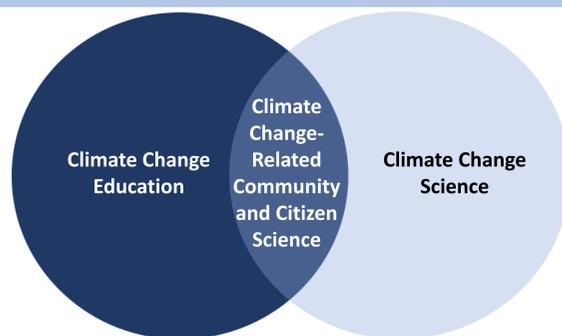


Community and Citizen Science Can Bridge Climate Change Education and Science



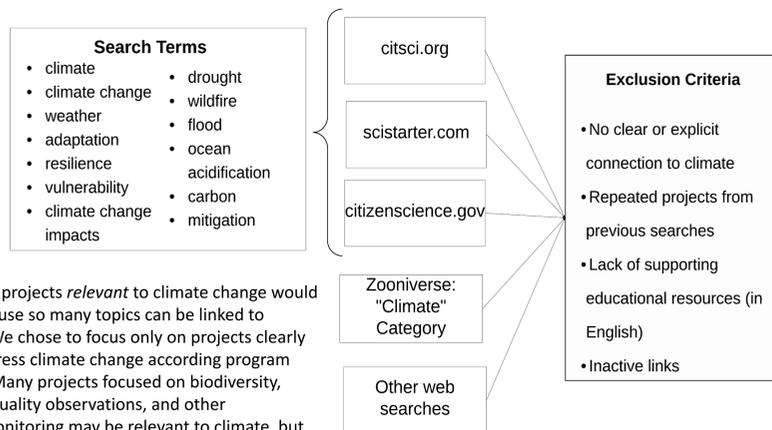
- Effective climate change education is essential to addressing the pressing issue of climate change by **improving climate literacy** among the public and inspiring the **individual and collective action** necessary to respond to climate change.
- At the same time, there remains a need to further **understand climate science** to better **prepare and respond to our changing climate**.
- Community and Citizen Science (CCS) **engages the public to contribute to the scientific process**. Participating in a climate change-related CCS project offers an opportunity for learning about climate change in **meaningful, personally-relevant and hands-on** ways, while contributing **usable data** to climate science.
- However, the educational benefits of CCS are not automatic – they depend in part on resources that support learning as part of CCS implementation. Resources that incorporate effective climate change education strategies may **facilitate CCS outcomes**, as well as achieve **climate change education goals**.

Effective Climate Change Education Strategies	<ul style="list-style-type: none"> • Make information personally relevant, meaningful, and engaging for learners • Discussion and conversation • Interaction with scientists and/or scientific processes • Design and implementation of community projects (Monroe et al. 2017)
Potential CCS Outcomes	<ul style="list-style-type: none"> • Knowledge and understanding of the subject matter • Engagement and interest in science • Experience with the scientific process and data contribution • Changes in attitudes or behaviors, increased engagement in local communities and connection to place • With intentional design, enhanced representation in science

Box A

Methods

In order to understand ways CCS projects provide educational value in the climate change context, we searched for projects using popular citizen science databases. Then, we looked through project online materials to identify which ones provided supporting materials to enrich their educational impact.



Examining all CCS projects *relevant* to climate change would be unwieldy because so many topics can be linked to climate change. We chose to focus only on projects clearly motivated to address climate change according program documentation. Many projects focused on biodiversity, weather and air quality observations, and other environmental monitoring may be relevant to climate, but have been excluded from this analysis.

