



Climate Action Now! Youth Ecological Stewards 10-week Environmental Education Curriculum

Climate Change Curriculum as the Nexus for Learning:

CAN! cultivates environmental education based in the outdoor classroom. The outdoor classroom provides learners with the psychomotor experiences associated with gardening. These include weed removal, soil preparation, planting activities, activities related to protecting plants and allowing for proper drainage, etc.

Participating students and staff learn that **climate change is the alteration or change of temperature, weather patterns and wind patterns due to anthropogenic (human-caused) increases in greenhouse gasses (like carbon dioxide and methane)**. And participants learn that living soil protects the local watershed by reducing pressure upon the City's combined sewer system while sequestering (or taking up and storing) carbon in the form of living plants and compost.

Garden education classes can last between 30 minutes (for Kindergarten) to 45 minutes for students in grades 1-5. Students in grades 6-12 receive 45-60 minutes of instructional time. Instruction takes place both in the classroom as well as in the appropriate outdoor classroom. The outdoor classroom includes all green spaces within the schoolyard as well as those established in the sidewalk.

K-2: Kindergarten to second grade student lessons will focus upon natural resources awareness, and especially water and energy conservation. Students will explore the gardens searching for decomposers, edible flowers and rotting leaves. Tactile experiences outdoors and exposure to bugs and plants will support dialogue about resource conservation. Students will irrigate plants and learn about the importance of and need for conservation. Bug hunts and garden tacos (of greens and flowers) are very popular with students of all ages.

3-4: Third and fourth grade student lesson will delve deeper into life cycles (like composting with the Fungus Bacteria and Invertebrates) and energy cycles (how plants use sun energy for power) which will lead to dialogue about renewable energy vs. fossil fuel energy. A focus on direct actions for energy reductions will be prioritized as the youth will be encouraged to find ways to save energy at school and at home. Garden lessons include cover crop planting and incorporation, turning the compost pile, journaling about scientific observations, measuring, observing and documenting.

5-8: Fifth grade students will finally dive into the water cycle, watershed awareness and eventually watershed pollution prevention. Garden activities include the building berms and swales, compost production, appropriate irrigation techniques with the hose, etc. Students will learn about evaporation, condensation, precipitation and collection, as well as the importance of the appropriate disposal of hazardous waste (like oil, paint and other chemicals).



All 5th – 8th grade students will participate in a “*Climate Action Hero*” mini-curriculum, which is broken into four, 45-60 minute lessons (3-4 hours of total instruction) including the following academic topics:

- 1) ***Climate Change Basics: Greenhouse Gases and Fossil Fuels***
- 2) ***Dry Planet: How Composting and Water Conservation Helps to Protect Nature***
- 3) ***Farm to Fork: Examining Food Miles, Seasonal, Local and Organic Foods***
- 4) ***Biodiversity in a Changing Climate: Local Diversity Matter***

Core Learning Concepts to be Promoted by CAN! Youth Ecological Stewards Program

- 1) Water, Energy and Soil Conservation; Composting with the Fungus, Bacteria and Invertebrates
- 2) Water Cycle Awareness, Water Pollution Prevention, Watershed Restoration Ecology
- 3) Renewable Energy Promotion in the Era of Climate Change; Solar and Wind vs. Fossil Fuels



Cover Crops and Compost
@ Mission Education Center



Tree Plantings in the Sidewalk
@ Argonne Elementary School



Appropriate Irrigation Techniques
@ SF Community School

Key proposed program-monitoring components include the following:

- 1) Documented achievement of environmentally sound knowledge, skills and attitudes by students as outlined in the California State Curriculum, related to the SFPUC core concepts.
 - *Can be in the form of pre and post exams to measure information retention.
- 2) Community involvement in the pursuit of common goals leading to student growth and a healthy environment.
 - *Will include CAN! presence at PTO meetings and teaching staff meetings.
- 3) Communication between and among groups who have common interests and common challenges related to environmental education, water and energy conservation, etc.
 - *Communication with partners – SFPUC, SFUSD, SFDPW, SFE, EO, RDNC, etc.
- 4) Program excellence and continual improvement guided by actively participating program stakeholders.
 - *Can be in the form of participant surveys and teacher/parent/student feedback.
- 5) Hands-on learning leading to student cognitive, affective and psychomotor skill development related to environmental literacy.
 - *Outdoor education as key component to program.
- 6) Ongoing support and leadership as provided by CAN! staff.



