CITIZEN SCIENCE AND ITS RELATION WITH EDUCATION AND ACADEMICS

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Abstract

In this article, I have discussed the concept of citizen science and also tried to define citizen science. The nature of citizen science which is nothing but it is communicating, analyzing, planning, questioning, and observing. In this article, I have also mentioned the technology which is used to study citizen science. In the section benefits of citizen science, we see that benefits for participants, benefits for researchers, and benefits for society. Also, I have given the examples of CS projects which are undergoing. I order to establish a relationship between citizen science, education, and academics I have used the articles published by various authors.

Introduction

Citizen science is the practice of public participation and collaboration in scientific research to increase scientific knowledge. Through citizen science, people share and contribute to data monitoring and gy programs. Usually, this participation is done as an unpaid volunteer.

Collaboration in citizen science involves scientists and researchers working with the public. Community-based groups may generate ideas and engage with scientists for advice, leadership, and program coordination. Interested volunteers, amateur scientists, students, and educators may network and promote new ideas to advance our understanding of the world.

Scientists may create a citizen-science program to capture more or more widely spread data without spending additional funding. They often work with community groups that are already collecting such information, such as birders or weatherbugs, to expand their studies and databases.

Volunteers have varying levels of expertise, from kids in their backyards to members of high school science clubs to amateur astronomers with sophisticated home equipment. Modern advances in technology make citizen science more accessible today than ever before. The success of any citizen science project depends on the establishment of a well-devised monitoring program and the dedication of its volunteers.

Citizen-science projects may include wildlife-monitoring programs, online databases, visualization, and sharing technologies, or other community efforts. (1)

Modern technology in use:

Historically, when professional scientists wanted to gather more information, they would use pre-existing citizen science networks of birders, weather bugs, and other amateur groups. With the widespread availability of the Internet in the late 1990s, it became easier for people to share and contribute information, and the number of citizen-science programs increased.

In the last few years, the field of citizen science has expanded even more rapidly with the development of smartphones, allowing more information to be shared through digital media.

Armed with phones that have built-in GPS receivers, volunteers can readily provide geo-location information about species or situations in real-time. New networks and communities of interested citizen scientists are created each day to learn more about the world and how we can contribute to understanding it.

In the future, more phones could be outfitted with smart sensors, which would let people measure and record environmental data, such as air-quality levels and temperature readings.

The other technologies are:

- Internet
- Smartphone
- Seismology
- Hydrology
- Plastics and pollution
- Citizen sensing

Benefits of citizen science

Building societies where practices of knowledge creation are not locked away from the public, and therefore Citizen Science can flourish is a good investment, a true case of win-win. Beyond the obvious advantage of creating new knowledge that works both for science and the society; it benefits societies, research, and the participants themselves in numerous ways:

Benefits for Participants:

- Access to scientific research has never been more important to provide the basis for debates on critical issues such as climate change, global health, or the crisis of democratic values. A deeper and broader understanding of how science operates is a powerful asset against fake news.
- Citizen Science is a form of simultaneous learning and knowledge-making.

It enables people to enhance their scientific literacy in fields that are truly relevant to them.

· By participating in Citizen Science projects, citizens can gain a greater say in and commitment to scientific and research matters.

· It empowers communities to make a difference in their immediate environment. And thus raise their social well-being.

· Citizen science bridges gaps by harnessing the power of people who are motivated by curiosity or have a desire to advance research, then connecting them to projects that benefit from their energy and dedication.

Benefits for Researchers

· Opening up your research processes to the public can lead to a discovery that you or your research group could never achieve alone. In the past, collecting large samples of data for research was the most challenging task of any initiative. However, with today's interconnected world, thousands of people from around the globe can remotely contribute to a study and provide, analyses, or report data that researchers can use. Public participation enables investigations that would not otherwise be possible.

· It allows you to investigate your research questions more deeply, on a much larger scale. Engaging interested citizens in the collection and analysis of your data you can create large data sets and complete labor-intensive tasks much faster and more efficiently.

· Input from non-experts can provide you with unexpected insights that can take you to new research questions. Develop new research questions.

· Including Citizen Science aspects into your project makes a clear statement that you care about the societal impact of your research and how it works for the public.

· Citizen Science is a great way to make your research more accessible to a wider audience and increase its reach.

· It builds pathways by which the utility and impact of Humanities research can be recognized.

Benefits for Society

· Citizen Science helps to make sure that scientific agendas are well aligned with grand societal challenges and thus it enhances societal trust in science and helps funding bodies to make a better investment into research development and open innovation.

· It is a powerful tool to make the interface between academia and the public more permeable and transparent.

· The democratization of access to knowledge and knowledge production positively impacts social mobility.

· Citizen science encourages people to take a stake in the world around them. As a result, the hope is that this informed public will play a valuable role in influencing larger decisions about science policy.
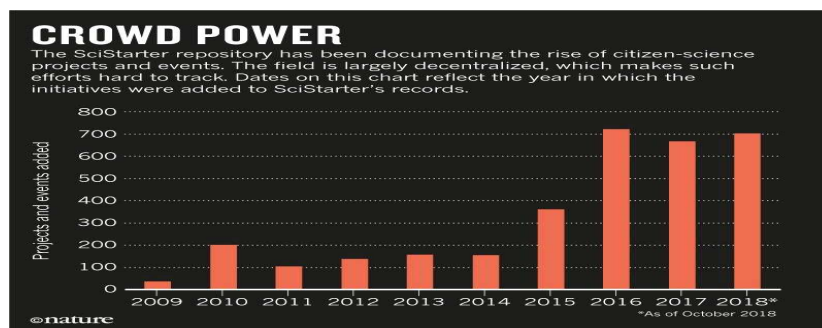
Disadvantages

· No immediate public presence, no method to share data directly with a similar group. The high cost of setup and publicity

· More than one interface for users, still a reliance on standard web-based information upload including possible mistakes.

