

Change – The transformative power of citizen science

The promises of citizen science – fact or fake?

Barbara Heinisch* (a)

(a) Centre for Translation Studies, University of Vienna, Vienna, Austria

Abstract

Despite its increasing popularity, not everybody is supportive of citizen science. Authors are critical of the promises that citizen science practitioners claim and challenge the role citizen science can play in the democratisation of science or in tackling societal challenges. They put the promises of citizen science under scrutiny and question that citizen science can increase trust in science among the public by participating in actual research. Some critics do not only deny the promises of citizen science, but even see a threat in it as it may jeopardize academic freedom or cement existing power relations.

Keywords: societal challenges, personal outcomes, social good, science-society relationship.

© 2024 Barbara Heinisch

This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Published by NHM, BOKU and ECSA and peer-reviewed under responsibility of ECSA-ÖCSK-2024 (Change – The transformative power of citizen science)

Introduction

The promises of citizen science are as diverse as the topics and disciplines it encompasses. Citizen science is said to increase trust in science (EC 2020), democratize science (Irwin 1995) or empower participants. Thus, citizen science holds a “dense promissory discourse” (Strasser et al. 2019).

But what are (these) promises in citizen science and why do they matter?

A promise, in general language, is defined as a “declaration or assurance made to another person (usually with respect to the future), stating a commitment to give, do, or refrain from doing a specified thing or act, or guaranteeing that a specified thing will or will not happen” (Oxford English Dictionary 2024). From

* Corresponding author. E-mail address: barbara.heinisch@univie.ac.at

a psychological perspective, promises are “social contracts that can be broken, kept, or exceeded” (Gneezy and Epley 2014). Keeping a promise is viewed more favorably than breaking it. From a philosophical point of view, “promises are binding because the act of making a promise creates expectations in the promisee” (Patterson 1992). Therefore, the act of breaking a promise is considered morally wrong and deserving of criticism. In organizational studies, it has been shown that unfulfilled promises among employees lead to negative behavioral outcomes, such as less loyalty or lower performance and an increase in complaints (Fu and Cheng 2014). Therefore, promises are closely related to benefits, virtues and potentials and especially to expectations.

The aim of this research is to shed light on some promises that citizen science holds and criticism these promises attract. Criticism refers to “[t]he passing of judgement on a person or thing” (Oxford English Dictionary 2024). Another aim is to raise awareness among the citizen science community, especially researchers on how and why they may propagate prevalent promises.

Study approach

Presently, citizen science is hyped in Europe, fueled by the European Commission, various funding bodies, research institutions and governments. The promises citizen science holds are one cause for this push.

Promises

The promises of citizen science found in literature can be categorized according to the “greater democratization of science, better scientific literacy, and new scientific breakthroughs” (Strasser et al. 2019). In the following, these promises are subsumed under three categories: the benefits for society as a whole (the greater or social good), the relationship between science and society and personal benefits.

Social good

The promises guaranteeing benefits for an entire society are related to the advancement of knowledge (in science), to the creation of a healthy environment (McKinley et al. 2016) or to increasing well-being, such as public health (Broeder et al. 2018). Additionally, citizen science holds the promise to influence policymaking (Schade et al. 2021). Another promise related to greater social good is that citizen science can help achieve the Sustainable Development Goals (SDGs) by defining, monitoring and implementing them (West and Pateman 2017). Other promises related to tackling societal challenges by means of citizen science according to Chari et al. (2017) are “more robust, open, and democratic decision-making processes”, the empowerment of communities as well as transformative change.

Criticism in this regard includes that citizen science cements power relations, contributes to the neoliberalization of science and platform capitalism (Mirowski 2017) instead of instigating real-world change.

Science-society relationship

Citizen science has gained increasing traction in the European Union, including in its funding schemes. The European Commission (EC 2020) states that citizen science “has the potential to improve research and its outcomes and reinforce societal trust in science” and increase “science literacy and confidence of the public in research”, thereby highlighting the role of citizen science in improving the relationship between science and society. The democratization narrative is seen as a means to overcome “the elitist barrier between scientists and the public” (Strasser et al. 2019). Another promise is that citizen science can increase the public understanding of science (Bonney et al. 2016). Moreover, there is the promise that through acquiring scientific literacy the acceptance, support and uptake of science among the public can be improved. Furthermore, citizen science can generate knowledge in previously underexplored areas and expand the scientific worldview (Strasser et al. 2019).

