

Review

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Posted Date: 7 December 2023

doi: 10.20944/preprints202312.0503.v1

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Review

Benefits of Citizen Science for Libraries

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Abstract: Participating in collaborative scientific research through citizen science, a component of open science holds significance for both citizen scientists and professional researchers. Yet, the advantages for those orchestrating citizen science initiatives are often overlooked. Organizers encompass a diverse range, including governmental entities, non-governmental organizations, corporations, universities, and institutions like libraries. For libraries, citizen science holds importance by fostering heightened civic and research interests, promoting scientific publishing, and contributing to overall scientific progress. This paper aims to provide a comprehensive understanding of the specific ways in which citizen science can benefit libraries and how libraries can effectively utilize citizen science to achieve their goals. The paper is based on a systematic review of peer-reviewed articles that discuss the direct benefits of citizen science on libraries. A list of the main benefits of citizen science for libraries has been compiled from the literature. Additionally, the reasons why it is crucial for libraries to communicate the benefits of citizen science for their operations have been highlighted, particularly in terms of encouraging other libraries to actively engage in citizen science projects.

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1. Introduction: Citizen Science and its benefits for the society and its participants

Citizen Science is a concept that encompasses various interpretations, but the fundamental and simplest definition characterizes it as scientific research conducted in whole or in part by members of the broader public, typically amateur non-professional scientists. Participants collect, share, analyse, or transcribe data and observations, often over large geographic areas or extended periods, generally utilizing mobile applications and the internet. Citizen Science is also known as community science, crowd-supported science, cloud science, volunteer monitoring, or simply public participation in scientific research. [1] Citizen Science offers numerous opportunities for scientific research, harnessing the collective power of individuals from diverse backgrounds. This approach not only expands the scope of scientific investigations but also brings research closer to the public, fostering a sense of shared responsibility and engagement in scientific discovery. Additionally, it promotes a deeper understanding of complex issues and encourages collaboration between citizens and professional scientists, ultimately benefiting society as a whole.

Citizen science has the ability to connect scientific subjects with people's daily experiences, transforming them into inquiries that relate to their everyday life. By prioritizing the methods and procedures over the final results, citizen science offers a dynamic and adaptable approach to communication, one that aligns with the project's specific circumstances and remains open to shifts within that framework. Moreover, citizen science frequently leads to effective science communication due to its distinct approach to teaching and learning compared to traditional science communication perspectives. [2] Citizen science enhances scientific literacy and promotes a sense of shared ownership of research, ultimately contributing to a more scientifically engaged and informed society.

The key participants in citizen science prominently include citizen scientists and professional researchers. There is an abundance of data available concerning the benefits that participants derive from engaging in citizen science. Jones, M. G. et al. conducted an extensive study that included a literature review on this topic, where they identified benefits for citizen scientist such as social

engagement, interaction, improvements in knowledge, skills, and attitudes, as well as changes in behaviours. [3] Additionally, Pateman, M., Dyke, A. and Elizabeth, S. in their research also listed benefits such as: greater employability, stress reducing, formation of new relationships and communities, social learning and better understanding of the scientific process. [4] Regarding the benefits of citizen science for scientists, Veeckman et al. state that increased research capacity, newly acquired data and information, more innovative research, more societally relevant research, bridging the gap between scientists and science and diversity in science. [5] Besley, Oh and Nisbet indicate that scientists are motivated by the desire to improve the public's favourable perception of science, raise awareness about scientific concepts, and persuade the public about the significance of the scientists' contributions. [6] Citizen science offers benefits by engaging citizens in scientific endeavours, providing valuable data for researchers, fostering public understanding of science, and enhancing the collaboration between the scientific community and the general public.

2. Citizen science and benefits for libraries

As stated by Ignat, Cavalier and Nickerson facilitators in citizen science could also be libraries. These spaces offer secure environments with access to information, resources, and communities. The collaboration between citizen science and libraries requires a close coordination among researchers, libraries, and the public [7]. There are numerous ways in which libraries can provide support for citizen science. Ignat et.al. wrote some examples like ensuring access to citizen scientists contributions and the research outcomes they contribute to, promoting and nurturing literacy skills, establishing partnerships with entities and facilitating local engagement and dissemination. [8]

Although libraries consistently emphasize the importance of their involvement in citizen science in terms of benefits for participants (both citizen scientists and researchers), it's worth noting that libraries themselves can derive certain benefits. Clearly, due to their mission and vision, they are oriented towards societal well-being, and their own benefits are seldom highlighted. However, more frequent acknowledgment of the direct benefits for libraries engaged in citizen science may encourage other libraries to join. The following text will examine literature from which an attempt will be made to compile a list of benefits of citizen science for libraries.

3. Materials and Methods: Literature review

For the compilation of the list of benefits of citizen science for libraries, articles by experts from various types of libraries were analysed, as well as those by other facilitators who organized citizen science activities in collaboration with libraries., Google Scholar was used as a tool for information retrieval. The key words used for the search were 'citizen science' and 'libraries,' with the addition of the word 'benefits' and its synonyms such as 'advantages,' 'perks,' 'pluses', 'opportunities', 'gains' and 'positives'. All types of libraries were included in the search.

