EDITORIAL

PARTICIPATORY EVALUATION AND IMPACT ASSESSMENT IN CITIZEN SCIENCE

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In this issue of FTeval Journal, we approach the topic of evaluation in Citizen Science from a particular angle, inquiring about the possibilities and conditions for making evaluation more participatory than it has been to date. While Citizen Science is by definition highly participatory, this claim often does not extend to its evaluation and impact assessment practices. In this special issue, authors explore a few of the manifold potential entanglements of participation and impact assessment. They deal e.g. with the question which formats of participation can be useful for the evaluation of Citizen Science, and to which extent. Contributions range from theoretical discussions to praxis reports and detail existing approaches to participatory evaluation that involve participants of Citizen Science activities in reflecting and assessing projects' or initiatives' processes and outcomes. Before diving into a more detailed description of the focus of this issue and outline the individual contributions, we must briefly outline the problem situation.

The term Citizen Science refers to scientific work undertaken by non-scientists, often in collaboration with professional scientists in the context of research projects. The participation of citizens in scientific projects can take many shapes, such as identifying a research question, collecting or analysing data, monitoring environmental or health conditions, and more. Citizen Science is rooted predominantly in the natural sciences – especially in the field of biodiversity research – and the public health sector (Bonney et al., 2009; Del Savio et al., 2016; Haklay, 2015), but is increasingly adopted as an approach across disciplines (Heinisch, 2019; Pelacho et al., 2021). The social sciences have always exerted a major influence on the understanding of Citizen Science, which draws on its own long tradition of participatory research. Thus, participation in Citizen Science covers research approaches that explore as well as influence natural, technical and social realities in partnership (Unger, 2014). Such an understanding of participation emphasises the co-creation and democratisation of scientific knowledge production in order to find solutions closer to the concrete needs and concerns of society (Felt & Fochler, 2008; Irwin, 1995; Mayer et al., 2018).

As a result of the increased public funding of Citizen Science, the question of its impact has also moved closer to the centre of public interest. There are high expectations – especially in innovation policy – of the new insights that can be gained by the co-design of research with the participation of citizens and non-scientific organisations. While a fundamental reputational gain of Citizen Science is observed, there is still a wide gap between the ascribed potential at strategic level and the actual implementation, as well as the actual integration of results from Citizen Science into concrete socio-political or socio-ecological decision making (Bonn et al., 2022). Observers thus see the danger of overselling when it comes to promises to society as opportunities for participation in the scientific process are currently perceived as rather limited (Dickel et al., 2020). The question remains how a sustainable, responsive, and participatory research culture, as is also called for in the context of responsible research and innovation (RRI), can be achieved with Citizen Science (Maasen, 2020; Stilgoe et al., 2013).

While designing an evaluation concept for a Citizen Social Science project in 2018 and searching the literature for appropriate approaches, we were somewhat surprised to find very little empirical reports on participatory evaluation methods in the field of Citizen Science. This was a double blind spot: participation was neither a focus nor a method in evaluation. But the issue is considerably more far-reaching than that. It is only relatively recently that the term Citizen Science has been included in the indexing catalogues of scientific disciplines, such as those used by funding institutions. Thus, it is only slowly becoming possible to grasp the extent of Citizen Science projects in general. Furthermore, the systematic assessment of co-created methods, outcomes, and their impacts is generally very difficult (Milat et al., 2015), and there are few widely accepted and appropriate measurement methods (Bornmann, 2013; Spaapen & Van Drooge, 2011). Furthermore, indicators for Citizen Science in general and their social impact are only slowly being developed (Wehn et al., 2021), which in turn deal only marginally with participation. To properly evaluate Citizen Science and its impact, it is first necessary to consider scientific processes as part of a larger context in which different logics are at work. Thus, in addition to research design, data handling, and communication of results, not only do the various cultures of the disciplines exert a strong influence on research activity, but institutional ties, funding structures, and cultures of recognition play a major role as well. In a research system that defines performance primarily in terms of citations in scientific journals, societal relevance is not of central concern. Further problems therefore relate to the lack of incentives and recogni-

tion for the evaluation of participatory approaches in science and the difficulty of presenting such co-created results in traditional high-quality / high-impact publication formats, coupled with a lack of opportunities to adequately acknowledge the contributions of co-researchers (Bonn et al. 2022, p. 75). Last but not least, the possible forms of participation differ greatly in their characteristics as well as the associated formats and limits of knowledge production (Shirk et al., 2012).