Criticism centers on the implications of the democratization of science. First, the way how citizen science is implemented may even reinforce (and not challenge) “existing knowledge paradigms and associated power dynamics” (Tubridy et al. 2022) and patronize citizens instead of empowering them. Additionally, researchers may have hidden agendas and exert their interests on the participants (Mirowski 2017) instead of acting in the interests of society at large. Second, the democratization of science may jeopardize academic freedom (Mirowski 2017) as everybody would have a say in academic research. Third, democratization might mean that citizen science has to align with the life worlds of its participants.

Additionally, citizen science usually relying on the support of volunteers, can be seen as an exploitation of citizens. Could citizen science even deteriorate the science-society relationship and burn bridges, for example, in a case where academic findings do not align with the lived experience of the participants or when communities are abandoned after a project concludes? This raises ethical concerns about building relationships with participants only to potentially disappoint them when the project concludes.

Another criticism here is that academics might be seen as superfluous and that citizen science results in “the social dumping of paid professionals and the “Uberizing” of research” (Strasser et al. 2019). Moreover, studies on the science-society relationship have mixed results, for example, whether citizen science can increase trust between citizens and researchers (Bela et al. 2016).

Personal benefits

The promises related to an individual’s benefit in citizen science (mainly focused on the participants and not the researchers) are the acquisition of disciplinary knowledge (Peter et al. 2019) or scientific skills (Gönner et al. 2023), such as data collection or reporting skills and increased (environmental) stewardship (Phillips et al. 2018). Additionally, changes in behavior or attitudes as well as new skills and enhanced self-efficacy (Peter et al. 2019) are personal benefits of the participants.

Criticism with regard to personal outcomes is based on studies that are inconclusive whether participation in a citizen science project results in a long-term change in behavior, attitudes or self-efficacy (Peter et al. 2019).

Keeping promises is difficult...

The citizen science community gives these promises to various actors, including funding bodies, the participants, academia, the public or policymakers. While there are studies demonstrating the potential of citizen science, they often face challenges in interpretation due to their small scale, contextual limitations, and project-specific focus. With regard to the socio-political impact, we see a “vision-reality gap for citizen science” (Gönner et al. 2023).

Moreover, there is a lack of standardized metrics to validate these claims. It is important that the citizen science community critically reflects on these promises and their propagation and urges caution against making overly sweeping claims. A means to assess whether a citizen science initiative kept its promises is the Citizen Science Impact Assessment framework based on five impact domains, i.e. society, environment, economy, science and technology and governance (Wehn et al. 2021).

The European Union and funding bodies contribute to heightened expectations of citizen science and promote these promises. Many funding schemes require applicants to outline the anticipated ‘impact’ of their projects. Some promises are overly broad, such as “increasing public understanding of science” or “democratization of science”, making it difficult to determine if a project has fulfilled them. These (too) broad claims have also called critics on the scene contesting the role citizen science can play in the democratization of science or in tackling societal challenges. Some critics do not only deny the promises of citizen science, but even see a threat in it as it may jeopardize academic freedom (Mirowski 2017).

Therefore, Pandya et al. (2018) recommend that the citizen science community analyses the actual outcomes of their projects, for example through longitudinal studies to track changes in individuals’ and communities’ scientific knowledge, skills, attitudes and behaviors across different citizen science projects.

Conclusions

Citizen science holds a wide variety of promises related to the social good, the improvement of the relationship between science and society and personal benefits for both researchers and participants. This contribution serves as a word of caution against overhyping the potential of citizen science. Since the science-society relationship is at the heart of many of these promises, researchers should be wary of propagating promises that might be difficult to fulfil, as unkept promises can be highly damaging to this crucial relationship.

References

- Bela G, Peltola T, Young JC, Balázs B, Arpin I, Pataki G, Hauck J, Kelemen E, Kopperoinen L, Herzele A, Keune H, Hecker S, Suškevičs M, Roy HE, Itkonen P, Külvik M, László M, Basnou C, Pino J, Bonn A (2016) Learning and the transformative potential of citizen science. *Conservation Biology* 30 (5): 990–999.

