

Citizen Science

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Short-term Benefits and Long-term Value

Citizen Science projects are perceived to have benefits both for research and for the participants who engage in the project. Citizen science is seen to benefit research projects and data collection by helping to accomplish tasks which otherwise might not be feasible. This can happen by:

- increasing the resources available for dealing with large-scale data¹
- making data collection more comprehensive
- reducing costs²
- serendipitous discovery from exposing data to large numbers of users.³

Citizen Science can also be considered a tool for public education about specific sciences and the scientific method, helping to promote scientific literacy, and it brings new voices to the research process.

Potential benefits for the participants in citizen science projects include:

- enjoyment, finding a social community⁴
- being able to participate in real science, contact with scientists, experiencing the process of science⁵
- acquiring confidence and skills, increased knowledge of specific topics.⁶

Additionally, benefits to society as a whole may result from closer connections between scientists and the public.

Introduction

Citizen Science is a term used for initiatives in which volunteers, including the general public and enthusiasts, engage in research-related tasks to collect information or participate in scientific research in other ways (e.g. observation, measurement or computation). As well as increasing the resources available to collect or analyse research data, citizen science makes a positive contribution to the public's engagement with science. Although the existence of projects that involve the public can be traced over several decades, there has been a recent explosion in the number and variety of citizen science projects that create and capture scientific information. Projects such as Wikipedia and GalaxyZoo have exploited the potential for engaging communities of volunteers through online methods with dramatic effect.

Perspectives on Citizen Science

'Crowdsourcing is a natural solution to many of the problems that scientists are dealing with that involve massive amounts of data'

- **Haym Hirsh**, director of the Division of Information and Intelligent Systems at the National Science Foundation (2010)

'It's not some fun game online while the scientists do the real work ... I hope visitors are learning that science is not just something done by people in lab coats in some underground bunkers. Science is something people can get involved in.'

- **Chris Lintott**, Galaxy Zoo (2010)

Both quoted in *The Chronicle of Higher Education*

'I am a biology teacher ... in the Netherlands and I admire Queen's guitarist and astrophysicist Dr Brian May. He mentioned on his website ... that people were sought to help a group of scientists classify galaxies ... The task was to look at beautiful images of galaxies taken by the Sloan Digital Sky Survey, and click the button that best described the form of the galaxy shown. Within a week, I got a picture on my screen that changed my life ... It's a lot of fun to see how all this works ... Reporters from all over the world are still interested and I'm also still giving lectures on my discovery ... I grew into being a science communicator ... Citizen Science Rocks'

- **Hanny van Arkel** (2011) writing in *Astronomy Now*

Roles and Responsibilities

Project management, participant engagement and data management must be addressed in the setting up and running of a citizen science project. Procedures are needed for establishing goals. They will normally be set by the team behind the initiative, although participants may be included at a later stage. Plans are required for recruitment and marketing, to establish how to identify and reach target communities.⁷

The project team must think about how and why people will be motivated to participate and collect data.⁸ Training for the participants may be needed, and retention is equally important. Tools and frameworks

may help to invite and encourage active participation. Data management activities include: determining how and what type of data is to be collected, techniques for data validation, data archiving, preservation and authentication, identifying appropriate methods for interacting with the data and defining how the collected data will be shared.

The RunCoCo project⁹ at the University of Oxford synthesised their advice into an ABC of sustainability: **A**im for two-way engagement (ensure contribution benefits the participants, contributors and the volunteers as well as the institution); **B**e part of your community (particularly through online presence) and **C**hallenge your assumptions (recognise the value that non-specialists bring and aim for equity of engagement, providing interest and motivation for people who might not normally use technology.)