We have been witnessing a change in the mainstream culture of research evaluation for some time now, shifting from a pure focus on the assessment of the scientific quality of results and orienting much more towards processes and stakeholders (Hemlin & Rasmussen, 2006). Accordingly, evaluation is increasingly seen as a learning process that supports self-reflection and adaptive management while helping to understand what impact Citizen Science initiatives have on science, involved citizens, and their socio-ecological contexts. Still, a review of the literature on evaluation (Schaefer et al., 2021; Svensson et al., 2018; Wehn et al., 2021) shows that in the field of Citizen Science as well as Social Innovation, participation in evaluation is mostly understood as "contributory". That is, information is collected from and sometimes by participants, but they are not actively involved in decisions about evaluation design and outcomes. Moreover, the body of scholarly literature is replete with criticisms of strictly pre-structured sets of criteria and targets, as well as urgent calls for further research on the topic (Milley et al., 2018; Wehn et al., 2021).

At the same time, there are other fields more or less adjacent to scientific research that can already draw on a wealth of experience in far-reaching participation in evaluation. One area in which participatory models have been used for a long time is programme evaluation. Success and quality control, as well as the assessment of the further effectiveness and sustainability of, for example, education programmes, rely heavily on collaborative or developmental approaches to evaluation (Cousins et al., 1996). Programme evaluation in education and youth work has already become much more participatory over the years (Richards-Schuster & Plachta Elliott, 2019). From these fields we know the advantages and strengths of participatory evaluation, which we hope to also establish for Citizen Science: identification of locally and thematically relevant evaluation questions, improvement of accuracy and relevance of reports, establishment and explanation of causality, improvement of project processes, organisational learning and capacity building, empowerment of participants, community- and team building[1]. Participatory evaluation is particularly suited to include notoriously neglected aspects of Citizen Science processes, such as trust building and power relationships (Bryson et al., 2011; Prainsack, 2014). Participatory evaluation schemes have to be assembled according to the project goals and the participants' expectations, but also have to be flexible enough to meet changes in the dynamics of participatory research routines. The challenge therefore is to plan accordingly, to develop the necessary skills for facilitation and incentive structures for such inclusive evaluation settings, so that assessment is not left to the project end, but actively implemented from the beginning of the research design. As such, participatory evaluation places its focus and uses time resources differently than traditional evaluation approaches, to negotiate questions of learning and accountability without going beyond the project scope. Milley et al. (2018) therefore suggest a move away from heavily indicator- and method-centred approaches. The focus should instead be on the flexibility of the evaluation process and the soft skills needed for the mediation processes. This special issue is dedicated to exactly these urgently needed soft-skills that can only be built by learning from a wide range of experiences. In our research and outreach activities, we encounter great interest in participatory methods for evaluation in Citizen Science from academics and practitioners alike. The diversity of topics and methods in Citizen Science, as well as the different research and funding cultures, do not make it easy to find quintessential examples here. We have to look beyond the disciplines and seek exchange among colleagues to share common problems, challenges, and potential solutions. Thus, the contributions from at times vastly different fields serve to break down the scientific silos, enable a cross-pollination between fields and methods, demonstrate possibilities, and discuss the necessary frameworks for more participation in evaluation based on concrete experiences.

The call for papers for this special issue aimed at a broad target group. On the one hand, we invited contributions from Citizen Science, participatory social research, public policy, environmental justice, public health and related fields. On the other, we also called for reports from practitioners, as well as theoretical and practical perspectives from programme evaluation and various other professions and disciplines. As a result, this special issue assembles a wide range of frameworks and methods for participatory evaluation, informed by the experiences gathered in diverse fields such as biodiversity, health, social policy, urban planning and so forth. Authors were invited to elaborate on theoretical and practical grounds their experiences with participatory evaluation in Citizen Science or other fields. We encouraged them – where applicable – to reflect on challenges, risks, and pitfalls, especially in times of physical distancing and global crisis.

