for the field. Rather, we aim to explore what the field, and the multiple publics it serves, might gain or lose by replacing the term citizen science, and the potential repercussions of adopting alternative terminology (including whether a simple name change might not actually do much to improve inclusion).

A more fruitful way forward, rather than focusing on changes to the name of the field, is to focus on approaches that increase inclusion; that is, to enable all people to feel that the identity they hold belongs and authentically influences the culture, values, and future of the field. To lend weight to those approaches, we recommend increases in funding for community science and the subset of citizen science and science more generally that address the interests, concerns, and needs of members of society historically and currently underserved by science.

CO-OPTING LANGUAGE

The term citizen science has come to have two intertwined meanings. The original, narrower definition, coined in the mid-1990s, refers to projects led by institutions guiding decentralized data collection by volunteers often unknown to each other yet sharing the common goal of advancing scientific research (1). These projects now number in the thousands and even a single project can engage millions of people (4). The second definition arose later as a kind of "big tent" concept to refer to highly varied projects across many disciplines with public-inclusive approaches to research and science education, regardless of the leadership, size, or design, and balancing multiple goals: science, engagement, education, policy, and/or empowerment (1). We begin here with the narrower meaning.

There are dozens of terms used to describe participants in citizen science, including phrases in different languages as well as terms within English that hold different meanings in different cultures. Terms that might offend in one culture (e.g., amateur) may be perfectly suitable to others, underscoring terminology challenges (5). Much of

the debate about the use of the term citizen science has been in the United States. People born in the US to currently or historically oppressed groups (by race, ethnicity, religion, gender, sexual orientation, etc) could perceive the term citizen as a source of power inasmuch as all these groups have struggled to obtain the rights of democratic citizenship. Although the term citizen also refers to people who reside in a place or are citizens of the world (6), many people contest the term because they perceive it to exclude, or even convey hostility towards, those without citizenship status within a given nation (7). Consequently, an increasing number of organizations in the US, such as the National Audubon Society and others (8), have adopted the term community science to rebrand their citizen science programs as open to all publics. Other institutions have selected alternative terms such as civic science (by AAAS, the publisher of *Science*) and neighborhood science (Los Angeles Public Libraries). In our personal experience, we have seen those in the sphere of public engagement in science call upon others to use the term community science to describe citizen science activities.

In the US, the urgent social pressures to re-label citizen science as community science pose a conundrum. On one hand, those using the term community science to replace the term citizen science hope to engage a wider range of demographic groups. On the other hand, the unintended impacts could be counter to inclusion. While most science, including citizen science, aims to produce new knowledge, the term community science describes a very specific, formalized, and longstanding research paradigm. Distinct from that of citizen science, community science is linked to social action with aims including protection of human rights and measurable improvements for communities facing environmental injustices and public health challenges (9). Community science includes community-based participatory research (CBPR), community-engaged research (CEnR), community-owned and managed research (COMR), street science,

¹Department of Forestry & Environmental Resources, North Carolina State University; Raleigh, NC, 27695, USA. ²Department of Geography & Environmental Systems, University of Maryland-Baltimore County; Baltimore, MD, 21250, USA. ³Department of Parks, Recreation, and Tourism Management, North Carolina State University; Raleigh, NC, 27695, USA. ⁴College of the Environment, University of Washington; Seattle, WA, 98195, USA. ⁵Department of Ecosystem Science and Sustainability, Colorado State University; Fort Collins, CO 80523, USA. ⁶School for the Future of Innovation in Society, Arizona State University; Tempe, AZ, 85281, USA. ⁷SciStarter.org. ⁸Department of Applied Ecology, North Carolina State University; Raleigh, NC, 27695, USA. ⁹Center for Evolutionary Hologenomics, University of Copenhagen; Copenhagen, 1165, Denmark. ¹⁰Department of Geography, University College London; London, WC1E 6BT, UK. ¹¹Biodiversity & Earth Observation Lab, North Carolina Museum of Natural Sciences; Raleigh, NC, 27604, USA. ¹²Environmental and Health Sciences Program, Spelman College; Atlanta, GA, 30314, USA. ¹³School of Arts, Sciences, & Humanities, Shaw University; Raleigh, NC, 27601, USA. ¹⁴West End Revitalization Association; Mebane, NC, 27302, USA. ¹⁵School of Public Health, University of Maryland; College Park, MD, 20742, USA. Email: cbcoope3@ncsu.edu

and other participatory methods aimed to bring social change, with roots in the critical pedagogy of Paulo Freire and the social psychology of Kurt Lewin. Community science elevates local experts and place-based issues above academic experts and publication-driven research agendas (10).