· Extraction of data best achieved through interfacing through websites API limitations of social network rules and regulations, no ability for branding.

· Diverse types of data not standard in terms of information present unknown quality robustness. Most images do not contain information such as location making mapping opportunity rates.

· Not all questions can be answered using citizen science methods; community engagement takes time (time = money), and needs to be done well; community engagement is (and should be) an on-going component; data biases (temporal and spatial coverage); some projects fail to attract community engagement; funding required for equipment or technology (postal survey, website, app, built infrastructure, other).

Examples of citizen science projects

Observe Wildlife Anywhere, Measure Night-Sky Brightness, Search Space, World Monitoring Day, Bird Census, BirdWatch, Monitor Bird Nests, Count Birds,

Celebrate Urban Birds, Collect Weather Data, Observe Coral Bleaching, Participate in a Field Survey, Bird Feeder Stakeout, Take Mountain-Top Photographs, Listen for Frog and Toad Calls, Frog and Toad Populations, Survey Monarch Populations, Observe Appalachian Flowers, The Horsehoe Count, Learn About Local Plants, Chesapeake Bay Foundation, Observe Plant Life Cycles, Classify Galaxies, Butterfly Census, etc.

Methodology:

This article has been written by reviewing research documents on citizen science and by visiting reputed educational websites and databases.

Relation with education and academia

There have been studies published that examine the place of CS within education (4). Teaching aids can include books and activities or lesson plans. (2). some examples of studies are:

From the Second International Handbook of Science Education, a chapter entitled: "Citizen Science, Ecojustice, and Science Education: Rethinking an Education from Nowhere" by Mueller and Tippins (2011), acknowledges in the abstract that: "There is an emerging emphasis in science education on engaging youth in citizen science." The authors also ask: "whether citizen science goes further with respect to citizen development (3). The abstract ends by stating that the "chapter takes account of the ways educators will collaborate with members of the community to effectively guide decisions, which offers promise for sharing a responsibility for democratizing science with others(3).

From the journal Democracy and Education, an article entitled: "Lessons Learned from Citizen Science in the Classroom" by authors Gray, Nicosia, and Jordan (GNJ) (2012) give a response to a study by Mueller, Tippins, and Bryan (MTB) called "The Future of Citizen Science(4) begins by stating in the abstract that the study The Future of Citizen Science: "provides an important theoretical perspective about the future of democratized science and K12 education." But GRB state: "However, the authors (MTB) fail to adequately address the existing barriers and constraints to moving community-based science into the classroom." They end the abstract by arguing: "that the resource constraints of scientists, teachers, and students likely pose problems to moving true democratized science into the classroom (5)

In 2014, a study was published called "Citizen Science and Lifelong Learning" by R. Edwards in the journal *Studies in the Education of Adults*(5)Edwards begins by writing in the abstract that CS projects have expanded over recent years and engaged CSS and professionals in diverse ways. He continues: "Yet there has been little

educational exploration of such projects to date. (5) He describes that "there has been limited exploration of the educational backgrounds of adult contributors to citizen science". Edwards explains that CS contributors are referred to as volunteers, citizens or as amateurs. He ends the abstract: "The article will explore the nature and significance of these different characterizations and also suggest possibilities for further research. (5)

In the journal *Microbiology and Biology Education* a study was published by Shah and Martinez (2015) called "Current Approaches in Implementing Citizen Science in the Classroom (6) they begin by writing in the abstract that CS is a partnership between inexperienced amateurs and trained scientists. The authors continue: "With recent studies showing a weakening in scientific competency of American students, incorporating citizen science initiatives in the curriculum provides a means to address deficiencies (5) they argue that combining traditional and innovative methods can help provide a practical experience of science. The abstract ends: "Citizen Science can be used to emphasize the recognition and use of systematic approaches to solve problems affecting the community (74)

In November 2017, authors Mitchell, Triska, and Liberatore published a study in *PLOS ONE* titled "Benefits and Challenges of Incorporating Citizen Science into University Education (6). The authors begin by stating in the abstract that CSS contributes data with the expectation that it will be used. It reports that CS has been used for first-year university students as a means to experience research. They continue: "Surveys of more than 1500 students showed that their environmental engagement increased significantly after participating in data collection and data analysis (7). However, only a third of the students agreed that the data collected by CSS was reliable. A positive outcome of this was that the students were more careful of their own research. The abstract ends: "If true for citizen scientists in general, enabling participants as well as scientists to analyze data could enhance data quality, and so address a key constraint of broad-scale citizen science programs (7)

Citizen science has also been described as challenging the "traditional hierarchies and structures of knowledge creation (8)

Conclusion

Citizen science is a method that offers great potential. A hugely difficult aspect to assess is the human element – will the citizens be interested and participate? Do yourself a favor and look into existing projects with the aim of researching opportunities to collaborate or informing the design and delivery of your concept. Finally, a warning: many scientists haven't worked that closely with citizens, and they can have very

different expectations to you the scientist and a key to success is establishing and maintaining good communication.

References

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