Features of Projects and Their Supporting Resources Were Highly Varied

Types of Educational Resources Accompanying Climate-CCS Projects

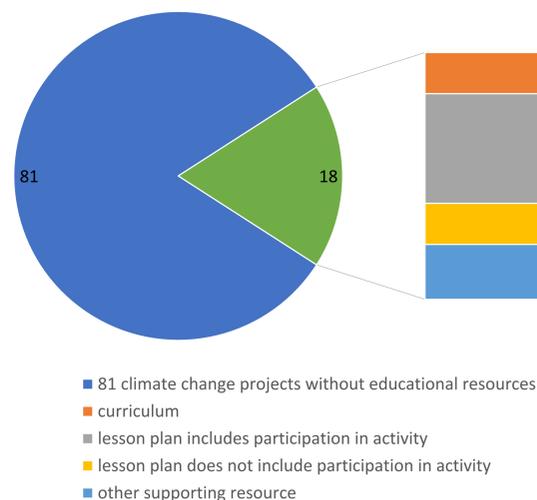


Figure A

- Few climate change CCS projects provide supporting materials, and the depth of those found varied.
- The most common supporting resource was a lesson plan that involved facilitating participation in an existing CCS project, often including additional learning materials and suggested discussions and activities.
- Few projects provide more elaborate curricula.
- Some projects provide lesson plans for educators that used data collected from the project, but did not involve active CCS participation by the students.
- The remaining projects provided some supporting materials, but no formal resource. For example, a video on the subject matter or a suggested discussion, but not as a formal resource.

Level of Participant Engagement of Climate-CCS Projects with Education Resources

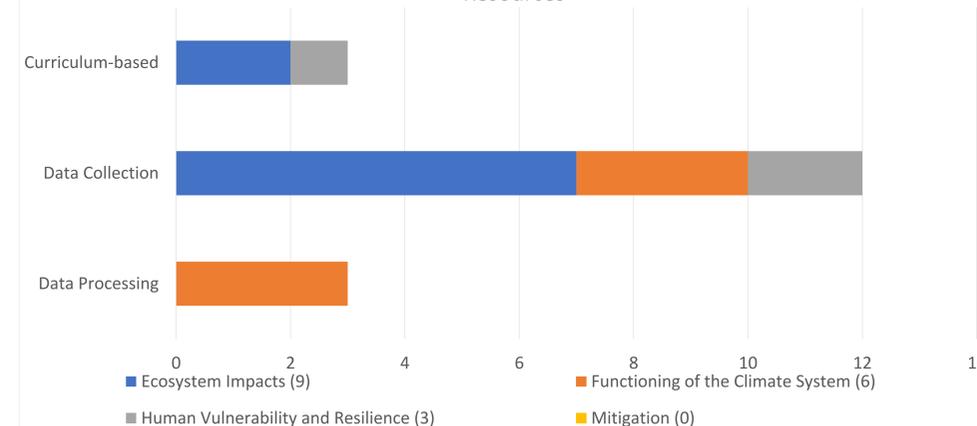


Figure B

The projects in *Figure B* are categorized by how participants engage with the program, using categories defined in Bonney et al. 2016. These categories are not mutually exclusive: projects categorized as curriculum-based also involve data collection.

Data Collection projects recruit volunteers to collect data to contribute to scientific research.

Data Processing projects contribute to scientific processes by analyzing and interpreting large amounts of data.

Curriculum-based projects are developed by organizations or educators, and typically involve students collecting or processing data for a larger citizen science effort.

Community Science projects involve community-scientist partnerships and seek to influence local decisions. This search did not return any of these projects, perhaps because most Community Science projects are hyper-local, or do not typically publish educational resources used.

The distribution of different climate change topics addressed by these projects is represented by the colored bars of *Figure B*. CCS projects focused on Ecosystem Impacts were the most common kind of project with supporting educational resources, while no Mitigation projects with supporting educational resources were found.

Climate-CCS Provides Opportunities for Collaboration Between Educators, Scientists, and Communities

Taking part in science in their local communities may inspire participants of these projects to remain engaged in climate change science and solutions. This potential may be maximized if the projects are supplemented by resources that incorporate key climate change education strategies, such as those in Box A, to provide more context and meaning for participants.

Posting educational resources online is not the be-all and end-all of supporting learning through CCS. However, our results do provide an instructive view of the highly varied ways in which climate-related CCS projects are deliberately striving to support learning. Many online projects do not have formal resources for educators available online, which points to both challenges and opportunities for the field, which includes funders, practitioners, scientists, and educators.

Resources

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