We – Barbara Kieslinger, Stefanie Schürz, Katja Mayer and Teresa Schaefer – kick-off the special issue with our own paper, as our forays into participatory evaluation in the context of the EU-funded research project CoAct on Citizen Social Science inspired this publication (www.coactproject.eu). CoAct's participatory research is co-designed and directly driven by citizen groups sharing a social concern. The focus is on the development of methods to give citizen groups an equal 'seat at the table' through active participation in research, from the design to the interpretation of results and their transformation into concrete actions, as well as their evaluation. Together with our partners, we evaluated three research and innovation actions on the topics of mental health (Barcelona), youth employment (Vienna) and environmental justice (Buenos Aires). In the paper, we outline our approach to co-evaluation, present first results, and discuss challenging experiences. Our approach was guided by a previously developed 3-dimensional evaluation framework for Citizen Science (Kieslinger et al., 2018), which we adapted during the course of the project. Furthermore, we discuss the challenges of trying to adapt and extend this framework in a participatory way in times of Covid. Even though not all original co-evaluation plans could be implemented in the CoAct project, we can clearly state that the participatory evaluation approach was worthwhile. We were able to document important negotiation processes for defining the success of the project, the collaborative evaluation of participation, and the management of expectations. This provided continuous feedback into the research process, which helped the project succeed – especially in times of crisis.

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1   This list is an adaptation from https://www.betterevaluation.org/en/plan/approach/participatory_evaluation (1 Sept 2022)

In their article, Ana Margarida Sardo, Sophie Laggan, Elke Franchois and Laura Fogg-Rogers report from the WeCount project (https://we-count.net/). WeCount engaged citizens to gather knowledge about traffic and mobility in their local neighbourhoods in 5 European cities (Leuven in Belgium; Madrid/Barcelona in Spain, Ljubljana in Slovenia, Dublin in Ireland, and Cardiff in the UK), using low-cost sensory equipment. The paper demonstrates a shift in Citizen Science design towards increased participation and co-design, putting citizens at the centre of decision making. As part of its evaluation framework, the project implemented co-creation and policy workshops centred on the question of how citizens wanted to shape the project to address their transport and mobility concerns. Detailing these approaches to evaluation, the paper interrogates to what extent the methodologies were able to involve citizens not only in participatory monitoring but also in evaluation. The authors point to the fact that the involvement of citizens in the evaluation process would not only help to identify priorities, but also develop a theory of change that integrates the needs for capacity building to implement collaborative assessment activities.

Similarly, Antonella Passani, Annelli Janssen, Katharina Hölscher and Giulia Di Lisio ask in their article whether the impact assessment framework developed in the Action Project (https://actionproject.eu/) can address both the demands for more participation and the negotiation of higher-level, policy-relevant impacts. The authors start from the question: how can we evaluate Citizen Science projects in a way that can show policymakers, funding agencies, and other stakeholders the impact of the project, while doing justice to the specifics of the participatory process, including e.g. the budget- and time-constraints of those involved in it? The ACTION impact assessment framework has a modular design and measures scientific, social, economic, political, and environmental impact, as well as the transformative potential of the project. The framework is based on collaborations with 12 Citizen Science projects over the last years. Several co-designed data gathering tools allow scientists and citizens to measure and discuss project outcomes collaboratively. The paper describes the process of developing the impact assessment framework, as well as its implementation to reflect the benefits and constraints and outline future needs, such as making data collection with volunteers easier and less time-consuming.