The circumstances in which community science occurs are varied with regard to social context and topic. Community science may arise, irrespective of race or income levels, when groups need scientific evidence that is not part of typical scientific agendas. For example, the Silent Spring Institute, formed by community members on Cape Cod, Massachusetts, USA, uses CBPR to prioritize cancer-prevention research on environmental causes of cancer to complement government and industry focus on cures for cancer. In other cases, community-based organizations, such as the West End Revitalization Association in central North Carolina, USA, use COMR to address inequities in environmental protections and basic amenities within historically marginalized communities (11). The COMR principles set expectations between formal institutions and community-based organizations to achieve funding equity, management parity, and science to support enforcement of regulatory compliance and other legal venues to protect human rights (10). What unites such diverse community science projects is that the authority, power, and funding rests with communities (12). In this way, community science represents a fundamental departure from institution-based science, including citizen science.

The basis of citizen science, in strong contrast to that of community science, is typically volunteerism within the realm of mainstream science, wherein funds flow to academic, government agency, or non-governmental organizations; credentialed individuals at those institutions make decisions, partially or wholly, about research directions, and projects can be geographically large, vastly exceeding the community scale. Relabeling citizen science as community science without consideration of these fundamental and structural differences may actually impede social justice efforts being carried out in the context of existing community science projects. We believe that switching the words citizen and community without regard to the traditions and norms associated with these well-established and quite different approaches to science is at least misleading and disingenuous, and at most directly harmful as larger citizen science organizations could dilute the goals of,

and potentially siphon donor funds away from, authentic community-driven efforts. Because community science is already underfunded, a clear distinction in terminology is necessary to establishing sources of support for authentic community-driven efforts.

In short, the term community science should be reserved for projects that focus on local priorities, local perspectives, and are able to maintain the locus of power in the community. A hallmark of individuals and organizations behind these efforts has been commitment to social action, and anti-racist, de-colonizing research praxis aimed at elevating multiple ways of knowing, engendering trust, and sharing power (9). A name change alone for citizen science, not accompanied by altering underlying practices such that projects bring about structural change (12), is akin to false marketing.

CITIZEN SCIENCE IN POLICY

Adding complexity to the conundrum, the term citizen science has a second meaning: a “big tent” encompassing the blurry continuum from the narrower meaning of the term through to community science and beyond. The broader meaning also includes other forms of public engagement and of formal and informal education.

In the race to rebrand, a cost of abandoning citizen science as the name of the big tent is the loss of tremendous global momentum in professional practice and in policy that have unified support for highly diverse participatory practices under this well recognized moniker. Since 2014, scholars and practitioners around the globe focused on public engagement in science have formed professional organizations using this term (13). “Citizen science” is also included in a range of laws and regulations in different countries (14). In the US, the reauthorization of America COMPETES Act in 2016, which included the Citizen Science & Crowdsourcing Act of 2015, codified and defined citizen science in federal law. The Act authorizes the federal government to carry out a wide variety of scientific activities with the inclusion of people irrespective of professional scientific credentials, and irrespective of citizenship status. As a big tent, citizen science provides legal protections for community science.

INCLUSIVE CITIZEN SCIENCE

The motivation of those who aim to change the name of citizen science is to make the field more inclusive. This is an extraordinarily important goal. To accomplish this goal, we argue that the most important change

must focus on ways to actually broaden participation in, and enlarge the number of beneficiaries of, citizen science endeavors regardless of project nomenclature. We call for strategic planning to advance accessibility, justice, equity, diversity, and inclusion in citizen science, both narrow and broad definitions. Although the terminology debate is mostly a US phenomenon, these issues are universal.

