Climate Champions of the Sonoma Valley

Lesson-by-lesson Description:
In the first lesson, students will learn what climate is, that the sun is the primary energy source for Earth's climate system, and that earth's climate is regulated by complex interactions among earth's systems. Students will learn these concepts by comparing weather and climate, and modeling the greenhouse effect. Students will investigate the greenhouse effect through a controlled experiment they will set up and collect data from, using jars to model the earth and its atmosphere.

In lesson two, students will learn how trees and native plants can be effected by changes in climate. Using a cross sections of a tree known as "tree cookies," students will identify seasonal and annual growth in the tree rings and understand how that evidence of past climate is recorded in plants. Students will collect and analyze tree ring data, and test a hypothesis to draw conclusions. Students will also learn about the concept of phenology—the timing of periodic life-cycle events, and how it can be studied to understand climate and the impacts of changes in climate. Students will learn how to make observations of a native plant at their school, and will collect data to contribute to Project BudBurst, a national citizen science project.

Students will learn about the carbon cycle in lesson three of Climate Champions. In this lesson, students will learn that carbon is very common on earth and is found in many living and non-living things. Students will work in groups to examine common objects and guess if they believe it contains carbon or not. After grouping the objects, the instructor will discuss each object with the class and explain that they all include carbon. Students will then create a chart outlining ways in which carbon can help or hurt the planet. Students will then learn about the carbon cycle through the Carbon Cycle Roleplay game.

In lesson four, students will learn about fossil fuels and nonrenewable resources, about the consequences of fossil fuel usage, and will conduct an energy audit in their learning environment. Students will learn issues related to coal mining by "mining" the chocolate chips out of chocolate chip cookies. The cookies will serve as models of the land in which coal is found. Students will learn about issues related to oil spills through an activity where they try to clean vegetable oil from a bowl of water with various tools. Students will learn about the issues of air pollution from a model using a candle and a jar. Then, students will audit their school energy use, examining sources of potential energy waste in their classroom and will then make suggestions for improvement.

In lesson five, students will learn the basics of ocean acidification, and its impacts on the marine food web and salmon life cycle. Students will explore the effects of ocean acidification as it pertains to ecosystems that are supported by nearby sanctuaries. This will be investigated

through study of pteropods, decalcification, and the intricate marine food web, which humans both impact and rely on. Students will read a scientific article about the impact of decalcification on pteropods. Students will then learn about the pH scale and ocean pH. Students will analyze atmospheric carbon data and compare it to pH data and draw conclusions regarding the relationship between the two and the potential impacts on the salmon food web.

On a field learning experience at Sugarloaf Ridge State Park, students will learn from Robert Ferguson Observatory docents in a presentation on solar energy and participate in solar observations using solar scopes, learning first-hand the power of the sun on our planet. Students will participate in a nature walk focused on climate and local ecology. On this walk, students will make observations of native plants, like they have practiced at their school, to contribute to Project BudBurst and compare the plant specimen at Sugarloaf Ridge State Park to the plant at their school site.

Details on Field Activities:
Sixth grade students will monitor the phenological (life cycle) stages of a native plant specimens at their school site, and contribute the data to an online citizen science project, and learn about the relationship between our climate and local ecosystems. This requires the students to observe a plant multiple times over the course of several weeks to collect their data and compare it to existing data. Students will be provided with guides to identify the phenophases of the plants, and coaching from SEC educators and their classroom teachers in recording their data. Students will participate in solar observations using solar scopes, learning first-hand the power of the sun on our planet, and will also be invited to Sugarloaf Ridge State Park to participate with their families in a nature walk focused on climate and ecology.

Details on Stewardship Element:
In Climate Champions, sixth grade students will discover how much energy their classroom and school may be wasting with an energy audit, and take actions to reduce the energy waste in their learning environment. After practicing in the classroom, students will be invited to audit their homes and help adjust their household energy use to collectively reduce greenhouse gas emissions which are contributing to a warming Pacific Ocean. These students will also take civic action, as part of their concluding lesson students will compose letters to their local government officials and representatives calling on them to make decisions that will protect our watershed and our national marine sanctuaries from the negative impacts of climate change.

Climate Champions Project Timeline

	2017	2018			2019			
Activity	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**
Development								
Recruitment								
Pilot Delivery								
Full Delivery								
Program Evaluation								