In their praxis report, Luciano D'Andrea, Evanthia Kalpazidou Schmidt, Elena Bužan, Mariana Vidal Merino, Elke Dall, Claudia Colonnello, Ebbe K. Graversen, Jacopo Cerri, Laura Iacolina and Fabio Feudo address the complex nature of evaluation tasks in Citizen Science by reporting their experiences from setting up the evaluation process in the Step Change project (https://stepchangeproject.eu/). Step Change draws on the experiences from five Citizen Science initiatives in different research fields (health, energy, and wildlife monitoring) and countries (Germany, Italy, Slovenia, Uganda, and the United Kingdom). Adopting a developmental and participatory approach, the evaluation process is organised as a Citizen Science initiative itself, with the evaluation team consisting of experts and local citizens. The article demonstrates the benefits and challenges of tailoring Citizen Science evaluation processes to the needs of the project and involved actors, especially when anticipating long-term impacts and institutional or societal change.

Inspired by co-creation methodologies from design thinking, Catharina van den Driesche and Sarah Kerklaan focus in their paper on visual co-analysis models as a specific method and examine its value as a potential instrument for participatory evaluation and inclusion. Since Citizen Science often propagates opening up scientific knowledge pro-

duction to participants with a wide variety of educational and literacy levels, it requires methodologies that facilitate this participation. Co-creation methodologies might be an effective instrument to bring different knowledge types together and generate constructive exchange. In a case study on technological support for informal caregivers working in healthcare, the authors use visual co-analysis based on affinity diagrams to create a research question together with academic researchers, caregivers, and human resource advisors. They discuss how the method can empower non-academic participants as well as academic researchers in decision making processes.

Addressing a similar gap in the impact evaluation literature in the context of innovation, Katrin Uude, Kerstin Kurzhals and Annika Wesbuer introduce their adaptation of the Payback Framework. In their theoretical paper, they adapt the framework by introducing the perspective of the Service-Dominant logic to allow for a more holistic approach to co-creation and the variety of actors and resources involved. While the article recognises there is no one-size-fits-all model, it emphasises how the inclusion of more dimensions leads to a better understanding of the various types of impact of participation in Citizen Science. The authors point out the need for broader testing of the applicability and usefulness of the approach they have developed. While the framework allows for citizen involvement in the project evaluation process, it does not currently include an assessment of the success of co-creative practices and evaluation factors such as trust and relationships.

In her praxis report, Annett Richter directs the attention to German national monitoring activities that engage volunteer actors to document biodiversity aspects for sustainable agriculture. The author proposes a set of indicators for Citizen Science-based biodiversity monitoring, which includes the evaluation of participation in relation to the scientific and wider project impact. Considering these indicators not only as infrastructures for quality assurance but also as tools for communication about the project and its results with the public as well as policymakers, they are designed to describe complex relationships in a simplified manner. While these indicators were created to evaluate participation in Citizen Science, their development also opened up potential for making the evaluation process itself more participatory. Richter calls for an integrated evaluation mix: including conventional evaluation from "outsiders" as well as participatory evaluation by "insiders". Such a mix would complement the generic demands from programme funders and academia with more insights on the motivations and benefits for research participants.

All papers in this special issue show how diverse approaches to participation in evaluation can be, how different the chosen dimensions and starting points can be, but also how complex the evaluative questions can become as a result. The last article in this issue focuses attention on the potential of collaborative documentation for evaluation. Julieta Arancio, Emilio Velis and Diego Torres report the development and implementation of a community-based data model for the documentation of a global innovation challenge and the further use of its results. In recent years, such challenges have become a new format of innovation for mission-oriented initiatives. The Global Surgical Training Challenge (GSTC) is a competition aiming to make simulation-based surgical training accessible worldwide through low-cost, open-source training modules. The authors use this challenge as a case study to investigate the opening of the innovation process, where all participants were instructed to make their solutions open source and fully reproducible by documenting them on a specific wiki platform. The data model for this platform – used to guide participants in open documentation of their projects – was evaluated

collectively for its capacity to enable reusability and open knowledge transfer. In their praxis report, the authors describe their approach to make it available for application in other evaluation procedures in open competitions or collaborative environments, but also discuss challenges regarding questions of motivation and ownership in implementation of such collaborative documentation efforts.