From broader perspective, Cohen et al stated that by linking researchers with citizen scientists, the library serves as a channel for citizen science initiatives and functions as an intellectual centre—a space for both accessing scientific knowledge and actively participating in scientific pursuits. [9] This also means that libraries can be recognized as institutions that can support scientific research, which is not always the primary mission of libraries. Senabe et al. argue that, based on the views of librarians, integrating public libraries into citizen science could facilitate unconventional learning opportunities. This, combined with enhanced social cohesion, has the potential to cultivate fresh outlooks on public libraries, transforming them into spaces where knowledge is not merely shared but also collaboratively constructed in a horizontal manner. [10] This assertion can be extended to all types of libraries, not just public libraries.

Cigarini et al. explored the potential of public libraries to become hubs for citizen science. In this context, the authors surveyed librarians. The respondents emphasize some of the benefits: the initiative attracted new library users and fostered new local connections; citizen science brought additional resources to the library while strengthening social networks in the community; librarians emphasized the opportunity the activity provided for them to acquire new skills and practices and citizen science enhances social cohesion and improves the perception of the library's societal value.

[11] Ignat et al stated that with the help of citizen science, libraries could enrich their collections and make them more accessible [7]. Mumelaš explained it further and stated that depending on the project type, libraries can encourage citizen scientists to use sources more frequently, whether in the form of printed or online materials. Examining successfully implemented projects reveals that participants, with prior education and clear instructions, can swiftly and effectively supplement and enhance, for example, digitized collections by participating in their description and tagging. In addition to raising awareness about the sources and collections the library possesses, citizen scientists also assist in the execution of library processes. [12] Bonney and Dickison have argued that Citizen Science influences scientific communication and encourages the publication of research results in open access. Libraries can facilitate broader access to published scientific papers [13]. The most highlighted benefit of citizen science projects for libraries are the development of new competencies and professional advancement. Ridge states that such projects encourage library staff to acquire additional skills, including community engagement methods, project management, communication of scientific topics, and improved business process management. [14].

If we look at papers that analyse specific examples of specific libraries and citizen science projects conducted in libraries or with library support, we can also observe some directly mentioned benefits. Overgaard and Kaarsted, in their work presenting the citizen science project "A Healthier Funen," explained how, through collaboration with the media, they managed to reach a large audience/citizen scientist. They also emphasized the importance of partnerships with other stakeholders. As a direct consequence of the success of the "A Healthier Funen" citizen science project, the authors mentioned the establishment of a Citizen Science Network between the university and the hospital. [15] Wiederkehr presented the benefits of conducting citizen science activities within the ETH Library. Similar to previous authors, he addresses the advantages in terms of increased media visibility for libraries through citizen science projects. Additionally, implementing citizen science projects within the library (in the case of this library, it was a crowdsourcing based on their Map Collection) has spurred the development of new library programs and tools. It was also emphasized that the ETH Library „had become a recognized competent partner in citizen science projects“. [16] Authors Opryshko and Nazarovets describe the project "Grinchenko's Dictionary and Modernity," which emerged as a product of a previously established citizen science project, the Dictionary of Borys Grinchenko. This confirms how libraries, based on implemented citizen science projects, can introduce new similar initiatives and additional programs. The authors also emphasized the importance of partnerships within the institution (in their case, Borys Grinchenko Kyiv University) as another benefit of citizen science for libraries. [17] About the experience of the University Library "Svetozar Marković" and their projects "Wiki Marathons" and "Transcribathon" wrote Mumelaš, Martek and Mučnjak. As benefits of conducted citizen science activities for the library, there is emphasized robust collaboration and outreach across diverse institutions throughout Serbia, integration of Wiki articles into the faculty curriculum, heightened visibility of materials in cultural institutions, the enhancement of library staff knowledge, and the establishment of robust business connections with libraries in Serbia. [18] The next project discusses the benefits for libraries from the perspective of collaborators in the implementation of a citizen science project. The authors, Lasky et al., presented the project "North Carolina Candid Critters." Project leaders acknowledged that collaborating with local libraries enabled them to establish more direct connections with rural communities. Libraries played a crucial role in distributing equipment, a task that would have been impractical on such a large scale from a single facility without additional funds [19]. It is necessary to emphasize that there are likely additional benefits for libraries that engage in or support citizen science activities. Only peer-reviewed papers that are mentioning direct benefits were considered. It should be noted that some libraries involved in citizen science do not share their experiences through written papers. Moreover, those that do often focus on the benefits for the local and scientific community.

4. Discussion – List of benefits

Based on the literature review, a list of benefits of citizen science for libraries is proposed:

- (a) recognition as partners in various fields of science
- (b) developing partnerships
- (c) attracting new library users
- (d) media recognition
- (e) enriching existing library collections and developing new services
- (f) personal and professional development of employees

Libraries have the potential to be acknowledged as collaborative partners in a range of scientific disciplines. Through active participation in citizen science initiatives, libraries position themselves as valuable contributors and supporters, engaging with diverse scientific fields and fostering collaborative efforts. This recognition stems from their role in providing access to research materials, contributing to data management practices, and advocating for open access principles. By aligning with these activities, libraries strengthen their position as essential partners in advancing scientific knowledge across various domains.

