

## The booklet “Citizen Science - Research with Schools” – Does it withstand the critical eyes of the citizen science community?

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### Abstract

Citizen science leads the way for promising and innovative forms of cooperation between science and education. In our conference workshop we aimed at performing a reality check on the booklet ‘Citizen Science – Research with Schools’ by focussing on three main topics: implementation, added value, and long-term integration. The results of three roundtables confirm the potential for a steady growth of the topic, far beyond national borders.

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## 1. Introduction

There is a steady increase in evidence on citizen science being a promising and powerful supplement with respect to both formal and informal education [1]. The added value generated by the cooperation between science and education is manifold and ranges from improved learning outcomes [2] to increased learning motivation [3-5].

At the Austrian Citizen Science Conference 2019 [6], members of the ‘Citizen Science Network Austria’ [7], founded the working group ‘Citizen Science at/with schools’ under the lead of the OeAD Center for Citizen Science [8] with the goal of pooling actors from educational and scientific institutions experienced in implementing citizen science projects with schools. The shared goal set up by the approximately 25 participants was the compilation of a practical guide, i.e., a booklet, highlighting lessons learned from two decades of citizen science with schools and suggesting recommendations and perspectives for future endeavours. The 70-pages long booklet ‘Citizen Science – Research with Schools’ focuses on citizen science initiatives in Austria and is available (in German) on Zenodo since September 2021 [9].

The booklet was written by 16 school teachers, researchers, and further experts and was aimed at different professional groups. Despite the diverse experiences and backgrounds, it is a fact that a limited number of people was involved in the general set up and writing. Therefore, the objective of the working group was to perform a "reality check" at the 7<sup>th</sup> Austrian Citizen Science Conference 2022 [10], as the matter fitted the main topic of the conference in Dornbirn: “Citizen Science – why (actually) not?”. In a workshop, we mainly aimed at clarifying whether the contents also withstand the critical eyes of the citizen science community joining the conference. For reasons related to time and logistics, we decided to focus on three main aspects of citizen science with schools, which were important chapters in the booklet: (i) implementation; (ii) added value; (iii) long-term integration. These aspects were considered the most relevant for a long-term and sustainable approach to the topic of citizen science and education [11]. We expected participants with different backgrounds to join our workshop contributing critical and constructive feedback.

## 2. Methods

The 17 participants of the workshop came from research institutions located in Austria, Germany, and Switzerland; they were mostly people interested in or already experienced with citizen science projects. Each of the three chosen topics was assigned to a discussion table, which was chaired by a member of the working group: Roundtable A “implementation” was chaired by DF; roundtable B “added value” was chaired by FW; roundtable C “integration” was chaired by MC. The participants were invited to join each roundtable for a period of 20 minutes. Details about the methodological approach adopted for the discussion at each roundtable are described in Table 1.

For formal reasons related to this publication, only the most gainful results are presented hereafter.

**Table 1:**

<b>Roundtable and subject</b>	<b>Contents // Approach</b>
A – implementation	<p>The following four questions were available on cards for (i) reflection and (ii) discussion:</p> <p>(1) <i>who</i> should consent <i>when</i> to the project?;</p> <p>(2) <i>how</i> and <i>when</i> should the roles in the project be defined?;</p> <p>(3) didactic concept: <i>who</i> is involved and <i>when</i>?;</p> <p>(4) <i>how</i> does internal and external communication look like?</p>
B – added value	<p>The following tasks were proposed:</p> <p>(1) cluster the added values in a matrix similar to the ones used in the booklet, i.e., including the following sections: <i>creating knowledge, connecting people, communicating knowledge, and learning/researching</i>;</p> <p>(2) classify each of the added values from three different perspectives: pupils, researcher, and teacher. The participants were asked to rank the added value for each perspective.</p> <p>Finally, the added value rankings and clustering were discussed in sub-groups.</p>
C – long-term integration	<p>Two tasks were given:</p> <p>(1) following the question “<i>What matters most for the long-term inclusion of citizen science?</i>” each participant could assign a total of three points to the aspects taken from the booklet;</p> <p>(2) based on the question “<i>What is missing?</i>” participants were asked to add new aspects.</p>

