PROCEEDINGS OF SCIENCE

How to assess scientific excellence in Citizen Science? Co-creating a science award

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This report provides a summary of a workshop held at the Austrian Citizen Science Conference 2023 in Linz, Austria. After a short introduction of the challenges and incentives for developing a German research award for citizen science, the participants discussed the criteria that render citizen science research "excellent". Additionally, they identified the information required to assess its quality and its societal and scientific impact.

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1 Introduction

Citizen science aims at being acknowledged as a research approach like any other by developing and following principles of good research practice. Additionally, the field strives to ensure a benefit for all parties involved - participants, coordinators, and researchers - as is outlined for example in the 2015 ECSA principles **[1]**. However, the wider scientific community appears to have yet to recognize the validity and usefulness of this research approach, which is a crucial step towards achieving this goal. The 2020 German citizen science survey **[2]** found that 54% of 280 citizen science researchers agreed that their engagement in citizen science is insufficiently acknowledged by the scientific community. The lack of recognition of citizen science activities for scientific careers is also debated as a hindrance for researchers in policy publications **[3]** and may discourage early-career researchers from participating in this field. Subsequently, there has been a recent call for the creation of further incentives and recognition of researchers using citizen science as an approach in various academic fields. For instance, in Germany, Bonn et al. **[2]**demanded such initiatives.

One way to build credibility and gain the trust of the scientific community is to demonstrate how involving non-academics in the research process can nevertheless maintain or even increase the quality and impact of research. Awards are a potential mean of providing recognition and incentives for researchers to establish themselves in new fields of research or modes of knowledge production **[4,5]**. In response to the call in the German White Paper for Citizen science **[2]** from 2021, the German platform 'Bürger schaffen Wissen' is currently conceptualising a citizen science research award. This award aims to provide recognition for researchers who use citizen science as a research approach and could serve as an additional incentive for young scientists to plan citizen science projects. Moreover, this effort allows for reflection on the criteria by which quality and impact in citizen science are evaluated: The results from citizen science projects should be comparable both to other research modalities within a discipline and to citizen science projects across disciplines.

1.1 Modalities of the award "Wissen der Vielen - Forschungspreis für Citizen Science"

This prize is not the first to award citizen science efforts. For instance, in 2022, the European Citizen Science Prize was introduced as a component of the impetus project **[6]**. The focus of this prize is on rewarding citizen science projects, especially their civic engagement. The "Wissen der Vielen - Forschungspreis für Citizen Science" awarded by "Bürger schaffen Wissen" in contrast highlights both the research findings that have emerged through the involvement of citizens and the quality of the participatory research process. It underscores the importance of involving citizens in the research process in an effective and meaningful manner. The award's concept is distinctive in its focus on research output, research quality and impact.

By comparing the criteria and awarding processes of European, Austrian and Swiss models and prizes for excellent research, both in general and in the realm of citizen science **[2,6–12]**, we have established the following conditions for the "Wissen der Vielen - Forschungspreis für Citizen Science”:

- The process, the criteria, and the jury are presented transparently on the website www.wissendervielen.de.
- Our focus is on the scientific quality and impact, as well as the benefit of citizen science in research outputs.
- We entrust the selection of the winner to an interdisciplinary jury, who will evaluate the submissions and select the winner based on qualitative defined criteria.
- We use citizen science-specific criteria for excellence in participative processes.
- Our evaluation of quality and impact within each discipline is impartial and accessible to both STEM and humanities fields.
- We base our assessment on the broad concept of Citizen Science as stated in Bonn et al., (2021).
- Scientific prominence as represented by previous awards, rankings, impact factors and honors won by applicants or publications is not relevant to the jury’s decision.

1.2 What constitutes scientific excellence for citizen science?

By showcasing awardees as prime examples of scientific excellence achieved by involving citizens, we attempt to amplify the visibility and recognition of citizen science. To achieve this, we need to define what “excellence” means for the field of citizen science and, more explicitly, within the context of this particular citizen science prize.

Excellence is a term that is widely debated and somewhat vague in the context of research assessment. As noted by Jong et al. **[13]**, the term is versatile in its use and can refer to various aspects including prominence, impact, and higher quality in comparison to other research. It can apply to researchers individually, research outputs, institutions, and geographical regions or states.

To begin defining the criteria for this award, we wanted to know how the community reflects models of excellence in research. To gather the values relevant to the fellow researchers within the citizen science community, we opted to hold a workshop during the Austrian Citizen Science Conference. During this event, we presented and discussed dimensions and criteria for evaluating and assessing research quality in citizen science that would reflect excellence for the participants.

1.3 Participatory development of criteria for excellent citizen science at the Austrian Citizen Science Conference, 2023

After introducing the workshop attendees to the theoretical underpinnings and objectives of the awards programme, we sought their input on the criteria and information required to assessing research outcomes emanating from citizen science initiatives.

