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Recommendations for the Creation of a Center for Citizen Science

Abstract

The explosive growth of citizen science has led to myriad independent projects in Minnesota and beyond. Here, we examine whether the field of citizen science would benefit from a center to coordinate efforts and help citizen science practitioners. We present results of a focus group–based needs assessment involving 52 practitioners active in citizen science. The main conclusions are that establishment of a center for citizen science would benefit efforts and that a statewide center should serve multiple functions. Though this process focused on Minnesota, we believe our findings and recommendations are applicable to and would benefit Extension efforts anywhere.

Keywords: focus group, needs assessment, coordination, practitioners, Minnesota

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Introduction

The field of citizen science is growing explosively—both in number of projects and number of participants (Bonney et al., 2014; Silvertown, 2009). Though this growth is exciting, it presents challenges as well as opportunities for everyone involved in the field. Researchers, project coordinators, platform managers, educators, and citizen scientists could all benefit from coordination and sharing of knowledge across projects regarding how to run successful citizen science endeavors.

For the purpose of clarity, we adopted the definition of citizen science used by Bonney et al. (2009) and the Citizen Science Association (2016) for the needs assessment described herein. Specifically, citizen science is scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions. It includes integration of explicit and tested protocols or workflows for collecting or processing of data, vetting of data by professional scientists, inclusion of specific and measurable goals for public education, and community building and engagement. Literature on citizen science generally refers to citizen science volunteers as "participants." However, in this article we use "citizen scientist" to indicate a citizen science volunteer, and we use "participant" to mean an attendee of a focus group session.

Minnesota is home to dozens of citizen science projects, some with a local focus (e.g., iFish Minnesota) and others with national and international audiences (e.g., Galaxy Zoo and others on the Zooniverse.org platform). Though the projects all achieve some degree of success, each is run independently and there is little or no

communication among the involved parties. This situation is not unique to the state (Ellwood, Crimmins, & Miller-Rushing, 2017; Francis & Goodman, 2010); therefore, those working in Extension programs across the United States likely have unique opportunities to use their infrastructures and networks to connect independent programs so that all can better achieve their objectives (e.g., Aigner & Kuhar, 2014; O'Callaghan & Skelly, 2013). In effect, Minnesota is a microcosm of the development of citizen science as a field anywhere in the United States and Europe. Consequently, the findings of the work described herein—a needs assessment regarding development of a state-based citizen science center—can be applied by anyone interested in establishing such a center.

The idea for the needs assessment we conducted started with a networking colloquium on citizen science sponsored by the University of Minnesota. One theme that arose during the colloquium was the need for a nexus of information on citizen science projects. This need was confirmed through an online survey of participants of the colloquium. Of the approximately 100 participants initially queried in a snowball fashion (i.e., initial contacts were asked to send the survey to people they thought would be interested), 92 people responded, and they identified themselves as researchers (29%), coordinators (36%), educators (31%), and citizen scientists (4%). The main conclusion determined through the survey was that all respondents would appreciate a network of citizen science that could address a number of topics (see Table 1) (Strauss, 2016).

Table 1.

Range of Topics Survey Participants Indicated Should Be Addressed by a Citizen Science Network

Topic for a citizen science network to address	No. of votes
Networking with others working in citizen science	59
Using citizen science to teach environmental education/science, technology, engineering, and math	56
Funding opportunities	48
Ensuring quality data	46
Volunteer training	41
Data entry tools/platforms	39
Case studies of specific citizen science programs	38
Citizen science–related work occurring at the national and international levels	37
Developing instructional materials (volunteer manual, activity materials, etc.)	37
Volunteer recruitment	37

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This initial enthusiasm led us to conduct a formal needs assessment involving five in-person focus groups.

Objectives

We had three objectives for our needs assessment:

1. Describe the current state of citizen science in Minnesota.
2. Envision what the state of citizen science could be in Minnesota.
3. Determine how a center for citizen science might bridge the gap between the current state and what could be.

Meeting these objectives allowed us to assess the overall need for a center for citizen science.

Methods

The focus group participants came from a pool of approximately 100 people contacted through lists we generated from people who attended the initial colloquium and/or who answered the subsequent online survey. Fifty-two people agreed to participate in the five focus group sessions, and the participant pool consisted of project coordinators (20), scientists (15), educators (7), science outreach specialists (4), museum professionals (3), and library and technical services personnel (3).

To determine the current state of citizen science in Minnesota, we asked the participants two questions:

1. What enables you to lead or engage in citizen science projects?
2. What makes it challenging to lead or engage in citizen science projects?

