INTEGRATING OPEN AND CITIZEN SCIENCE INTO
ACTIVE LEARNING APPROACHES IN HIGHER EDUCATION

Co-Creating a Shared Vision for Citizen Science

in Higher Education: Pitfalls and Recommendations

Report on two Vision-Building Workshops

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Abstract:

This document corresponds to activities under O6A1 of Intellectual Output 6 (Engage, Raise awareness and Foster policy change), aiming to trigger policy change by raising awareness on societal impact from Open Science and Citizen Science inside and outside Higher Education Institutions. This document is the public report depicting the methodology, content and outcomes from two vision-building workshops:

"Open and Citizen Science in Higher Education: Co-Creating a Shared Vision" and "Shakers & Makers: key stakeholders in Open Science & Citizen Science".

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Table of Contents

6

List Of Figures

List of Abbreviations

The following table presents the acronyms used in the deliverable in alphabetical order.

Abbreviations	Description
OS	Open Science
CS	Citizen Science
HEI	Higher Education Institution
OI	Open Innovation

Executive Summary

Engagement, raising awareness and fostering policy change are necessary for the deployment of OS and CS activities, but also for their integration in HEI active learning approaches. CS, being a somewhat new concept under the OS spectrum, is becoming more and more popular for the democratization, accessibility and validation of scientific research. INOS, focussing on OS and CS in HEI places HEI staff and students at the core of its activities, as main stakeholders. However, for OS and CS activities to be successful and seminal, engaging a wide spectrum of actors is imperative.

The two INOS vision-building workshops of O6A1 served this exact goal. During the first workshop, the core stakeholders (HEI staff and students) were brought together, to discuss their experience with OS and CS in their universities and university libraries, the main stakeholders for the deployment of such activities from their point of view, their working routines (established and recommended), knowledge and skills gaps that that prevent them from further advancing OS and CS in HEI, as well as best practices. The second workshop built upon the conclusions of the first one. A wider spectrum of stakeholders was approached, including HEI management staff, policy makers, funding bodies and members of networks/ consortia of European and international reach on OS, the HEI sector and business. This second workshop aimed to collect the participants point of view related to the advantages of CS for the future of education and research, their interaction with HEIs in CS activities and the role of CS in existing HEI curricula across Europe. Barriers in the implementation of CS when it comes to collaboration with HEIs were uncovered, best practices were promoted and discussed and action points were proposed. In both workshops, inspiring presentations focussing on collaborative and participatory methods from different points of view took place, thus triggering discussion during the Group Mapping Exercises. Diversity in terms of disciplinary approach, age and geographic groups were apparent.

This report depicts the main goals tackled, the methodology followed, as well as the main outcomes, recommendations and best practices as derived by the discussion. All participants who provided input and expressed an interest to be involved in the writing of this report, are listed as contributors, an indication of direct engagement and ownership of results. It will serve as the basis for further activities related to engagement, raising awareness and fostering policy change throughout the INOS project, building upon the project's previous Intellectual Outputs.

1 Introduction

1.1. Scope

This document's goal is to present the outcomes of the two vision-building workshops "**Open and Citizen Science in Higher Education: Co-Creating a Shared Vision**" and "**Shakers & Makers: key stakeholders in Open Science & Citizen Science**". The structure of the document focuses on each workshop and depicts the methodology followed for its design, its aims and the outcomes from the Group Mapping Exercises. For each one of the workshops, a set of thematics for discussion were provided to guide the stakeholders in providing their point of view, also taking into account their background, level of affinity with OS and CS, position and organisation, as well as other statistical aspects (eg geographical aspects, discipline, and age group in some cases). The document closes with overall conclusions and recommendations.