To this end, we utilised the 2021 Swiss National Science Foundation (SNSF) excellence model **[10]**. The model outlines dimensions of excellence based solely on scientific quality and impact rather than prominence in the science community. It defines an excellent research culture that leads to epistemic advances. This evaluation of science by the agency must serve the SNSF's overarching goal of promoting "research that advances knowledge for the benefit of all". The model comprises three dimensions and 12 adjective criteria. We have selected the three dimensions of "question", "methods," and "behaviour" as a foundation to explore the criteria that would be specifically relevant to citizen science.

To make the exercises more interactive, we decided to simulate a jury scenario: The participants received sample nomination materials from fictious applicants of the new award. For this purpose, we selected four examples of citizen science publications **[14–17]** from different research fields to reflect on the issue of interdisciplinarity in the assessment exercise. We proceeded to produce simulated 'nomination letters' using Chat GPT **[18]**, and provided the workshop participants with both, the metadata and a printed version of the publication in question.

Approximately 40 participants attended the workshop and sat down at four unmoderated group tables. The large number of participants led us to opt for a focused discussion on the three dimensions of the SNSF model: each group evaluated either the questions, methods or behaviour, and additionally looked for relevant information not present in the nomination. We additionally requested any relevant literature pertinent to the formation of criteria for exceptional citizen science. Subsequently, each group reported their findings back to the plenum, and we collected all the ideas and discussions on a shared board.

2 Results and Discussion

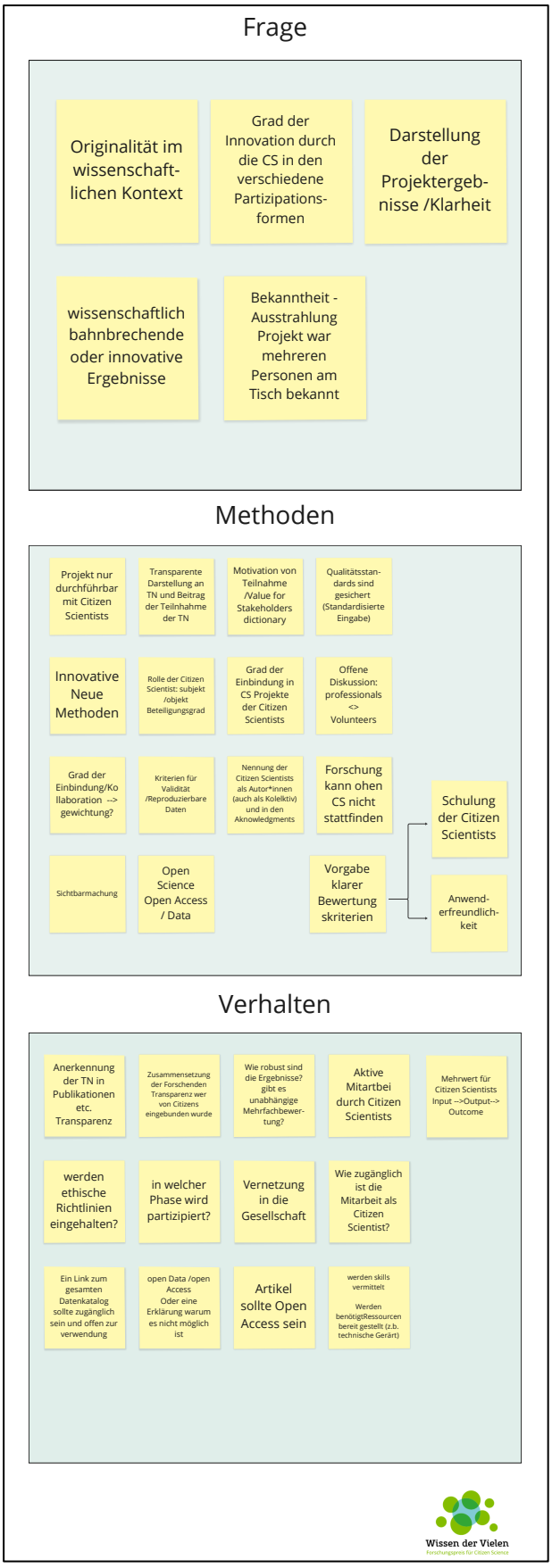

Fig 1: Collected criteria and comments (in German) from participants during the workshop at ÖCSK 23 on criteria that can be used to assess research excellence of citizen science. These criteria were used for the development of the award criteria of the "Wissen der Vielen – Forschungspreis für Citizen Science". The first call for nominations opened in July 2023 with winners announced in November of the same year.

