

Executive summary

Citizen science, the active involvement of non-professional scientists in research, is experiencing an upsurge of interest. Activities range from small projects by groups with a common interest to large international projects, which involve professional scientists and research institutions. Citizen science can involve a vast range of activities, from gathering data in remote regions of the planet to crowdsourcing over the internet. Smart phones and other low-cost instruments are opening up new opportunities for public engagement with research. Thus scientists at many LERU universities and elsewhere are actively involved in managing citizen science projects in various domains.

The League of European Research Universities (LERU) recognises the potential of citizen science for research and its role in the open science movement. LERU is aware that modern IT technologies enable citizens to engage in monitoring pollution, collecting data on biodiversity, language studies as well as many other research activities. LERU's commitment to tracking important trends in research, advising on them and encouraging a productive relationship between science and society motivates this paper.

The purpose of this paper is twofold: First, it provides a set of actionable guidelines for professional scientists engaging in citizen science at universities, thus helping to ensure high quality research results of citizen science projects and encouraging efficient collaboration between professional scientists and the public. Second, based on these guidelines, this paper provides a series of policy recommendations for universities, research funding organisations and policy-making bodies to promote excellence in citizen science.

Given the diversity of citizen science, no simple set of guidelines can accurately and exhaustively describe all the challenges that a professional scientist may face when planning and running a citizen science project. Still, through concrete examples and references to pertinent literature on the subject, we document good practice at LERU universities and elsewhere, raise awareness about some of the major obstacles and pitfalls, and dispel some popular misconceptions about citizen science.

The paper begins with an introduction to the history and state-of-the-art of citizen science. We observe that the number and scope of citizen science projects are increasing due to the widening interest of citizens in science, the growing availability of advanced communication technologies, and increasing concerns about various issues of general interest such as environmental sustainability and cultural heritage conservation. Furthermore, governments are increasingly interested in strengthening citizen involvement in science projects for education. In addition to these trends, the European Commission is advocating strongly for an open science agenda, of which citizen science is an important element.

Second, this paper highlights some recent developments in citizen science projects run by professional scientists at universities. We distinguish three important trends:

1. Increasing coordination and collaboration between citizen science practitioners from different fields, which leads to sharing procedures and best practices, and to the creation of networks and associations.
2. Emergence of platforms that support a variety of citizen science projects, creating broader public awareness and encouraging a greater retention of volunteers.
3. Expanding the role played by citizens in the projects beyond simple tasks to include greater participation in all phases of the research process from conceptualisation to publication.

To contextualise these trends at the national and international level, this paper also addresses the role of organisations for citizen science, which embrace an increasing activity outside academia with variable relationships to universities. The paper also hints at possible future directions of collaboration for these organisations and research universities.

Third, this paper lists some important success factors common to many existing citizen science projects, and summarises these as a set of succinct guidelines for professional scientists planning citizen science projects at universities. These guidelines cover the following seven themes: recruitment and retention of participants; quality and impact of the resulting research; opportunities for informal learning and scientific creativity; openness and transparency; questions of organisation, information flow and sustainability; appropriate credit and rewards; and ethical and legal considerations.

Based on these guidelines and recent trends in citizen science, the paper concludes with a set of recommendations for LERU and other universities, for research funding organisations and for policy making bodies.