1.2. Audience

The two workshops targeted different types of audiences. The first workshop "**Open and Citizen Science in Higher Education: Co-Creating a Shared Vision**" focussed on engaging HEI academic and library staff, and students, aiming to collect the HEI point of view on the forms and conditions of HEI participatory landscape regarding OS and CS, the working routines, training needs, and identify potential best practices. University and library staff, and students on behalf of the project partners were individually invited, while an open registration procedure was also followed. The second workshop "**Shakers & Makers: key stakeholders in Open Science & Citizen Science**" targeted a wider audience, that was approached using both an open registration procedure and individual invitations: HEI management staff, policy makers, funding bodies and members of networks/ consortia of European and international reach on OS, the HEI sector and business. Aim of this second workshop was to bring together a wide spectrum of stakeholders that either already are or can collaborate for the deployment of OS and CS activities in HEI. The report on the two vision-building workshops is relevant for all stakeholders represented in the said events. Most of all, it is relevant for HEI staff and students that want to explore interconnections and grounds of collaboration in fostering OS and CS using participatory methods.

2. First Vision-Building workshop: "Open and Citizen Science in Higher Education: Co-Creating a Shared Vision"

2. 1 Aims of the workshop

The first of the two-series workshops "**Open and Citizen Science in Higher Education: Co-Creating a Shared Vision**" was designed to inspire participants to think systematically about open and citizen science practices in their respective institutions and discuss how these practices could be implemented in other universities/libraries. The workshop aimed at gathering best practices from diverse practitioners: from university to library staff. While several students who originally signed up for the workshop could not attend, some expressed interest in contributing after the event. There were 37 participants, who took part in the workshop.
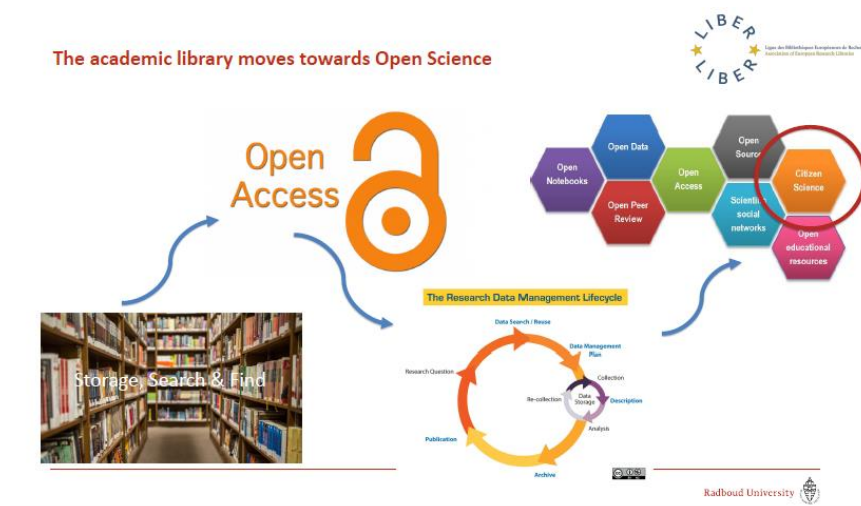

Figure 1 - The academic library moves towards Open Science.

2. 2 Structure of the workshop

The workshop was structured to allow maximum time for discussion within small groups and overall discussion afterwards. After a short introduction, Dirk van Gorp, Open Science Manager at Radboud University, Nijmegen,

The Netherlands, and a member of LIBER's Citizen Science Working Group spoke about the relationship between Open and Citizen Science, library and university support that is needed and provided in Nijmegen to staff focusing on open science, and the BESPOC (Broad Engagement in Science - Point of Contact) model from the point of view of the university implementation. After the introduction, participants were split into 6 working groups where they discussed predefined questions on the existing structure to support open and citizen science within their universities/libraries. The questions discussed included, but are not limited to the following:

- What has your experience with OS and CS in your university/library been?
- Who are the main stakeholders when it comes to Open Science and Citizen Science implementation at universities/libraries?
- What working routines, if any, have you established that work best and you could recommend to others?
- What knowledge and skills gaps do you have that prevent you from further (or at all) advancing OS and CS in your university/library?
- Formulate a best practice/conclusion on behalf of your group.

The workshop concluded with a wrap up, during which each group presented the outcomes of their discussions, which will serve as the basis for the outcome document from both workshops of this series.

Figure 2 - Deliverables: content templates & courses.