To envision what citizen science could be in the state, we asked the participants an additional question:

1. What do you need or desire to improve your engagement in citizen science?

Finally, to determine how a center for citizen science should bridge the gap between the current state and what could be, we asked participants an additional three questions and requested that they answer as if the year were 2027 and a center had been operating for 10 years:

1. What specific outcomes have we achieved on the national or global stage in citizen science programming or networking?
2. What problems has the center helped solve in creating engaging and productive citizen science work?
3. What are people saying about the Center for Citizen Science?

The focus group sessions were conducted under methodology suggested in three publications: Altschuld and Kumar (2010), Etling and Maloney (1995), and Witkin and Altschuld (1995). Data were analyzed in two phases, in immediate debriefings following each session and then via a comparative analysis by the leaders and recorders

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following methods described in Witkin and Altschuld (1995) and Altschuld and Kumar (2010). The study was granted an exemption by the University of Minnesota Institutional Review Board.

Findings

Current State of Citizen Science

What Enables Citizen Science in Minnesota?

Focus group participants described a variety of factors that contributed to citizen science in the state. At the top of the list was the quality of the citizen scientists, with many participants noting the strong culture of volunteering combined with widespread environmental awareness. The participants also noted strong support from both formal and informal science institutions, including the University of Minnesota, the Bell Museum of Natural History, the Science Museum of Minnesota, and dozens of nature centers around the state. This support was bolstered by strong local expertise and programs in citizen science, such as various monitoring programs sponsored by the Minnesota Department of Natural Resources. Finally, participants remarked on the importance of technology, with social media used to help recruit citizen scientists and data platforms such as iNaturalist used to support their efforts (Drill, 2013).

What Makes It Challenging to Engage in Citizen Science?

Focus group participants highlighted the lack of coordination among citizen science efforts as a primary challenge to citizen science engagement. They emphasized the potential duplication of projects, redundancies and/or shortcomings in training and a lack of expertise for developing new projects. In particular, they wanted technological assistance both in developing tools for data collection and in managing data and databases. Participants also lamented a lack of resources in support of citizen science. Ranging resource scarcities were mentioned, including scarcities in funding, equipment, and staff time allotted to projects. They particularly commented on the short-term nature of most funding sources and how this scenario precludes long-term citizen science work. A final set of common challenges centered on citizen scientist recruitment, training, and management. Participants described difficulties recruiting a representative diversity of citizen scientists in terms of ages, abilities, geographic spread, and socioeconomic, cultural, and racial backgrounds. Though citizen scientists were enthusiastic, they sometimes had insufficient preparation to implement rigorous protocols or lacked the capacity to follow through on more demanding protocols. A common challenge expressed was difficulty retaining citizen scientists for more than one field season.

Future Possible State of Citizen Science

What Do You Need or Desire to Improve Your Engagement in Citizen Science?

Much of the input from the focus group participants emphasized the need for a central location or clearinghouse to assist with the many facets of citizen science. This clearinghouse could provide connections among projects and citizen scientists seeking one another; resources and expertise for the development of new projects; and multidirectional communication platforms that close loops across posing research questions, creating study designs, collecting data, analyzing and interpreting results, and communicating findings. Many participants

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emphasized the need for specific protocol guidance, data collection tools, and database management resources that could result in reliable and accessible data from citizen scientists. Several participants wanted to build a greater community around citizen science, with a physical center in which to meet, an annual gathering through which to share information and success stories, and research on how to make citizen science projects more effective. Through all of these recommendations ran a thread of the need to diversify the citizen science community regarding both who participates and where projects take place.

Potential Functions of a Center for Citizen Science

What Specific Outcomes Have We Achieved on the National or Global Stage in Citizen Science Programming or Networking?

The participants projected that by 2027 a well-functioning center for citizen science would have achieved several important outcomes. Many comments focused on the center's being a model for engagement with citizen science, emphasizing that citizens would have moved beyond being primarily data collectors to being involved in posing questions, developing study designs, and interpreting and reporting results. Participants envisioned a center that would develop and disseminate best practices for welcoming, training, and retaining a diverse body of citizen scientists. Participants further envisioned that these practices would increase science literacy, capital, and agency among citizens. Another focus was that findings from citizen science projects would have led to action, including natural resources management, habitat improvement, policy formation, political influence, and fund-raising. Several participants focused on the center's potentially being a true leader in technology for data management. Finally, many envisioned that citizen science would have become integrated in science education.

What Problems Has the Center Helped Solve in Creating Engaging and Productive Citizen Science Work?