This assembly of articles – some more theoretical and others more practical in nature – is intended to encourage readers to explore participatory methods for the evaluation of Citizen Science, but also other fields of science, social science, and humanities, as well as Social Innovation. The intention is to overcome the blind spot of Citizen Science evaluation: project results and participation should still be evaluated, but the means and formats of this evaluation should be jointly created or at least negotiated with the participants. Central to any participatory evaluation is the initiation of an open, reflexive process for a systematic assessment of activities and results. While participatory evaluation is not applied to all aspects of a project, for reasons laid out above, it can still accompany an entire project course. In any participatory evaluation, it makes sense to focus on some central aspects or activities, or to work participatively with selected, representative actors. We acknowledge that the processes involved are costly in planning and organisation, often require specific training, may despite all benefits represent an additional burden to participants, or are difficult to reconcile with institutional procedures. Evaluation processes should therefore take into account not only expectations about outcomes and benefits, but also expectations about how knowledge is produced. Based on the experience of the assembled authors, we conclude that a mix of methods is likely to emerge, in which the participatory dimensions of evaluation qualitatively complement predetermined indicators and support an agile and adaptive project management. From the various frameworks and field reports, we see many commonalities in the challenges that these types of evaluation seek to address: the high degree of flexibility and the need to tailor evaluation methods; the overburdening of involved actors; the management of the many different interests and expectations; the problem of proving in advance the long-term sustainability of project goals or assessing social or institutional change. But we also see the benefits of treating societal promises according to the participatory credo in an increasingly accountable and auditable world. Citizen Science should always remain a safe experimental space that enables new forms of participation in knowledge production, that drives the transformation of science toward a more open, democratic knowledge culture, and that can create new formats of responsibility and trust for decision-making processes while facing its participants and its resources with the utmost respect. We hope you enjoy reading and welcome feedback and comments (coact@zsi.at).

REFERENCES

Kieslinger, B., Schaefer, T., Heigl, F., Dörler, D., Richter, A., & Bonn, A. (2018). Evaluating citizen science-towards an open framework. UCL Press.

Bonn, A., Brink, W., Hecker, S., Herrmann, T. M., Liedtke, C., Premke-Kraus, M., Voigt-Heucke, S., von Gönner, J., Altmann, C. S., Bauhus, W., Bengtsson, L., Büermann, A., Brandt, M., Bruckermann, T., Dietrich, P., Dörler, D., Eich-Brod, R., Eichinger, M., Ferschinger, L., … Woll, S. (2022). Weißbuch Citizen Science Strategie 2030 für Deutschland [Preprint]. SocArXiv. https://doi.org/10.31235/osf.io/ew4uk

Bonney, R., Ballard, H., Jordan, R., McCallie, E., Phillips, T., Shirk, J., & Wilderman, C. C. (2009). Public Participation in Scientific Research: Defining the Field and Assessing Its Potential for Informal Science Education. A CAISE Inquiry Group Report. In Online Submission. Center of Advancement of Informal Science Education (CAISE). https://eric.ed.gov/?id=ED519688

Bornmann, L. (2013). What is societal impact of research and how can it be assessed? A literature survey. Journal of the American Society for Information Science and Technology, 64(2), 217–233.

Bryson, J. M., Patton, M. Q., & Bowman, R. A. (2011). Working with evaluation stakeholders: A rationale, step-wise approach and toolkit. Evaluation and Program Planning, 34(1), 1–12.

Cousins, J. B., Donohue, J. J., & Bloom, G. A. (1996). Collaborative Evaluation in North America: Evaluators' Self-reported Opinions, Practices and Consequences1. Evaluation Practice, 17(3), 207–226. https://doi.org/10.1177/109821409601700302

Del Savio, L., Prainsack, B., & Buyx, A. (2016). Crowdsourcing the human gut: Is crowdsourcing also'citizen science'? Journal of Science Communication, 15(3), A03.

Dickel, S., Maasen, S., & Wenninger, A. (2020). Nachhaltige Transformation der Wissenschaft? Soziologie Und Nachhaltigkeit, 6(1), 1–20.

Felt, U., & Fochler, M. (2008). The bottom-up meanings of the concept of public participation in science and technology. Science and Public Policy, 35(7), 489–499. https://doi.org/10.3152/030234208X329086

Haklay, M. (2015). Citizen science and policy: A European perspective. Washington, DC: Woodrow Wilson International Center for Scholars, 4.