2.3 Current state of affairs

Currently, the situation with Citizen Science (CS) implementation, it's advancement within Higher Education Institutions (HEI) and the structure and administration of CS projects across Europe differs. The predominant logic is that where CS is not part of the overall university/library strategy, it is hard to initiate and implement CS projects. In most cases libraries play a support role for all Open Science (OS) and CS projects (where such exist), through coordinating them, connecting stakeholders to each other, translating complex ideas into the language each stakeholder understands, and providing advocacy support and training for all involved. In many European countries Ministries of Education play a major role in advancing the OS agenda, but it is majorly the universities and libraries that drive the advancement of CS through projects and advocacy. Examples of how libraries and universities accomplish this goal are the following:

- **Central office for all Open Access, Research Data management and CS topics.** Such offices can be created within HEI. The office collects and openly shares the information on all three topics on a specialized website, as well as provides free online courses.

- **EU-funded and HEI-funded CS projects.** Initiation and participation in such projects promoted CS further. Example of project include:
  - Time4CS (https://twitter.com/time4cs) – aimed at developing a framework for best practices of CS across European universities;
  - Wikipedia Educathon to open up science on Wikipedia;
  - Openstreetmap;
  - HEI projects aimed at working with primary and high schools to educate children about CS through projects like bird-watching and flower observations;
  - Climackathon;
  - Projects establishing a platform for engaging with citizens in the forms of questionnaire;
  - Project-based collaboration on open science in robotics in education, helping educational technology start-ups.

- **Specialized courses within the curriculum, free training.** Inclusion of such courses into HEI curriculum increases the overall interest in CS, and knowledge to initiate a CS project. Free training contributed to the same objectives.

- **Citizen Scientists.** Invitation of them to discuss their involvement, projects, potential, etc. increases motivation to participate and initiate new projects.
- **Libraries providing support**, including open archives, initiation of emerging initiatives, research data curation and creation of RDM guidelines advances CS through eliminating bureaucratic barriers and administrative burdens.
- **Specially designed pedagogical methods.** Their utilisation enhances students' engagement, determination, mindset, design thinking, encouraging collaboration between peers from the same thematic topics, and engagement with other stakeholders.

While the structures of CS support teams are different across the continent, participants often mentioned cross-cultural teams and multidisciplinarity as common challenges in advancing CS. While there are clear benefits to the diversity of participants, bridging the gap between their knowledge, jargon and the general language they speak is not an easy task. The insecurity about engaging citizens is prevailing and hinders the advancement of OS and CS.

2.4 Stakeholders

By nature, CS projects involve a multitude of stakeholders from across different sectors. The most common ones identified by the participants were the following:

- IT departments
- Different faculties within HEI (researchers, students, alumni)
- Libraries and library staff (often specifically dedicated OS officers)
- Policy-makers in the HEI
- High School students
- High School teachers
- Individual project leaders
- Ministry of Education
- Funders
- Non-governmental organizations

2.5 Best practices and recommendations

Any recommendations on advancing CS and its integration into HEI curriculum need to be based on best practices and trial and error approach, as CS projects across Europe differ in so many ways, and, given the nature of the projects and their participants, there is no 'one size fits all' solution. The following were identified as working techniques and recommendations to integrate CS:

- **Advocate** at the HE and Ministerial level. While the bottom up approach is most effective in formulating and implementing CS projects, without approval and push from up top very little can be achieved. The necessity to engage policy-makers has also been made evident by the inability of researchers to make time for CS projects unless supported from the top.

- Engage a **multitude of stakeholders** and create external motivation for them, from University policy-makers to students. Involvement of PhD students is a crucial aspect to bring in new fresh ideas without institutional bias. Diversity, particularly in age and background, is crucial for the successful implementation of CS projects.

- Use the **right methodology and tools**. Often tools and the way of engaging stakeholders can make or break the projects. Choosing the right approach is therefore vital for success.

- Establish **co-responsibility** for the project through ensuring that all project/activity members are well-aware of the goals of the project. Along with co-responsibility, identifying and sharing clear rules for interaction is important.

- **Division of responsibility** for particular tasks based on background and skills is also vital to ensure nothing falls through the cracks and all tasks are completed.

