Empowering Elementary Students through Environmental Service-Learning

by Eileen Merritt, Tracy Harkins and Sara Rimm-Kaufman

"We use electricity when we don't need to."

"When we use electricity we use fossil fuels and fossil fuels pollute the air and fossil fuels are nonrenewable."

"We use too many non-renewable resources to make energy."

"One problem that we have with the way that we use energy is that we often taken it for granted, leaving lights on when it's unnecessary, and plugging in chargers without using them."

"We are literally putting pollution on the blanket of the earth!?"

The problems listed above were identified by fourth grade students in the midst of an environmental service-learning unit. These powerful words, and many similar ideas shared with us by other fourth grade children, show that children care a lot about our planet. They notice when we waste resources, pollute our air, water or land, or cause harm to other living things. Their concerns must be heard, to motivate others to confront the environmental crises that we are facing today. Greta Thunberg has recently demonstrated how powerful one young voice can be, mobilizing people around the world to take action on climate change.

How can educators help students develop skills to be change agents, offering creative and feasible solutions to problems they see around them? Service-learning is one powerful way to build students' knowledge and skills as they learn about issues that matter to them. Recently, we worked with a group of urban public school teachers to support implementation of environmental service-learning projects in their classrooms. In environmental service-learning, students apply academic knowledge and skills as they work together to address environmental problems. High quality service-learning, according to the National Youth Leadership Council (NYLC), provides opportunities for students to have a strong voice in planning, implementing and evaluating projects with guidance from adults and engages students in meaningful and personally relevant service activities that address content standards (NYLC, 2008). We designed Connect Science, a curriculum and professional development program, with these

goals in mind (Harkins, Merritt, Rimm-Kaufman, Hunt & Bowers, 2019). As we have analyzed student data from this research study, we have been inspired by the strength of conviction that students conveyed when they spoke about the environment and the creative solutions they generated for problems they noticed. In this article, we describe key elements of lessons that fostered student agency (see Table 1). First, two vignettes below exemplify service-learning projects from two classrooms.

One class noticed that people waste too much electricity. They recognized that fossil fuels pollute the air, which is bad for us. They decided to hold an energy festival for second grade students and their parents, to teach them both the how and the why of conserving electricity. Students created a booth to teach why we need to conserve, a demonstration booth for how to conserve, a station to make magnets/stickers to promote conserving electricity, a song about conservation that they taught the student visitors, a fishing for facts game, and a bowling for information game. Adult participants were able to complete a home energy audit on a local power company's website. After completing the audit participants registered to receive an energy saving kit.

Developing Agency through Environmental Service-Learning

In another classroom, students launched a campaign to reduce the use of disposable plastic containers at their school. They made posters to educate others about single-use plastics, explaining how they were made from petroleum (see Figure 1). Students and teachers in their school were encouraged to take a pledge to use reusable water bottles, containers and utensils in their lunches. Sign-up sheets were placed near posters around the school. Several hundred people took the pledge.

What both groups have in common is that they participated in a science unit about energy and natural resources. In the first part of the unit, they discovered problems as they learned about different energy sources and how these energy sources produce electricity. They began to recognize that fossil fuels that are used for transportation, electricity production and plastic products, and that their use causes some problems. This awareness motivated them to take action. Later in the unit, each class honed in on a specific problem that they cared about and chose a solution. Below, we summarize steps taken throughout the unit that empowered students.

1 Choose an environmental topic and help students build knowledge

Students need time to develop a deep understanding of the content and issues before they choose a problem and solution. Many topics are a good fit for environmental service-learning. Just identify an environmental topic in your curriculum. Our unit centered around NGSS core idea ESS3A: How do humans depend on earth's resources? (National Research Council, 2012). Students participated in a series of lessons designed to help them understand energy concepts and discover resource-related problems. **These lessons can be found on our project website: *connectscience.org/lessons*.** Fourth grade students are capable of understanding how the energy and products they use impact the planet (Merritt, Bowers & Rimm-Kaufman, 2019), so why not harness their energy for the greater good?

There are many other science concepts from NGSS that can be addressed through environmental service-learning. For example, LS4.D is about biodiversity and humans, and focuses on the central questions: What is biodiversity, how do humans affect it, and how does it affect humans? Environmental service-learning can be used to address College, Career and Civic Life (C3) standards from dimension 4, taking informed action such as D4.7 (grades 3-5): Explain different strategies and approaches students and others could take in working alone and together to address local, regional, and global problems, and predict some possible results of their actions (National Council for the Social Studies, 2013). Language arts and mathematics standards can also be taught and applied within a service-learning unit.

Figure 1. Poster to Educate Others About Plastic Use

2 Generate a list of related problems that matter to students

Partway through the unit, each class started a list of problems to consider for further investigation. Collecting or listing problems that kids care about is an effective way to get a pulse on what matters to students. Fourth graders' concerns fit into three broad categories:

(continued on next page)