Strategies may or may not require a shift in terminology. But decisions about what to name a research enterprise – or a movement – need to happen within a broader portfolio of strategies designed to advance inclusive practices. However, considerations of terminology should: (a) avoid exporting from the Global North limitations on meanings of words such as ‘citizen’ into other areas of the world; (b) be reflective to prevent harm from well-intentioned virtue signaling that can unintentionally undermine social justice efforts, and (c) identify different terms for the big tent and the narrower field of institution-led projects. Discussions must occur beyond the narrow domain of scholars. A strategy should include perspectives from many sectors that have a stake in the outcomes, including government (e.g., tribal, federal, state, and local), non-governmental and community-based organizations, academia, and corporations. It should also include those unaffiliated with institutions (written here with full recognition that our own author roster includes the voice of only one person not affiliated with an institution). It should include representations of Black, Indigenous, and People of Color, and other underrepresented groups, as well as individuals living in countries in which they do not hold citizenship.

In recommending changes to enhance inclusivity, we are not suggesting that all projects should become community science (in name or in practice). We applaud that the content focus and decentralized design of institution-led citizen science has intentionally facilitated discovery science by expanding spatial and temporal scales of data collection through the engagement of hundreds to millions of participants. Field-based citizen science has allowed fine-grain, continental scale documentation of shifts in species occurrence, abundance, and phenology; and of precipitation, extreme weather, and earthquakes. Digital crowdsourcing projects have discovered new astronomical structures, organized genomic data, and solved puzzles of protein structure. Given that the success of large-scale projects depends on reaching many people, success with inclusion in this

model could translate into massive broadening of participation.

CENTERING IN THE MARGINS

Irrespective of geographic scope or discipline, we suggest that citizen science projects will only become inclusive through action. For those seeking to realign their citizen science projects and programs with inclusive practices, or who are considering the design of new projects, we recommend centering in the margins (15): if a project is accessible to the marginalized, it will be accessible to all. Though its implementation will vary in its details, the broad approach is general and generalizable. For some projects, the best strategy might be elevating culturally relevant perspectives (emphasizing diversity and inclusion). In others, the best strategy could be a focus on racial and economic disparities in environmental conditions (emphasizing justice and equity) aiming for sustained efforts to produce tangible outcomes beneficial to underserved groups. For institutions housing citizen science, attention to diverse representation in project leadership can assist in fostering accessibility, as will addressing structural barriers, such as economics (e.g., costs of transportation and gear). Regardless of project scope, inclusion can be advanced by making a clear, honest linkage between project outcomes and the lives, livelihoods, values, and cultures of the participants. Funding that supports research priorities that address the needs and interests of those historically and currently underserved by science will be a major step in providing the necessary foundation for inclusive citizen science.

The impetus of practitioners to relabel citizen science as community science is evidence of their recognition that citizen science is not serving all people. We applaud this momentum, and hope to re-focus it on deeper work to create inclusive citizen science. In addition to project-specific actions, we advocate for research across the big tent on real and perceived barriers to citizen science volunteerism, including public perceptions of alternative terminology. We urge critical reflection to identify project design principles for citizen science that can answer relevant research questions and lead to positive social change. We recommend that evaluation of projects and assessment of outcomes include tangible measures of participant diversity and encourage practitioners to publish participant demographics where feasible.

Citizen science has opened the doors and put out a welcome mat to create a bridge between science and society. Yet the result has

been homophily: the overwhelming majority of participants in citizen science are racially similar to those currently overrepresented in the science professions. The challenges of inclusion in citizen science are a wake-up call revealing that words - no matter what the terminology - and intentions - no matter how good - are not enough. Recognizing the distinct practices of community science and their necessity to those underrepresented in science highlights the reality that science has failed to serve all segments of society equitably, thus creating hollow invitations to participate. Funders and practitioners seeking to support diversity and inclusion in citizen science (as in science more generally) must recognize that even the choices of science agendas, what to study and how to affect that work, are not neutral and will serve some segments of society more than others. It is important, therefore, to be mindful of where the locus of power and decision-making lies within a given project, and which sectors of society benefit the most.

We believe that new edges of scientific discovery and actionable science lie in inclusion: the addition, without assimilation, of diverse voices, values, perspectives, lived experiences, and identities. Because citizen science has multiple goals - research, education, policy, empowerment - this braided path provides multiple inroads to inclusive practices. Citizen science will achieve its egalitarian aspirations when individual projects actively engage in inclusive praxis and the big tent collectively engages across diverse publics. As the boundaries of inclusive citizen science expand such that no segments of society remain underserved, so too will the face, and the foci, of science.

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