- Make clear/establish **benefits for all stakeholders** at the beginning of the process, as it is necessary to ensure participation. Gaining new skills through participation can often serve as motivation.

- Select "bridges" – **people who would serve to connect between all the stakeholders** engaged in the CS project regardless of their background. Explaining to all involved that scientific background is not a prerequisite for participation would fall under the responsibilities of such bridges.

- Provide **training** for all involved; Include CS training sessions for early career researchers to motivate them to participate and initiate their own CS projects (eg Open Science course in findocnet.fi).

- Engage **citizens from the beginning** of the process by asking them for ideas of **challenges to address** to ensure the ideas come from "the bottom" and address a societal need.

- Provide special focus to establishing the **legitimacy of knowledge** that is built with citizens' engagement. There is a pre-existing set of standards according to which science is to be performed. Involving citizens may be seen by many as non-scientific, which is something that needs to be addressed at the beginning of the process.
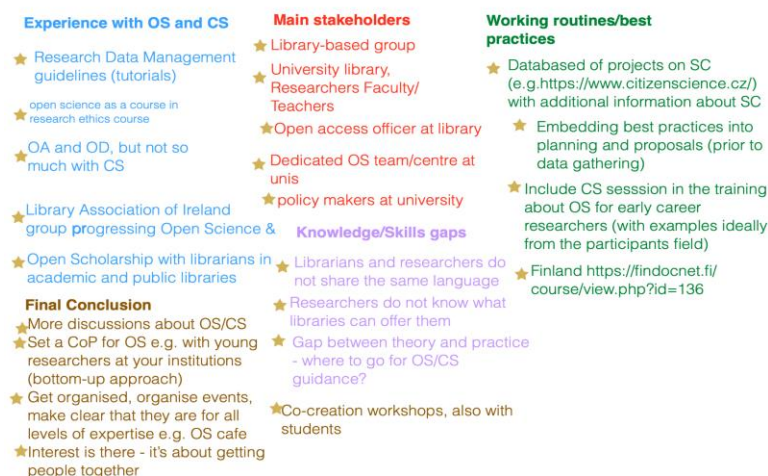

Figure 3: Example of group discussion notes, 1st workshop.

- Create **databases** of CS projects (eg in Czech Republic). These may inspire others to replicate, initiate new or join the existing projects, as well as create a wealth of knowledge created by such collaborations.

- Embed **best practices into planning** and proposals prior to gathering data. This would help to ease the project implementation in the future without reinventing the wheel.

- Have a project **coordinator as a specialist** who can engage and motivate everyone else involved (often a library specialist). Such people are vital to the success of the project and motivation of its participants.

- Create a clear **OS and CS advancement strategy at an institutional level**, as well as a definition of CS. The strategy would help motivate university and library staff and help with finding the time to get involved, while a definition of CS would support identifying existing CS projects.

- Provide hands-on experience through a **learning-by-doing** approach.

- **Limit the involvement of outside organizers** for CS events like Hackathons, as they take on the task without the transparency and inclusion, which are key to CS activities.
- Utilise **CS as a method** rather than a goal in itself.

3. Second Vision-Building Workshop: "Shakers & Makers: key stakeholders in Open Science & Citizen Science"

3.1 Aims of the workshop

The second of the two-series workshops "**Shakers & Makers: key stakeholders in Open Science & Citizen Science**" was based on the knowledge and skills gaps that were identified during the first Vision Building workshop. It was designed to identify grounds of collaboration in a wide spectrum of stakeholders, to support and foster the deployment of Citizen Science within Higher Education Institutions. The expected participants represent different sectors that support, influence, and collaborate with universities in Citizen Science activities and endorse public participation in scientific research. There were 47 participants who took part in the workshop. However, a significant number left before or during the breakout sessions.