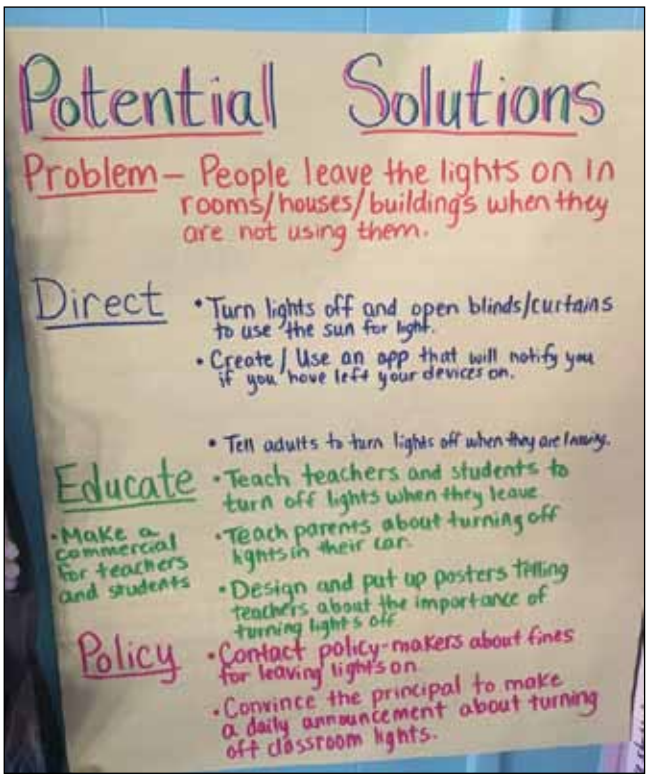
- **pollution (air, water or land)**
  People need to stop littering. Before you even throw everything on the floor, think about it in your head… should I recycle, reuse? I can probably reuse this
- **not causing harm to people, animals or the environment**
  Plastic bags suffocate animals.
- **wasting resources (e.g. electricity, natural resources or money)**
  If people waste energy, then their bill will get high and it will just be a waste of money.

Co-creating a visible list for students to see and think about legitimizes their concerns and may help them develop a sense of urgency to take action.

3 Collectively identify an important problem

The next step was for students to choose ONE problem for the upcoming service-learning project. Each teacher read the list of problems aloud, and students could cast three votes for the problems that they cared about the most. They could cast all 3 votes for one problem, or distribute their votes. Most teachers used this process to narrow in on one problem for their class to address. One teacher took it a step further by allowing small groups to work on different problems. Either way, allowing students to CHOOSE the problem they want to work on fueled their motivation for later work on solutions. Different classes honed in on problems such as wasting electricity, single-use plastics, foods being transported a long distance when they could be grown locally, and lack of recycling in their communities.

Figure 2. List of Potential Solutions for Lights Left On



4 Explore possible solutions and teach decision-making skills

Students were introduced to three different ways that citizens can take action and create change. They can *work directly* on a problem, *educate others* in the community about the issue or work to *influence decision-makers* on policy to address the problem. They broadened their perspective on civic engagement as they brainstormed solution ideas in each of these categories. After deciding to work on the problem of lights left on when not in use, one class generated the following list of possibilities for further investigation (see Figure 2).

After considering ways to have an impact, students were ready to narrow in on a solution. Teachers introduced students to three criteria for a good solution. This critical step provides students with decision-making skills, and helps them take ownership of their solution. Our fourth graders considered the following guiding questions in a decision-making matrix:

- Is the solution going to have a positive impact on our problem?
- Is the solution feasible?
- Do you care a lot about this? (Is it important to the group?)

At times, this process prompted further research to help them really consider feasibility. Of course, teachers needed to weigh in too, since ultimately they were responsible for supporting students as they enact solutions. When discussing impact, it's important to help students understand that they don't have to SOLVE the problem—the goal is to make progress or have an impact, however small.

While many groups chose the same problem, each class designed their own unique solution. Most focused on educating others about the topic that mattered to them, using a variety of methods: videos, posters, announcements, presentations to other students or administrators, and an energy fair for other members of the school community. The process of educating others about an issue can help consolidate learning (Hattie & Donoghue, 2016). Some groups took direct action in ways such as improving the school recycling program or getting others to pledge to use less electronics or less plastic (as described above). These direct actions are very concrete to upper elementary school children since impacts are often more visible.

5 Support students as they enact solutions

Social and emotional skills were addressed throughout the unit. During project implementation, teachers supported students as they applied those skills. Students developed self-management skills by listing tasks, preparing timelines and choosing roles to get the job done. At the end of the unit, students reflected on the impact that they made, and what they could do to have a larger impact. One group of students noticed that every single student in their class switched from plastic to reusable water bottles. Another student felt that their class had convinced people not to waste electricity. Some groups recognized that their solution wasn't perfect, and wished they could have done more. For elementary students, it's important to emphasize that *any* positive change makes a difference. Critical thinking skills develop when students can compare solutions and figure out which ones work the best and why. The instructional strategies described in this article have been used by educators across grade levels and subjects for other service-learning projects, and can be adapted for different purposes (KIDS Consortium, 2011).

Student-designed solutions yield deeper learning

One challenge that teachers faced when implementing environmental service-learning was that it took time to work on projects after the core disciplinary lessons, and curriculum maps often try to fast forward learning. Deeper learning occurred when teachers carved out time for service-learning projects, allowing students to apply what they know to a problem that mattered to them. There are always tradeoffs between breadth and depth, but ultimately students will remember lessons learned through experiences where they worked on a challenging problem and tried their own solution. School leaders can work with teachers to support them in finding time for deeper learning experiences. The students that we worked with cared a lot about protecting organisms and ecosystems, conserving resources and reducing pollution. They had many wonderful ideas for solutions that involved direct action, education or policy advocacy. For example, one student suggested the following solution for overuse of resources, "Go out and teach kids about animals losing homes and people polluting the world." The voices of children around the country can be amplified through civic engagement initiatives such as environmental service-learning. Citizens of all ages are needed to actively engage in work toward solutions for climate change. Why not help them begin in elementary years?

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