Heinisch, B. (2019). Vorherrschende Wissenschaftszweige auf deutsch- und englischsprachigen Citizen Science-Projektplattformen. Konferenzband Des ForumCitizenScience2019, S40-52.

Hemlin, S., & Rasmussen, S. B. (2006). The shift in academic quality control. Science, Technology, & Human Values, 31(2), 173–198.

Irwin, A. (1995). Citizen Science: A Study of People, Expertise and Sustainable Development. Psychology Press, UK.

Kieslinger, B., Schaefer, T., Heigl, F., Dörler, D., Richter, A., & Bonn, A. (2018). Evaluating citizen science—Towards an open framework. In S. Hekler, M. Haklay, A. Bowser, J. Vogel, & A. Bonn (Eds.), Citizen Science—Innovation in Open Science, Society and Policy (pp. 81–95). UCL Press. https://doi.org/10.14324/111.9781787352339

Maasen, S. (2020). Innovation und Relevanz: Forschung im Gerangel widerstreitender Anforderungen. Competing Knowledges–Wissen Im Widerstreit, 9, 123.

Mayer, K., Kieslinger, B., & Schaefer, T. (2018). Open and participatory citizen social science for evidence-based decision making. Austrian Citizen Science Conference, 4, 74–77. https://doi.org/10.5281/zenodo.1479273

Milat, A. J., Bauman, A. E., & Redman, S. (2015). A narrative review of research impact assessment models and methods. Health Research Policy and Systems, 13(1), 1–7.

Milley, P., Szijarto, B., Svensson, K., & Cousins, J. B. (2018). The evaluation of social innovation: A review and integration of the current empirical knowledge base. Evaluation, 24(2), 237–258. https://doi.org/10.1177/1356389018763242

Pelacho, M., Ruiz, G., Sanz, F., Tarancón, A., & Clemente-Gallardo, J. (2021). Analysis of the evolution and collaboration networks of citizen science scientific publications. Scientometrics, 126(1), 225–257.

Prainsack, B. (2014). Understanding Participation: The 'citizen science' of genetics. In P. B. & W.-F. G. and (Eds.), Genetics as Social Practice (p. S. S.). Ashgate. http://www.academia.edu/3552182/Understanding_Participation_The_citizen_science_of_genetics

Richards-Schuster, K., & Plachta Elliott, S. (2019). A practice matrix for involving young people in evaluation: Possibilities and considerations. American Journal of Evaluation, 40(4), 533–547.

Schaefer, T., Kieslinger, B., Brandt, M., & van den Bogaert, V. (2021). Evaluation in Citizen Science: The Art of Tracing a Moving Target. In K. Vohland, A. Land-Zandstra, L. Ceccaroni, R. Lemmens, J. Perelló, M. Ponti, R. Samson, & K. Wagenknecht (Eds.), The Science of Citizen Science (pp. 495–514). Springer International Publishing. https://doi.org/10.1007/978-3-030-58278-4_25

Shirk, J., Ballard, H., Wilderman, C., Phillips, T., Wiggins, A., Jordan, R., McCallie, E., Minarchek, M., Lewenstein, B., Krasny, M., & Bonney, R. (2012). Public Participation in Scientific Research: A Framework for Deliberate Design. Ecology and Society, 17(2). https://doi.org/10.5751/ES-04705-170229

Spaapen, J., & Van Drooge, L. (2011). Introducing 'productive interactions' in social impact assessment. Research Evaluation, 20(3), 211–218.

Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. Research Policy, 42(9), 1568–1580. https://doi.org/10.1016/j.respol.2013.05.008

Svensson, K., Szijarto, B., Milley, P., & Cousins, J. B. (2018). Evaluating Social Innovations: Implications for Evaluation Design. American Journal of Evaluation, 39(4), 459–477. https://doi.org/10.1177/1098214018763553

Unger, H. von. (2014). Partizipative Forschung: Einführung in die Forschungspraxis (Participatory research: Introduction to research practice) (2014th ed.). Springer VS.

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. Sustainability Science, 16(5), 1683–1699.

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