

The Democratic Potential of Citizen Science: Public Participation in Scientific Research

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Abstract

Citizen science, or public participation in scientific research, encompasses a wide variety of participatory activities. Members of the public actively participate in scientific research often in collaboration with or under guidance of professional scientists. Popular examples include collecting air quality data using low-cost sensors and the great backyard bird count.

Citizen science is being promoted as a means of democratizing science, raising expectations that anyone can become a citizen scientist and that power is distributed among those involved in generating knowledge. However, it is unclear whether citizen science is living up to this promise and what the necessary conditions are for achieving genuinely democratic citizen science. This doctoral thesis therefore takes a critical stance on the democratic potential of citizen science. While acknowledging its significant potential for its democratization, the aim is to gain a better understanding of the necessary conditions. To this end, we apply a Grounded Theory approach, drawing on theories of science communication, participation and democracy, as well as on case studies implemented by VUB between 2016 and 2025.

The first part of the thesis explores democratic principles in collaborative knowledge production, as well as key aspects of democratised science. It considers who initiates and controls citizen science, who participates in them, and the different levels of engagement. It also examines the role of research performing organisations and public government in further detail.

Building on these exploratory insights, the second part of the thesis analyses how the democratic potential of citizen science can be further unlocked. Through a theory synthesis, we present our main conceptual framework which identifies prerequisites for democratic citizen science and clarifies which citizen science practices can and cannot be considered democratic. This framework is the result of a theory synthesis between citizen science and deliberative democracy, specifically Fishkin's equality-participation-deliberation trilemma.

The final part of the thesis refines the conceptual framework by offering practical design recommendations for achieving equality, participation and deliberation. Two case studies and a handbook reveal practical insights into specific methods and strategies.

This doctoral thesis aims to contribute to the practice of citizen science by engaging in the broader discussion on what democratised science entails. Our intention is to raise critical awareness among practitioners and caution against the misuse of the language of democratisation. Overall, democratic citizen science is not the default option. However, those aiming for it must carefully balance democratic principles - especially seen the potential lack of participant diversity and genuine deliberation - and provide the necessary evidence.