### 3. Results

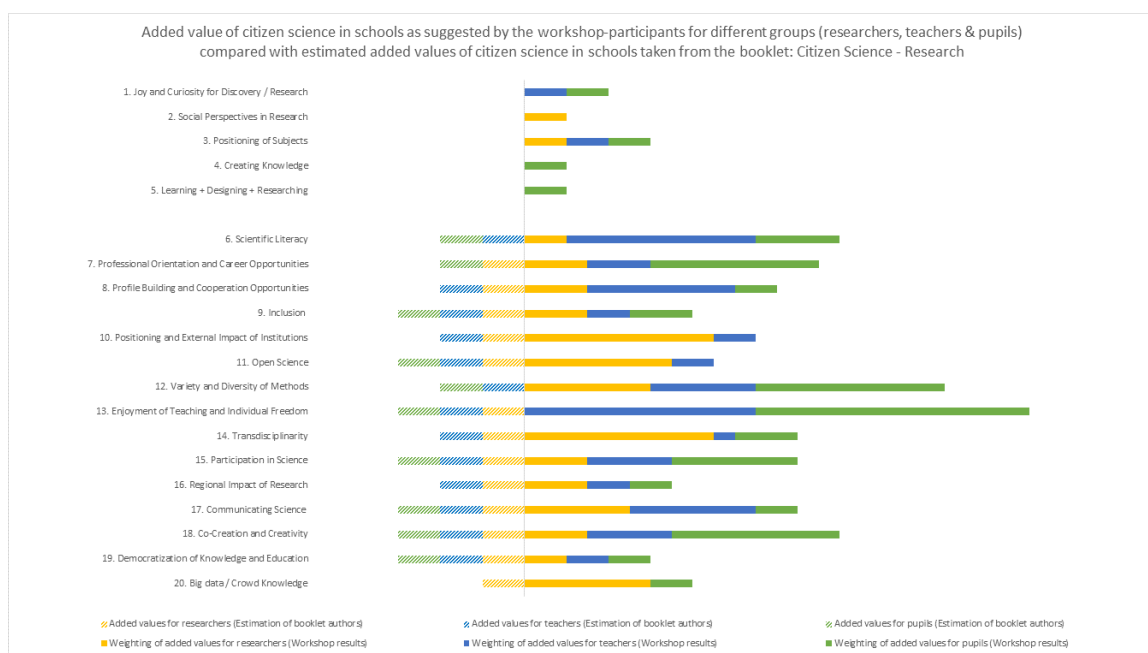
Essentially, the results of the different activities of the three roundtables can be summarized as follows:

**Roundtable A – implementation:** In the discussion the challenges of interdisciplinarity were the most interesting for the participants. Hence, the need for a clear and inclusive communication within the project team was reiterated. Also, the potential of involving experts of communication at some relevant steps of the project (e.g., at the beginning when compiling the working plan) was specifically addressed by some of the participants.

**Roundtable B – added value:** From the point of view of pupils, the four most emphasized points were creativity, variety of methods, enjoyment of the lessons, and career orientation. For the teachers, individual freedom, scientific literacy, and the implementation of scientific content into the classroom emerged as the most important added values. For the researchers, it was the

opportunity for transdisciplinary work with heterogeneous teams, the opening of science, and the associated positioning of the institutions in society (Figure 1).

**Roundtable C – long term integration:** All aspects listed in the booklet were considered as relevant, but some more than others. Participants agreed that on part of the scientific system it is essential to better integrate citizen science in traditional research projects, while in the educational system citizen science should be considered more in the strategic orientation of schools in order to create better opportunities for such cooperation. To achieve this, communicating the added value of citizen science to all persons and stakeholders involved was seen as crucial. Aspects that were added to the existing list were e.g., “capacity building for teachers, researchers etc.”, “networking opportunities for actors”, “measuring the added value”, and “communicating teachers’ needs and wishes to researchers”.



**Figure 1:** Results of the activities and discussions on the added value (roundtable 2). Added values 1–5 were added by workshop participants, added values 6–20 taken from the booklet were weighted and clustered by workshop participants and then compared to the added value estimations by booklet authors.

#### 4. Discussion

During the last two decades, profound know-how on citizen science with schools was generated in Austria. In fact, funding opportunities for the cooperation between science and schools enabled the implementation of around 300 projects from all scientific disciplines over the last 15 years [12]. The combined experience of teachers and scientists made the booklet possible. The “reality check” supported the validity of the booklet’s core statements. An effort was made in order to represent the main stakeholders involved in a project (i.e. researchers, pupils, school teachers). The results of the activities and discussions performed at the three different roundtables confirmed furthermore the complexity of implementing scientific projects with schools. There is no identifiable single added value of citizen science projects in schools but the benefit lies in an

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individual mixture depending on the project and participants with different weightings. However, it can already be seen that intensive scientific work in particular has a positive effect on the career choice of pupils and it is also an enrichment for schools and research institutions [13]. Such values are often talked about based on personal experiences but are rarely investigated in citizen science projects. This seems to be a gap in evaluation due to lack of time, financial resources, expertise and awareness but seems promising for future research projects [13-15]. A better understanding of the added value will contribute to embedding citizen science deeper within the scientific and educational systems. Though the booklet seems to cover many essential aspects of long-term embedment of citizen science, our workshop highlighted the great interest for further discussion and development of the topic. For example, the factors of networking and capacity building were added in multiple ways: (i) bringing together practitioners from schools and research institutions (on- and offline), so that new cooperations might arise, (ii) gathering more and less experienced persons to share knowledge, and (iii) organising professional citizen science trainings for researchers and teachers alike.

On the one hand, Austrian citizen science initiatives and working groups pursue the important goal of reaching out to as many schools and interested parties as possible (co-operators from industry and society) in order to conduct innovative research. On the other hand, sharing their own experiences beyond the national borders will contribute to the growing multidisciplinary network interested in the growth of the collaboration between science and education. Recommendations for future booklet editions are 1) to include pupils who participated in citizen science projects to gain further knowledge about the added values for that specific group and 2) to consider newly added aspects of long-term citizen science integration.

Last, but not least, the degree of a successful and sustainable establishment of citizen science with schools depends not only on the resources provided by future citizen science funding, but also on the commitment and motivation of all involved parties as well as constant communication between them.

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