- Bonney R, Phillips TB, Ballard HL, Enck JW (2016) Can citizen science enhance public understanding of science? *Public understanding of science* (Bristol, England) 25 (1): 2–16.
- Broeder LD, Devilee J, van Oers H, Schuit AJ, Wagemakers A (2018) Citizen Science for public health. *Health promotion international* 33 (3): 505–514.
- Chari R, Matthews LJ, Blumenthal MS, Edelman AF, Jones T (2017) *The Promise of Community Citizen Science*, Santa Monica, CA, USA, 19 pp.
- EC (European Commission) (2020) *Citizen Science: elevating research and innovation through societal engagement*. Publications Office of the European Union.
- Fu C, Cheng C (2014) Unfulfilled expectations and promises, and behavioral outcomes. *International Journal of Organizational Analysis* 22 (1): 61–75.
- Gneezy A, Epley N (2014) Worth Keeping but Not Exceeding. *Social Psychological and Personality Science* 5 (7): 796–804.
- Gönner J von, Herrmann TM, Bruckermann T, Eichinger M, Hecker S, Klan F, Lorke J, Richter A, Sturm U, Voigt-Heucke S, Brink W, Liedtke C, Premke-Kraus M, Altmann C, Bauhus W, Bengtsson L, Büermann A, Dietrich P, Dörler D, Eich-Brod R, Ferschinger L, Freyberg L, Grützner A, Hammel G, Heigl F, Heyen NB, Hölker F, Johannsen C, Kluß T, Kluttig T, Knobloch J, Munke M, Mortega K, Pathe C, Soßdorf A, Stämpfli T, Thiel C, Tönsmann S, Valentin A, Wagenknecht K, Wegener R, Woll S, Bonn A (2023) Citizen science's transformative impact on science, citizen empowerment and socio-political processes. *Socio Ecol Pract Res* 5 (1): 11–33.
- Irwin A (1995) *Citizen science. A study of people, expertise and sustainable development*, 1. publ ed. Routledge, London [u.a.].
- McKinley DC, Miller-Rushing AJ, Ballard HL, Bonney R, Brown H, Cook-Patton SC, Evans DM, French RA, Parrish JK, Phillips TB, Ryan SF, Shanley LA, Shirk JL, Stepenuck KF, Weltzin JF, Wiggins A, Boyle OD, Briggs RD, Chapin SF, Hewitt DA, Preuss PW, Soukup MA (2016) Citizen science can improve conservation science, natural resource management, and environmental protection. *Biological Conservation* 208: 15–28.
- Mirowski P (2017) Against citizen science. <https://aeon.co/essays/is-grassroots-citizen-science-a-front-for-big-business>.
- Pandya R, Dibner KA, Editors, Committee on Designing Citizen Science to Support Science Learning, Board on Science Education, Division of Behavioral and Social Sciences and Education, National Academies of Sciences, Engineering, and Medicine (2018) *Learning Through Citizen Science: Enhancing Opportunities by Design*, Washington (DC).
- Patterson DM (1992) The value of a promise. *Law and Philosophy* 11 (4): 385–402.
- Peter M, Diekötter T, Kremer K (2019) Participant Outcomes of Biodiversity Citizen Science Projects: A Systematic Literature Review. *Sustainability* 11 (10): 1–18.
- Phillips T, Porticella N, Constan M, Bonney R (2018) A Framework for Articulating and Measuring Individual Learning Outcomes from Participation in Citizen Science. *CSTP* 3 (2): 1–19.

- Schade S, Pelacho M, van Noordwijk T, Vohland K, Hecker S, Manzoni M (2021) Citizen Science and Policy. In: Vohland K, Land-Zandstra A, Ceccaroni L, Lemmens R, Perelló J, Ponti M, Samson R, Wagenknecht K (eds) *The Science of Citizen Science*. Springer International Publishing, Cham. S. 351–371.
- Strasser BJ, Baudry J, Mahr D, Sanchez G, Tancoigne E (2019) “Citizen Science”? Rethinking Science and Public Participation. *Science & Technology Studies*, 32(2): 52–76.
- Tubridy F, Mölter A, Lennon M, Pilla F (2022) Citizen science and environmental justice: exploring contradictory outcomes through a case study of air quality monitoring in Dublin. *Local Environment* 27 (5): 622–638.
- Wehn U, Gharesifard M, Ceccaroni L, Joyce H, Ajates R, Woods S, Bilbao A, Parkinson S, Gold M, Wheatland J (2021) Impact assessment of citizen science: state of the art and guiding principles for a consolidated approach. *Sustain Sci* 16 (5): 1683–1699.
- West S, Pateman R (2017) How could citizen science support the Sustainable Development Goals? Discussion Brief. <https://mediamanager.sei.org/documents/Publications/SEI-2017-PB-citizen-science-sdgs.pdf>.