Engaging in citizen science initiatives enables libraries to cultivate partnerships both within their organizational structure (internal) and with external entities. Internally, libraries can forge collaborations among different departments or teams within the library, fostering a multidisciplinary approach to citizen science projects. Externally, libraries can establish partnerships with external organizations, research institutions, community groups, or other stakeholders involved in citizen science. These collaborative efforts contribute to the library's ability to support and enhance citizen science activities, broaden its network, and create a more robust ecosystem of shared knowledge and resources.

By actively participating in citizen science initiatives, libraries have the potential to draw in and attract new users. Citizen science projects often involve the community in scientific research, creating an opportunity for individuals who may not traditionally use library services to engage with the library. The appeal of citizen science, which encourages active participation in scientific activities, can serve as a gateway for people to discover and utilize the resources and services offered by the library. In this way, libraries can broaden their user base and reach individuals who are interested in both scientific exploration and the diverse offerings provided by the library.

Citizen science initiatives can contribute to gaining recognition from the media for libraries. When libraries actively participate in citizen science projects, they engage in collaborative and impactful activities that are often of interest to the broader community. The media may find these initiatives noteworthy, leading to coverage and visibility for the library's involvement in citizen science. This recognition can take the form of news articles, interviews, or features that highlight the library's role in supporting scientific research and community engagement. By leveraging citizen science projects, libraries have the potential to enhance their visibility in the media, thereby strengthening their public image and raising awareness about the valuable contributions they make to scientific endeavours and community involvement.

Citizen science participation can contribute to the enrichment of a library's existing collections and services. Through citizen science projects, libraries often involve the community in activities that generate new knowledge, materials, or resources. The outcomes of these projects, such as data, research findings, or tangible artefacts, can be incorporated into the library's collections, enhancing the diversity and relevance of available materials. Moreover, citizen science engagement may inspire the development of new services that align with the interests and needs of the community involved in these projects. Citizen science serves as a means for libraries to actively augment their collections and adapt their services to better reflect the evolving interests and contributions of the community they serve.

The involvement of library employees in citizen science can yield positive effects on their personal and professional development. Engaging in citizen science projects offers employees opportunities to develop and enhance a variety of skills, such as project coordination, project management, evaluation, and research data management. These experiences contribute to the enrichment of their professional skill set and may lead to increased competence in handling diverse aspects of library work. Additionally, participating in citizen science can broaden the horizons of

library staff, exposing them to new challenges and fostering a deeper understanding of the collaborative nature of scientific inquiry. This exposure not only contributes to their professional growth but also adds a valuable dimension to their personal development by fostering a sense of accomplishment and engagement with meaningful, community-oriented work. Overall, citizen science initiatives in libraries provide a platform for continuous learning and development for library employees.

Why is it important to talk about the benefits of citizen science for libraries? Discussing the benefits of citizen science for libraries is important for several reasons. Firstly, it sheds light on the valuable contributions that libraries can make to scientific endeavours through citizen science initiatives. This recognition is crucial in highlighting the evolving role of libraries beyond traditional information repositories. Secondly, emphasizing these benefits serves to inspire and encourage other libraries to engage in citizen science. By showcasing the positive outcomes, such as increased visibility, enriched collections, and community engagement, it encourages a broader adoption of citizen science practices within the library community. Furthermore, discussing these benefits contributes to a broader understanding of the societal impact of libraries. It underscores their role not only as information providers but as active participants in community-driven scientific activities. This can enhance the public perception of libraries, positioning them as dynamic institutions that contribute actively to the advancement of knowledge and community well-being.

5. Conclusions

Participation in citizen science activities presents a multifaceted opportunity for libraries, transcending their conventional roles as repositories of knowledge. Engaging in citizen science not only positions libraries as active contributors to scientific endeavours but also fosters dynamic partnerships across diverse fields. Through the collaborative nature of citizen science libraries are recognized as vital players in community-driven research initiatives, thus elevating their standing as knowledge hubs. This involvement extends beyond the mere accrual of data; it sparks the enrichment of library collections, infusing them with a living, community-generated dimension. Moreover, the professional and personal development of library staff is a direct outcome, as they acquire new skills and insights through active participation. To further underscore the significance of this engagement, effective communication of these benefits is paramount. Articulating the value of citizen science for libraries is not merely a means of self-promotion; it serves to inspire broader community involvement and highlights the library's commitment to facilitating meaningful contributions to scientific knowledge. By transparently communicating these advantages, libraries not only enhance their visibility but also cultivate a sense of shared purpose within their communities, reinforcing the pivotal role they play in fostering a culture of scientific inquiry and community collaboration.

Future research endeavours can delve into the specific benefits derived from individual citizen science projects within the context of libraries. Examining the outcomes and impacts of particular initiatives can provide nuanced insights into the effectiveness of citizen science engagement at the project level. Researchers may explore how different types of projects contribute to community empowerment, scientific knowledge advancement, and the overall mission of libraries.

Funding: This research received no external funding.

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