CASE STUDY

School Garden: Elementary Classroom

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

As part of an integrated science and literacy unit, 3rd grade students participate in the **Lost Ladybug Project (LLP)**, a citizen science project documenting the distribution of ladybug species across North America. Students work in their classroom, school garden, and science lab to (1) collect and identify ladybug species on their school campus in Northern California and (2) modify their school garden to attract more ladybugs. Students collect and photograph ladybugs and submit the photos to LLP, which are used to map and study shifts in ladybug populations. In addition, students read and write about garden and farm ecosystems, and participate in garden management decisions related to ladybugs and pest management. Students present their work to the community at a school-wide end-of-year showcase.

SPECIES OR SYSTEM STUDIED

Ladybugs. Students document the presence of ladybug species in their school garden weekly.

RESEARCH SITE

School garden. Students collect ladybugs in the garden as well as around the school campus.

PARTICIPANTS

Elementary school students. Twenty 3rd grade students in a two-way bilingual Spanish-English immersion MAGNET school participate with their teacher, the garden teacher, and the elementary science specialist.

STRUCTURE

Classroom-based. Students collect and submit data once a week and also engage in related reading and writing during daily literacy instruction.

DURATION

8 weeks. The unit takes place during the spring, when all stages of the ladybug life cycle are observable. 2016 was the first year that the teacher and school participated in the LLP.

INSTITUTION

Elementary school classroom. Activities take place during the regular school day. The team of teachers incorporates LLP data collection into the integrated science and language arts unit and facilitates all learning activities. In 2016, the UC Davis research team and school administration provided teacher professional development and support for the project.

OTHER ACTIVITIES

Students upload photographs to the LLP website, read expository text to understand ladybugs' role in garden and farm ecosystems and write a three-paragraph essay about ladybugs they found. They develop posters and presentations to share their work at the end-of-year MAGNET showcase, attended by teachers, school and district administrators, parents, master gardeners and other community members. Students advise the garden teacher with recommendations about how to attract and sustain ladybug populations for integrated pest management and help with plan implementation. Students write written reflections on their scientific work and themselves as scientists.

CURRICULA RESOURCES

Resources created include 4-H science toolkits and biology and identification information. To access, go to **yccs.ucdavis.edu/content/case-school-garden-elementary-classroom**.

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

School and community stakeholders recognize students as experts when they share findings from their research.

Students shared their work with the broader community during the school's annual MAGNET showcase presentations, which teachers, district administrators, and community stakeholders attended. The class was divided into six groups of 4 – 5 students, and each group developed a poster and shared one component of the project. For example, one group presented the data the class gathered and submitted to LLP while another group presented the class recommendations for attracting more ladybugs to the garden. Students shared in a poster presentation format, and visitors circulated fluidly to each group over the course of one hour.

Preparing and giving the showcase presentation was particularly important for students who enjoy science but are reluctant to assert themselves or less confident in their abilities. For example, Julia was able to position

herself as an expert to both her peers and community members, although she was generally quiet during group discussions and two boys in the group did most of the talking. As the students prepared their presentations, the teacher played a key role by suggesting that Julia use the iPad during the presentation. This enabled Julia to take the lead during the showcase, showing visitors how the group collected and submitted their LLP photographs.

Some students had additional opportunities to share their work during the eight-week unit before the showcase. Two groups presented their posters to visiting educators from Australia, and three students led members of a parent club to the garden where they demonstrated how to photograph a ladybug and upload the picture to LLP. One girl, Kira, felt especially proud of leading the parent garden tour. She shared that adults typically "don't pay attention to students." However, when she was in the role of school garden expert, Kira captured the adults' attention and was able to teach them what she had learned.

YOUTH OWNERSHIP OF DATA QUALITY

Students determine what constitutes a high quality photograph and which photographs to upload.

While some CCS projects design multiple ways for students to take ownership of collecting high quality data, LLP scientists review every photo and identify the ladybug species to ensure their data quality standards. This seemed to limit types of student ownership of data quality.

However, we observed more subtle evidence of ownership when students submitted data to the national contributory CCS project. First, students were in charge of taking good photographs. The teacher initially modeled scientific photography by showing students how to freeze a ladybug for 5 minutes so it wouldn't move, take the photo on a piece of white paper, and ensure the ladybug was large and in focus. Students discussed whether or not the quality of the photograph was good, mentioning characteristics like whether or not the ladybug was in focus. They occasionally asked the teacher to refreeze the ladybugs when they were moving or retook photographs. In this way, students took responsibility for submitting data to scientists that they thought were high quality.

In addition, students determined which ladybugs they should photograph and submit to LLP. The educator taught students how to make a scientific sketch, rich with detailed observations and labels. This helped students make close observations and learn to accurately identify different ladybug species, including the most common ladybug in their garden, the convergent ladybug (*Hippodamia convergens*). As LLP is interested in species distribution rather than abundance, students discussed whether or not they should upload multiple photographs of the same species. After the first two days of data collection, students decided to only upload photographs of new species they observed.

INTERACTING WITH COMPLEX SOCIAL ECOLOGICAL SYSTEMS

Students understand their role in a garden ecosystem through science and literacy integration, and through participation in garden management decision-making.

Students learned about the ecological relationships in the garden as well as human management of the garden for food production through their integrated experiences in the garden and classroom. As they collected LLP data in the garden, students observed how the large aphid population was damaging their crops and how ladybugs acted as a natural predator. Students also read articles about ladybug life histories and attracting ladybugs to the garden during their language arts lessons. The teacher then asked students to generate multiple solutions for how to control the aphid population in the garden. Students shared their ideas, engaged in respectful argumentation, and decided as a group on a management strategy that involved cutting down annual food crops infested with aphids and planting perennial native plants to provide year round ladybug habitat.

The garden teacher helped students carry out part of their plan, cutting down annuals and continuing monitoring. Through this integrated unit, students experienced themselves as actors in a garden ecosystem and came to understand how humans influence and are influenced by ecological processes. This understanding extended for weeks after the unit had ended, as students continued bringing ladybugs they found from home to the garden to help control the aphid population.

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 document the prescence of ladybugs with photographs weekly. Entomologists identify the species and add the photographs to the LLP database.

Audience: Cornell Lab of Ornithology entomologists, general public

POSTERS

Students create posters to present at the MAGNET school showcase and open house to introduce information about ladybugs and integrated pest management to the community.

Audience: Teachers, district administrators, parents, community stakeholders, other MAGNET schools

OUTCOMES & EVALUATION

The teacher and school had four main outcomes for the students in language arts, science, and citizenship.

First, students used their science work as material for writing an essay. Student essays were scored by two teachers using a rubric, and students were expected to demonstrate a writing level of three out of four. These essays were used immediately to assess students' writing levels and the school-wide writing goals. The school also saved them as part of student writing portfolios for future teachers' use and the school's annual MAGNET program evaluation.

Second, students were expected to communicate through oral presentation, which was informally assessed during showcase presentations.

Third, the teacher assessed student engagement in the scientific practice of argument through evidence, a practice emphasized in the Next Generation Science Standards. This was assessed informally through the students' use of evidence from their observations and reading.

Finally, the principal hoped that student participation in citizen science could address two of the school's six character goals: collaboration and citizenship. The teacher assessed these two goals and they were incorporated into student scores on their district report card.