The participants projected that by 2027 a well-functioning center for citizen science would have helped solve several important problems. One cluster of comments focused on the value and management of data—in particular, that tools would be available for easy data entry, quality control, and data retrieval and visualization for citizen scientists. There was also a suggestion that the center would have enabled sharing of data across projects, allowing for integration of data sets and expansion of the scope of the data in both space and time. Another cluster of comments described a resource repository and expertise that would address diverse challenges ranging from data management to volunteer management, project design, and communication breakdowns between the layers of citizen science (i.e., researchers, coordinators, educators, and citizen scientists). A cluster of comments focused on the educational value of science, that the use of citizen science would have led to huge gains in science, technology, engineering, and math education and that citizen scientists would be finding it easier to realize and share the value of lifelong learning. An extension of these education-themed comments was another set of comments describing the concept of greater societal changes having increased the value of science, the credibility of citizen science, and the use of science as a problem-solving tool for everyone. Finally, themes of diversity and inclusion emerged, drawing attention to the need to remove barriers to communication and participation.

What Are People Saying About the Center for Citizen Science?

The participants projected that by 2027 people would be saying many complimentary things about the new

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center for citizen science. Many of the statements focused on the potential accessibility of the center to researchers, project coordinators, platform managers, educators, and citizen scientists, with respondents often remarking on it as "one-stop shopping." Educators focused on its potential accessibility as a feature that would allow them to integrate citizen science into both informal and formal science education settings. One statement emphasized the potential networking function of the center: "Connects people and ideas across institution-science-policy boundaries and solves grand challenges!" Many comments reflected the sentiment that the center would have become a model others would want to emulate in creating similar centers.

Recommendations

The focus group process has led us to nine distinct recommendations ranging from the establishment of such a center to the focus of its services.

1. Pursue development of such a center. There was unanimous enthusiasm for establishing a center for citizen science. Participants identified multiple needs that could be fulfilled by a coordinating body that assisted with all facets of citizen science in the state.

2. Serve and connect multiple audiences: researchers, platform managers, project coordinators, and citizen scientists. A center for citizen science should serve multiple audiences, including researchers who study citizen science as a phenomenon, researchers who use it as a tool, project coordinators and platform managers who implement projects, policy makers who make use of information gained through projects, educators who use citizen science as a tool for science education, and most of all, citizen scientists themselves.

3. Support research on the field of citizen science. The center should not be limited to implementing citizen science but also should support research on the field of citizen science—what makes projects successful, how to best recruit and train volunteers, how to validate data and minimize bias. In other words, research should address the full enterprise of citizen science in order to make it more successful.

4. Create a technical center for managing data and data quality. A repeated request by project developers and coordinators was the need for help with all facets of data and its management. Citizen science creates large—and sometimes unruly—amounts of data, and project personnel need assistance preparing for, entering, analyzing, preserving, and visualizing data.

5. Provide assistance to researchers for project development and execution. Though many researchers expressed an interest in using citizen science as a tool, many commented that they need help developing and executing projects. They reported having often had research ideas that require the spatial or temporal scale afforded by citizen science but not knowing how to take ideas through project development and execution.

6. Provide assistance to project coordinators for citizen scientist training and retention. Project coordinators often serve as the conduit between researchers and volunteer citizen scientists. They requested help with recruiting, training, and retaining volunteers for projects as well as with developing skills for leveraging the capacity of enthusiastic researchers and volunteer citizen scientists.

7. Establish a clearinghouse of opportunities for citizen science practitioners. A repeated request was for the establishment of a central location for all the projects, where each project's objectives, scope, contact information, and volunteer needs could be cataloged.

8. Integrate citizen science into science education. Educators particularly emphasized the need for assistance in

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integrating citizen science in teaching efforts, whether in informal science education settings, such as at nature centers, or formal science education settings within schools. This is particularly relevant to Extension which could incorporate citizen science more fully in its educational outreach efforts in both informal settings, such as 4-H, and formal settings, such as teacher professional development.

9. Address diversity and inclusion in all facets of citizen science. All participants stressed the need to broaden diversity of citizen science in all ways—from the people involved to types of participation and locations of projects. There is a need to infuse citizen science with multicultural and multigenerational perspectives and dismantle barriers to inclusion.

Conclusion

This focus group–based needs assessment was successful in defining the current state of citizen science in Minnesota, both in ways that it is successful and ways it could be improved. Though the findings are specific to Minnesota, they are relevant to anyone interested in initiating a broadly supported center for citizen science. Overall, the participants were enthusiastic about the idea of a center for citizen science that could coordinate efforts, and they were particularly helpful in defining the particular needs that could best be met by such a center. Lastly, participants outlined ways the center, in partnership with the communities it would serve, could develop new models of engagement and advance new knowledge. We look forward to using the insights, opinions, and advice offered during our focus group sessions to develop a dynamic, collaborative, helpful, and effective center for citizen science. We also anticipate that our findings may be applied by others interested in establishing such centers.

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