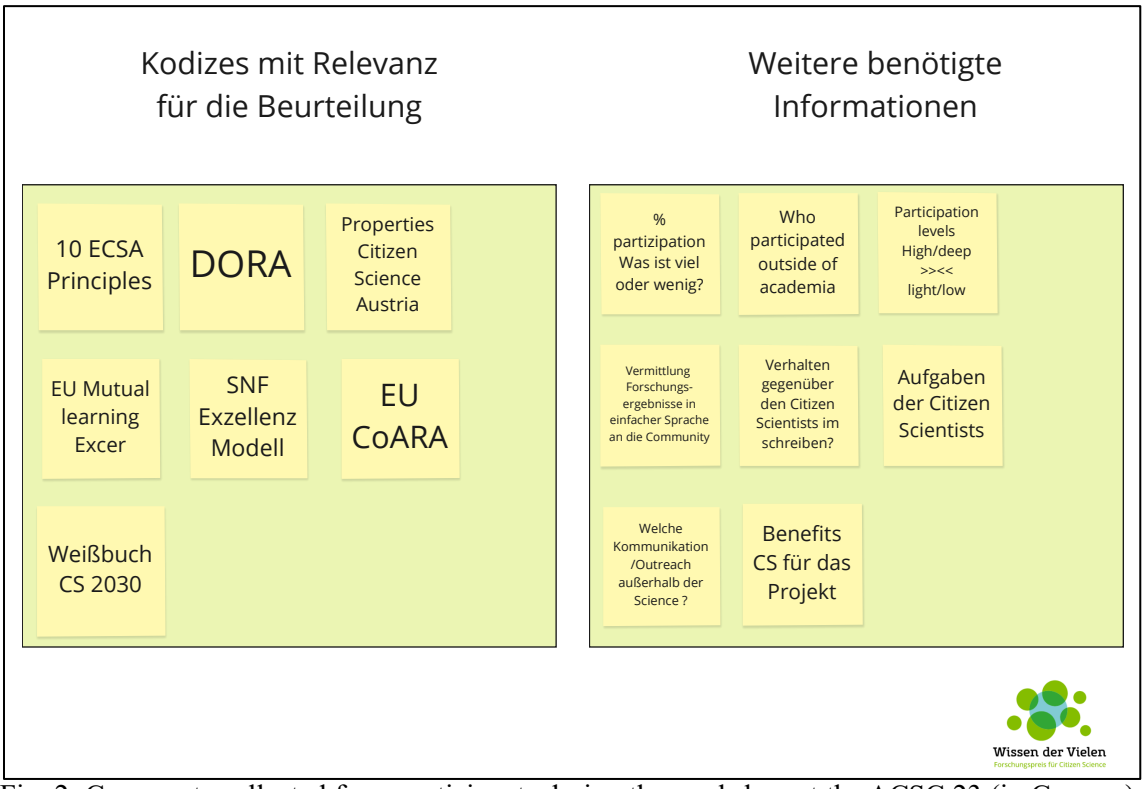

Fig. 2: Comments collected from participants during the workshop at the ACSC 23 (in German) on additional information needed for the application process and on codes and principles relevant for the development of excellence criteria.

We found that the framework provided by the SNSF served as a useful starting point for discussing citizen science assessment (Fig 1 and 2). However, the participants appeared more apt to assess the quality of methods and behaviour—especially in terms of citizen engagement – than the overall scientific quality. We attributed this observation to the disciplinary focus of scientific quality in the "question" dimension. For instance, it would not be expected from a historian to evaluate the scientific significance of a quantum physics research question. To address this in the award process, the use of external reviewers was suggested. This is common practice in funding processes.

Another concern of the participants was the importance of societal impact within the context of the award. For citizen science, it is an essential aspect of both scientist and participant motivation, and therefore is an essential aspect of excellence. However, accurately measuring societal impact can be challenging and evidence suggests that it only becomes apparent after a prolonged period of time **[19]**. The participants therein suggested taking into account the prospect of future societal impact in the assessment of the applicants for the award.

Several participants expressed concerns regarding the significance of the level of involvement in the excellence concept created for the prize. They argued that the quality of engagement is closely tied to the citizen science quality and, therefore, should be included in the evaluation. The participants observed that the data available in publications is frequently insufficient for the assessment of the participation procedure, and the selected researchers should hence provide additional information on the process to allow judging it correctly. Moreover, the participants discussed that achieving "excellent" citizen science requires the degree of participation to correspond with the research questions asked. Overall, the adequate choice of methods emerged as an important criterion for quality: it is as crucial in attaining good participation as it is in addressing a scientific inquiry.

3 General Discussion

A simple checklist cannot adequately evaluate the quality and impact of citizen science. In order for citizen science to be deemed exceptional, the assessment by the jury must consider a range of factors. The objective of this workshop was to establish the dimensions and criteria that can be used as a basis for a jury, funding agency or peer reviewer to identify particularly relevant and exceptional research that apply citizen science as a research methodology. It is just the start of our attempt to put forth such dimensions and criteria.

The inputs provided by the workshop's participants proved a beneficial foundation for elaborating on the criteria, call and awarding process further with the jury. Notably, we implemented a review requirement for the scientific output that is nominated. Moreover, we have decided to solicit detailed information on the participatory process from the nominees, in addition to the scientific output, due to its significance highlighted in the workshop.

The call for nominations, awarding process, criteria, and the jury are now presented on the website www.wissendervielen.de. The criteria and awarding process are subject to change and will be further refined in consultation with the jury for the next round in 2024. A comprehensive report on the framework for excellence is planned for publication following the second award round.

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