Issues to be Considered

- **Strategic issues for institutions and the research community**
 - Understanding how research groups can best make use of citizen science, how it will benefit them and their stakeholders
 - Deciding which projects are best suited to citizen science
 - Developing resources for sharing experiences, and learning from each other to save on time, resource and expense.¹⁰
- **Motivating participants**

There is a lack of research on the motivation of volunteers particularly in projects which are conducted through on-line interaction.^{11 12} Motivation is described as being either intrinsic (e.g. improvement of skills) or extrinsic (e.g. fun and intellectual stimulation), and the motivation can be specific to the type of project.¹³ Other factors that influence contributions include social network effects and feedback to participants. It is suggested that more study is needed to learn who participates in citizen science and what motivates them. Taking an active part in your community, as suggested by RunCoCo, can help to understand what motivates your 'crowd'.
- **Data quality**

Weaknesses in citizen science can lead to poor data quality. Data quality can be affected by limited knowledge or training of contributors and their relative anonymity, non-standardised or poorly designed methods of data collection, or lack of commitment from volunteers.¹⁴ Research is needed into what tasks and datasets are most appropriate and pilot studies are recommended. Data can be validated by comparison with valid data, using social networks¹⁵ and seeding data with good examples to raise standards.¹⁶ The needs of the users of the data must be considered.¹⁷

- **Engaging participants**
Galaxy Zoo provides an example of the successful use of mainstream media to attract volunteers; they also recommend the use of forums to help participants interact and support each other;¹⁸ PatientsLikeMe prioritises patient-patient interactions over expert-mediated forms of engagement.¹⁹
- **Competitive element**
Some projects employ a rating system to record contributions, which introduces competitive credit into the community, with a league of top participants. This may be seen to motivate volunteers. However others suggest that monitoring of low-rated contributions should only be used to direct additional training or support.²⁰
- **Effects on participants**
These should be monitored and studied to find out what participants have learned about the science content and the science process, and how attitudes have changed.

Finally, there are many other different ways in which the public can be involved in the research agenda, besides data collection or content creation. These include setting the research agenda, interpreting research and disseminating research findings.

Related Research

Runcoco <http://runcoco.oucs.ox.ac.uk/> was a JISC-funded project on how to run a community collection, where the general public or members of a particular community are invited to contribute to a project by uploading their own content or adding information to existing resources. The project provided training events, information, guidance, and software for others wishing to run their own Community Collection initiative. Although the project is no longer funded, the website provides useful information. Any further support would need to be provided by agreement.

The Research Communications Strategy Project on open research <http://rcsproject.wordpress.com/2011/05/03/open-science-and-citizen-science-investigating-the-strategic-issues/> has a final project report, briefing paper and video interviews from their project on current thinking and practice around open science and citizen science in the UK.

Galaxy Zoo <http://www.galaxyzoo.org/> is a mature open science example which has developed a community of amateur astronomers who collectively help to classify galaxies via customised user interfaces, successfully combining human observational and pattern recognition capacity with categorisation capability. The public work alongside disciplinary experts, in a truly global initiative, to collaboratively help map the universe.²¹

PatientsLikeMe <http://www.patientslikeme.com/> is a site where patients can anonymously share their personal treatments, symptoms, progression and outcome data. The site has 40,000 patients organised around disease communities, and seeks to answer the questions that patients have around best outcomes, with tools and features designed to answer those questions. The site collaborates with industry and researchers to carry out market research and promote clinical trials. Patients can also participate in experiments and are involved in collecting adverse effect data.

Transcribe Bentham <http://www.ucl.ac.uk/transcribe-bentham/> is a project based at University College London that involves the public in online transcription of manuscripts by Jeremy Bentham ('1748-1832'), founder of utilitarianism. The aim is to turn them into a digital collection that is more widely accessible. The transcription desk running on mediawiki is at the heart of the operation. Interaction with other participants happens through a social profile and a discussion forum. There is the opportunity to be accredited in the Collected Works being produced as a project output.

Further Information and Bibliography

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<http://www.jisc.ac.uk/whatwedo/programmes/digitisation/econtent11.aspx>

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Notes

- ¹ Raddick (2009 Citizen Science)
- ² Alabri (2010)
- ³ Currier (2011)
- ⁴ Raddick (2009 Citizen Science)
- ⁵ *ibid.*
- ⁶ Brossard (2005)
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- ¹² Nov (2011)
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- ¹⁸ Raddick (2009 Galaxy Zoo)
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- ²¹ Lyon (2009)



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