3.2. Structure of the workshop

The workshop was structured in two parts: 1) the first part involved Tiberius Ignat (Director of Scientific Knowledge Services) who gave a short presentation entitled on the BESPOC model as means for collaboration between different stakeholders for Citizen Science. He presented a prototype built to address the recommendations of the LERU 20th Advice paper on Citizen Science (CS) and Universities. 2) The second part allowed time for discussions to occur within small groups. Participants were split into 3 working groups where they discussed predefined questions on the existing structure to support open and CS within their professional institutions. The workshop concluded with a recapitulation, during which each group presented the outcomes of their discussions which serve as the basis for the outcome of the document from both workshops of this series.

The questions discussed included, but were not limited to the following:

- What are the advantages of Citizen Science for the future of Education and Research?
- How does your organisation currently interact with HEI in Citizen Science activities?
- What is the role of Citizen Science in existing HEI curricula in your country?
- What are the barriers to the implementation of Citizen Science activities in HEI?
- Are there any best practices you know of, that you would like to share?
- What are the actions we should propose for cultural change?
- Formulate a best practice/conclusion on behalf of your group

3.3 Current state of affairs

The discussions were an opportunity for participants to explore and address the advantages, barriers and best practices of CS projects and activities, which eventually led to a variety of suggestions and concrete actions to move forward. The democratisation of knowledge is one aspect that stands out of these discussions, whether it comes from the researchers or from the citizens. Involving citizens and making the link between science and society can increase the uptake of research outputs, as one participant mentioned. Overall, CS can serve the ultimate purpose of science whose fundamental aim is to serve society. The outcomes of the discussion below provide material to bring CS to the forefront as an essential game-changer to reach this goal.

3.4 Advantages of CS for Education & Research

CS for education and research holds a variety of advantages, as it has been emphasised by the participants. What stands out from the discussions is to what extent CS is a democratic process that enhances the valorisation of knowledge coming both from researchers and citizens. By connecting HEI with citizens, CS projects help to bridge a gap between education and communities. CS also provides formal and informal learning approaches and contributes to public engagement. A selection of outcomes listed here below illustrates the variety of CS positive outcomes:

- Contributes to bridge gaps and prevents silo-mentality between education and research;
- Facilitates the connection between the industry sector and business;

- Involves the collaboration from different sectors and regions in the society;
- Provides a bottom-up element in the production and use of research outputs and education or skills and training;
- Considers research as one specific component of civic activity by producing knowledge and sharing it;
- Acts on the sustainability of knowledge.

3.5 Barriers to implementation of CS in HEI

The implementation of CS in High Education Institutions (HEIs) still has many barriers to overcome. Several ones have been identified by the participants, which seem to fall in two main categories: 1) The lack of awareness (and understanding) of politicians, but also of researchers on what CS is and why it is important; 2) The lack of time let to researchers to dedicate efforts to CS projects; 3) The lack of funding. Both are intrinsically connected since funding opportunities for CS projects can only occur if there is an acknowledged awareness of CS contribution (to the research, to the society, etc.). But some other barriers were also identified by some participants which are listed here below:

- Risk of losing the skills and knowledge gained during CS projects;
- Lack of consideration of CS within HEI;
- No employees dedicated to CS in HEI;
- Absence of a standard approach that could be applied (and adapted) by universities;
- No institutionalisation of CS activities;
- Lack of tools and strategies for CS activities.

One participant emphasised that the lack of consideration above mentioned might be due to insufficient awareness of best practices for quality management in CS projects.

3.6 Role of CS in HEI in different countries

There are several CS projects, initiatives and activities that already exist in different countries. Their scope (funding, stakeholders involved, means) vary from one country to another, from one institution to another.

18

Some examples were mentioned by the participants, such as in France, where the Mosaic project was mentioned as a collaborative initiative between the National Museum of Natural History and Sorbonne University, which aimed at bridging research and cultural institutions for society. Other initiatives exist also in research libraries all over Europe, which target PhD students. But these initiatives are not applied consistently.

3.7 CS Best practices

The breakout sessions were an opportunity to discover some relevant best practices in CS. One aspect that was emphasised relates to the business models which are used (or misused) in CS projects. The necessity to adapt business models to the specific context within which CS projects occur seems to be important because it can influence the efficiency of the research itself (data collection, outputs, etc.). This aspect is also closely related to the funding provided. Some institutions suggest funding opportunities for PhD students who will be undertaking their research with (and for) the civil society. Indeed, to transform a CS project into a doctoral study is a way to implement CS initiatives in the curricula of universities (an aspect that will be emphasised further below). Education can be enriched as students can be involved with projects that are relevant to society and be part of the research process. Other best practices that were mentioned relate to the necessity to share the best practices of CS projects within the institutions, whether by training activities, or dissemination of the results.

