CASE STUDY

Urban Creek: Teen Summer Program

Youth-focused Community and Citizen Science // A project of the UC Davis Center for Community and Citizen Science // **education.ucdavis.edu/ccs**

Youth Community and Citizen Science (YCCS) can take many forms. In the case study below, drawn from in-depth field research, we highlight important project features and describe how educators and youth have taken up three key practices that promote science learning and environmental science agency—the ability to use experiences in citizen science and environmental science to make positive changes in one's life and community.

DESCRIPTION

In the **Hillview Creek project**, organized by the East Bay Academy for Young Scientists (EBAYS), students meet daily during the summer to monitor water quality at a local urban creek. In the fall, a subset of students continues work, meeting weekly to collect, graph and analyze the data, and prepare findings for presentation to scientific, community and government audiences. The group also conducts creek clean-up, invasive species removal, and plantings of native species. Over the last 4 years, these activities have transformed the site from an overgrown area with frequent illegal dumping to a park-like space, used and appreciated by the community.

SPECIES OR SYSTEM STUDIED

Water quality. Once or twice weekly, the group assesses chemicals in an urban creek. At least once a season, they also survey macroinvertebrates.

RESEARCH SITE

Urban creek. Hillview Creek is relatively inaccessible, though most participants live within a mile of it. The creek is heavily impacted by dumping, human and animal waste, and growth of invasive species.

PARTICIPANTS

Middle and high school students. In the summer, 3 – 10 demographically diverse participants, ages 13 – 17, participate. A subset continue work on weekends in fall and winter.

STRUCTURE

Community-based. Most students join during the summer, as part of summer employment, internships, community center programs, or via recruitment at local schools. Sample collection happens at the creek, with data entry/analysis at a community center and local high school.

DURATION

Variable. 2 – 3 months in the summer. Some youth work through December to prepare for presentation at a scientific conference. Some are drop-in or short-term participants, and some may become project leaders and mentors over the long-term.

INSTITUTION

ISE. The project is run by EBAYS, a program of the Lawrence Hall of Science, based at UC Berkeley. EBAYS gives young people from marginalized communities opportunities to experience authentic science and develop community leadership skills. Partnerships with community advocacy organizations, city agencies and local schools are critical to the project.

OTHER ACTIVITIES

Youth present posters at a scientific conference, and make presentations to city agencies and local organizations. They also engage in site restoration, planning of events, and field trips to regional parks. They often join other EBAYS projects on a range of environmental and community health issues.

KEY PRACTICES

There are many strategies to get youth involved in community and citizen science. Through in-depth case studies of diverse YCCS projects, we have documented three youth-centered practices that are effective in promoting learning and environmental science agency. These practices are ***youth sharing findings with outside audiences****,* ***taking ownership of data quality*** *and* ***interacting with complex social ecological systems****.*

SHARING FINDINGS WITH OUTSIDE AUDIENCES

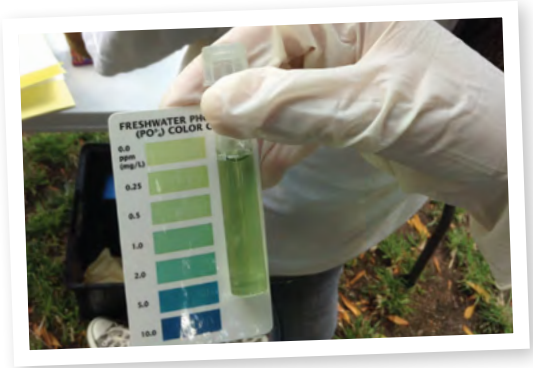
Sharing findings with both scientists and neighbors helps youth see a role for science—and for themselves—in their community.

The group produces a poster for an international scientific conference. They also present findings to local officials and organizations. Program staff guide the team's research submission, provide an undergraduate mentor, and secure funding.

The students share their work with volunteers at community work days, to community groups, and informally to community members who ask about the group's activities. When these audiences visit the creek, EBAYS staff position youth scientists as knowledgeable spokespeople.

During his first year, presentation at the scientific conference allowed one student, James, to learn the norms of the scientific community. His older brother convinced him to wear a tie, and he came to realize that "science" includes wide range of people and topics. In his second year, James took the lead on the team's poster, by teaching other students to compile and analyze data, drafting the research abstract, and leading editing of the poster.

Presenting to community members helped



James feel that he had the tools and inclination to make positive change around him. As a returning group member, James often took responsibility for describing the team's work and findings to people visiting the creek. James's perception of the community evolved: he came to see that despite a few that dumped in the creek, many neighbors valued the creek. Positive feedback showed James that his own work and participation in this community space were valued.

