KEY PRACTICE

Youth Share Findings with Outside Audiences

WHEN YOUTH SHARE their science findings, we found that they become motivated and take ownership of their findings. This key practice requires creating opportunities for youth to share the results of their scientific work with audiences beyond their classroom, out-of-school program, or family unit. Community and Citizen Science (CCS) can expand the typical audiences to include scientists, policy-makers, community stakeholders and leaders, other CCS participants, and the general public. Audiences may be in-person or online. They may be anticipated by educators, such as a presentation at a scientific conference, or unanticipated, such as neighbors passing by during data collection. Audiences can play multiple roles; they can simply listen to young people, use the data or findings, provide feedback, or make decisions based on what they've learned.

Case 1: Presenting at a Scientific Conference

Every Thursday after school, from September through November, a group of three high school students worked together, preparing a research poster for a large international scientific conference, which is attended by thousands of professional scientists. As part of a summer internship at a local science museum, these young people had collected and submitted data about Pacific mole crab (*Emerita analoga*) to the Long-Term Monitoring Program and Experiential Training Program for Students (LiMPETS), a regional citizen science project that monitors the abundance and distribution of the Pacific mole crab along the coast of California. They were nervous and excited as they prepared to present their research about the prevalence of a parasite (*Profilicollis altmani*) in the Pacific mole crab.

These high school students are presenting their findings at a scientific conference.

Afterwards, one girl, Evan, expressed her excitement about being seen and respected by professional scientists, explaining, "I never would have imagined that

> Key practices for youth in youth-focused community and citizen science (YCCS) can lead young people to be more motivated and engaged in scientific practice, see themselves as part of scientific and local communities, broaden possible career paths, and foster youth agency with environmental science.

such a young generation could communicate with, like, the older generation who have accomplished so much, and just kind of be on a somewhat level playing field… they'll respect us despite being kids." At the conference, they gave their presentation to over twenty different scientists and youth participants, and left feeling proud of themselves and their contribution to science.

Case 2: Blogging About Science

Across town, another group of students were working with the same LiMPETS data but publishing their results in a class blog. The blog, written for members of the public, made school feel more relevant for some students, including Sydney, who reflected on how "[the blog] is much more to me personally than an assignment. It's kind of like something that I can share with people, and that other people can see, and I think that's really, really cool for me." It was important to Sydney that what the group was learning about the Pacific mole crab would be shared with members of the public, and her family and friends.
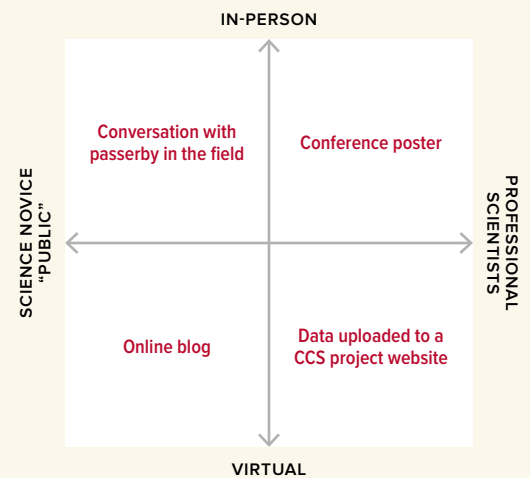
Why It's Good for Learning

Sharing findings with an authentic audience can positively influence young learners' engagement in scientific practice, motivation, and position within scientific communities. Accountability to an outside audience has been found to increase young people's use of scientific language and norms.[1] It can also break down the isolation of the classroom[2] and can encourage extra revision and organization of understanding.[3] Presenting to an outside audience helps to position youth as community science experts[4] making a visible and valued contribution to their communities.

Our research builds on this work, showing that sharing findings with outside audiences can help young people develop environmental science agency.[5] As illustrated by the stories above, we found that sharing their findings helped young people see themselves as experts because they were recognized by scientific communities, local community governments, and members of the public. In addition, we found that working with outside audiences helped expand young people's ideas about possible future career paths, providing an important foundation for future individual and community change.

FIGURE

Example Dimensions of Audience

Writing a blog post, youth might use general language and share locally relevant information. Students presenting to professional scientists might focus on scientific language and methods. The two axes in this figure show just one way to think about how different audiences can influence how youth communicate their findings and what they learn through that process.

IN-PERSON

SCIENCE NOVICE "PUBLIC"

PROFESSIONAL SCIENTISTS

Conversation with passerby in the field

Conference poster

Online blog

Data uploaded to a CCS project website

VIRTUAL

Tips for Implementing

1. **Determine the appropriate audience based on your goals.** The quadrants in the figure above provide one example of how to think about different audiences. Not all require extensive work on the part of educators. Short conversations with people passing by a research site or posting work online can position students as experts. In addition, scientists and members of the public have different norms for verbal and written communication. The kind of audience you choose has implications for the kind of language and norms young people learn about.

2. **Emphasize audience so that it builds buy-in but doesn't overwhelm the project focus.** A real audience can be rewarding but also cause anxiety. Make sure to support young people so they feel pride in their accomplishments without unnecessary stress.

3. **Prepare youth with audience-appropriate scaffolds.** It is important to provide scaffolding throughout a project so young people are ready to present their findings. Example scaffolds include: practicing public speaking through "lightning talks" or writing practice blogs in the appropriate genre.

4. **Plan for collaboration between educators and community members.** Try to collaborate with CCS project staff, other scientists, community members or local city government if those are appropriate audiences. Collaboration takes time so start conversations early.

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3 Okita, S. Y., & Schwartz, D. L. (2013). Learning by teaching human pupils and teachable agents: The importance of recursive feedback. *Journal of the Learning Sciences, 22*(3), 375-412.

4 Calabrese-Barton, A. C., & Tan, E. (2010). We be burnin'!: Agency, identity and science learning. *Journal of the Learning Sciences, 19*(2), 187-229.

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