Some other examples of CS positive outcomes are listed here below:

- Community building;
- Training (and learning) new skills;
- Inclusion of regional guidelines in the tasks of researchers.

3.8 Proposed actions for cultural change

Several ideas and concrete actions have been suggested by the participants to help overcome the barriers identified and mentioned earlier, and foster the deployment of CS implementation within the HEI.

The necessity to modernise the curricula of universities by including CS within their programmes, not only towards students but also for their researchers was one aspect that was underlined by some participants. Of

course, the BESPOC model for HEI to involve a different kind of stakeholders and bring forward the field (e.g. communities) certainly needs to be taken into consideration, particularly if the aim is to reach some kind of standardisation of CS implementation.
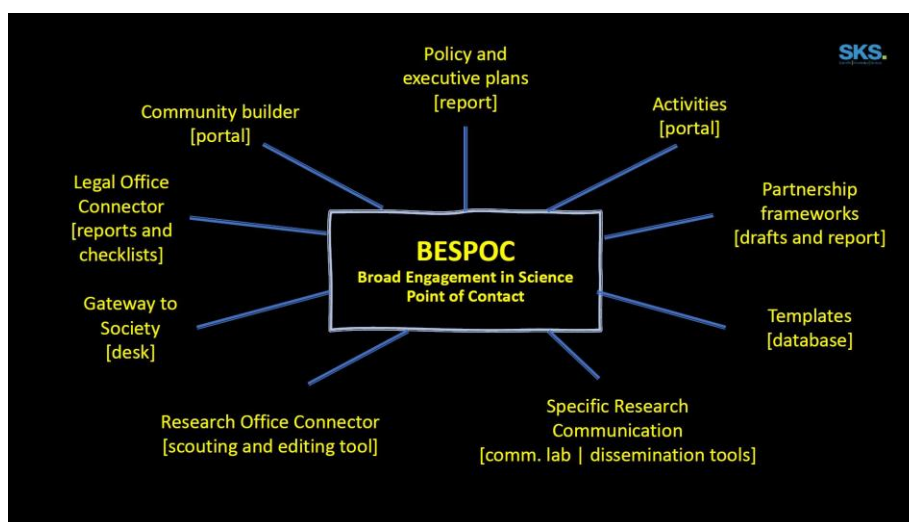

Figure 4 - The BESPOC model. (Ignat, T., 2021)

On another level, the demonstration of the value of CS itself was also mentioned as being a significant step to promote CS among the HEI. For instance, how CS can help citizens to understand the value of evidence in science and how it can counter the spread of misinformation (e.g. fake news) - an aspect that seems particularly accurate nowadays. Some other aspects were also suggested which are listed below:

- Distinct & common training for citizens and researchers;
- Make all efforts needed to engage and understand communities;
- Consider citizens as co-researchers (if properly trained)

A participant emphasised that training sessions for citizens should cover issues related to data management, data quality, GDPR, etc. Training sessions for researchers, should include modules on communication and project management.

4. Conclusion

The discussions in both vision-building workshops were an opportunity to emphasise the common agreement on the fact that a systemic change is needed if CS projects are to be integrated within the Higher Education sector. What stood out from the debates is that there is a need to raise the awareness of the various stakeholders, particularly the politicians, but also researchers and policymakers in HEIs. As brought up in the discussions, the approach should include a strategy from the top, for people to be supported with appreciation, tools, infrastructure, and legal support, but also from the bottom, with ideas generated from societal needs and by involving HEI students at the very first part of CS project and activity planning. CS implementation should be a matter of considering it as an opportunity for modernising the universities. Once the awareness will be spread, funding opportunities should follow. This should help to remove the silos that were mentioned earlier on and bring a significant cultural change.

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