YOUTH OWNERSHIP OF DATA QUALITY

Educators encourage youth to translate confidence with protocols into group leadership and investment in the scientific work.

EBAYS pairs experienced students with new students to facilitate peer teaching and encourage discussion of water quality readings to ensure consistency. Early in the program, educators describe why particular parameters are in use, to help students understand how chemical and physical characteristics can reflect creek health and human impact on it.

Over the course of the program, students become confident with data collection protocols and knowledgeable about routines, and often begin work before receiving instruction. The program then gives students responsibility for teaching sample collection and analysis to volunteers and new students.

Some students in the group take on specialized, if informal, roles related to data quality. One participant, Janey, became her team's leader in data collection in multiple ways. First, Janey saw herself as someone who would just "get things done." Data collection involved obtaining water samples from tricky parts of the creek and as some students backed off from getting down the bank, Janey's willingness to jump in helped her establish a role and take ownership of it. She developed her own methods for handling multiple chemical tests simultaneously, which were taken up by other youth in the group. Second, Janey became proficient in water testing techniques and was given responsibility for organizing group members during data collection. During public presentations, the lead educator and other youth often turned to her to explain data collection methods.

INTERACTING WITH COMPLEX SOCIAL ECOLOGICAL SYSTEMS

Engaging with issues that have no easy answers can provide opportunity for sophisticated reasoning about nature, community, and the roles—good and bad—that we play.

In their work, the team encounters issues common to inaccessible urban creeks, including sewage leaks, animal waste, trash dumping, and human defecation. The research sites on the creek have been known as places where people smoke or otherwise hide. For this reason, the youth participants' initial perceptions of the creek were complicated. They saw the robust plant life as natural and seemingly healthy, but they knew that the some community members didn't value the creek - and didn't necessarily value the presence of young people there.

As they studied water quality at the creek, worked to improve it, and spoke about it in their communities, youth participants grappled with complex trade-offs in human-nature interactions. First, participants came to understand that "not all green is good"; ecosystems dominated by non-native species may look healthy but don't necessarily provide the same ecosystem function as native ecosystems. In addition, by comparing two different creek sites—one that passed through a manicured park and one that had dense vegetation—participants saw trade-offs in the design of green spaces. They saw that although a site with dense vegetation and other features that protected it from high human traffic might seem more natural, a more park-like environment can lead to a healthier creek, since visibility and neighborhood investment might reduce dumping. Third, youth participants saw how public perception shapes human-ecosystem interactions. Their restoration work improved community perception of the creek and pushed the city to direct more funding towards their efforts.

Lastly, the issue of homeless encampments impact on creek water quality pushed students to think about the complicated choices involved in addressing intertwined ecological and social problems. Though they saw negative impact that homeless encampments could have on the creek, they also knew—some of them from having experienced poverty in their own lives and communities—that the people in the encampments were struggling and could not simply be thrown out.

These issues provided occasions for rich discussion and reasoning, and a chance for youth participants to understand that even small actions could impact the environment and community—for better and for worse.

YCCS PRODUCTS

In YCCS, the work youth do has a purpose—a "product" that has an audience and impact beyond the classroom walls. These products can vary widely by case.

DATA

Students assess Ammonia, Phosphate, Nitrate values in the creek weekly which produces a baseline understanding of fluctuations in creek health, and helps alert researchers to events such as sewage breaks and fertilizer run-off.

Audience:

- Large conference of geoscientists
- City government, Department of Environment: Students give a presentation
- Local foundation, environmental advocacy and citizen groups: Presentations at the creek and informal Q&A with passing community members

RESTORATION

Students remove invasive species removal and plant native species which re-establishes habitat and ecosystem function provided by native species, discourages illegal dumping, and for direct action by youth.

Audience:

- City government: Interaction through city maintenance departments and at community events, such as Earth Day
- Neighbors and community members: Through informal conversation at the site, volunteer days, and occasional community tours

OUTCOMES & EVALUATION

EBAYS program goals include supporting students to develop "critical thinking skills through scientific research and exploration," become leaders in their communities, and gain STEM skills through hands-on work in science. They also believe the program can "foster both increased understanding of important scientific concepts, as well as greater appreciation of how scientific research contributes to addressing issues relevant to students' lives."

This case study has been condensed. To read the full version, and to ready other case studies, visit **yccs.ucdavis.edu/case-study**.