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10-week Environmental Education Curriculum for 6th-8th Grade

Week:	Classroom Lesson Outline:	Garden Activities
1.	Water is the basis for all life on planet earth. Students review the water cycle (evaporation, condensation, precipitation and collection) while doing the “Water Cycle dance”. CAN! staff draws the cycle on the board. Students review how San Francisco gets their water: via Hetch Hetchy reservoirs from collection basins near Yosemite National Park. Students discuss the difference between salt water and fresh water and understand where both are found. Students write up fresh water bodies on the board: Lake, River, Stream, Pond, Toilet, etc.	
2.	Natural Resources are the fundamental building blocks of the natural world. <u>“Natural Resources” come from nature and humans use them as they are or turn them into things that people want and need to survive.</u> Students try to name one thing that humans use that <i>doesn’t</i> come from nature. Students learn the 4R’s (Reduce, Reuse, Recycle and Rot) while understanding the importance of putting reduction first.	
3.	The soil is alive. Students learn that soils are cultivated by farmers, and have been created with a mix of biological, geological and chemical properties. Soils are diverse and different soils support different plant and animal communities. Students learn how to compost using the green bin as well as building a compost pile in the garden. Organic material vs. non-organic material is discussed and examined: ie biological material vs. inorganic material. Students examine the Scientific Method by building their own compost pile (including some non-organic materials) creating their own soil building experiments, which will be measured throughout the remainder of the course.	
4.	<u>“Ecology”</u> is the study of the relationships between living things and the natural environment. Students learn basic ecological principals and how every action they do can either promote conservation or destruction of the natural environment. Different environments are written on the board and students must come up with creatures and plants found in each bioregion. Living things are broken down into Kingdoms (<i>Animalia, Plantae, Fungi, Bacteria, etc.</i>). Students learn about scientific classification. All life plays distinct/important roles in the ecosystem.	
5.	Botany is the study of plants. Students learn that plant cultivation has taken place throughout human history, since the advent of agriculture (12,000 years ago in present-day Iran and the fertile crescent). Students deepen their understanding of plant parts, seed parts, plant relationships and the living soil. Students learn that plant genetics play important roles in production both in the wild and in cultivation. Basic plant needs are examined (water, air, sun, soil, space).	



6.	<p><i>Climate Change Basics: Greenhouse Gases and Fossil Fuels</i></p> <p>Climate Change is the alteration of rain, snow and wind patterns due to anthropogenic [human-induced] increases of greenhouse gases (like CO₂, Methane, SO₄, etc.). Students brainstorm the various ways that modern society utilizes fossil fuels (like oil, coal and natural gas) while engaging student in a discussion about extraction, transportation, air and water pollution, leading to a deeper understanding of carbon pollution. Students learn that the earth once had previously high levels of CO₂ and that these increases in atmospheric carbon lead to increases in temperature, severity of weather patterns and drought.</p>	
7.	<p><i>Dry Planet: Composting and Water Conservation Helps Protect Nature</i></p> <p>Students learn the definition of the word “Drought” a prolonged period of <u>abnormally low rainfall/snow fall</u>, while building connections about their own water consumption. Students learn that soils high in organic material can maintain more consistent soil moisture. Students brainstorm water conservation methods for home and school.</p>	
8.	<p><i>Farm to Fork: Examining Food Miles, Seasonal, Local and Organic Foods</i></p> <p>Conventional agriculture uses tremendous amounts of chemical inputs. Students learn what pesticides, herbicides, fungicides and rodenticides are and how these chemicals are dangerous to human health. Organic agriculture is promoted as the healthy alternative for the planet (and humans). Seasonal food production is examined as a means to reduce fossil fuel dependency. Students learn about tropical food production, and hemispheric differences in seasons related to food production and consumption. Students calculate the carbon footprint of a school lunch. Strawberries are examined as an especially important crop to purchase organically to reduce methyl bromide proliferation. Farm-worker health, Environmental Justice and human rights are discussed.</p>	
9.	<p><i>Biodiversity in a Changing Climate: Local Diversity Matters</i></p> <p>From tigers to elephants to the Mission-Blue butterfly, biodiversity on earth is fundamentally important to ecological balance. Biodiversity is the variety of different forms of life found on earth. Students learn the definition of endangered species, conservation and species extinction.</p>	
10.	<p><i>Garden-Enhanced Nutrition Education: Eating Healthy for the Planet</i></p> <p>Every crop that farmers grow takes resources. Some foods take more water than others. Promoting vegetable consumption (while eating lower on the food chain) also promotes a healthier lifestyle. Students learn that meat production, especially beef, takes incredible amounts of water and other resources while vegetables production uses fewer resources. Sources of vegetable protein and lean animal proteins are examined. Students learn that regularly eating the rainbow (multi-colored foods) supports healthy immune systems. Careers in Agriculture, Agroecology and Horticulture, Nutrition and Health are examined.</p>	