

Lesson: Sustainable Table

*Arlington Echo works to continuously improve our lessons. This lesson may be modified over the course of the school year.

Environmental Literacy Question: How have humans affected the Chesapeake Bay and its watershed?

Topic/Essential Questions: How can we reduce our energy use and help the environment?



Content Standards:

- **Environmental Literacy**

5.B.1. *Analyze*, from local to global levels, the relationship between human activities and the earth's resources.

1.B.1: Use recommendation(s) to *develop* and *implement* an environmental action plan.

f. *Recognize* and *explain* that activities and technology of the human species have a major impact on other species in many ways such as: Destruction of habitats through direct harvesting, pollution, atmospheric change (*and erosion*).

5.A.2. Analyze the effects of human activities that deliberately or inadvertently alter the equilibrium of natural processes.

8.A.1. Understand and apply the basic concept of sustainability to natural and human communities.

- **Science**

5.A.1. Analyze the effects on human activities on earth's natural processes.

- **Social Studies**

3.D.1. *Describe* how people adapt to, modify and impact the natural environment

b. *Describe* ways and reasons people in Maryland and the United States modify the natural environment and the consequences of modifications.

- **Common Core State Standards**

CCSS.ELA-Literacy.RI.4.7 *Interpret* information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

Lesson Sequence: This lesson is one of the lessons for Q3 and Q4 at Arlington Echo Outdoor Education Center. This lesson's focus is on decreasing negative environmental impacts of agriculture and eating habits by encouraging sustainable practices such as eating local, seasonal, whole, and organic food.

Length of Lesson:

50 minutes for 6 way overnight programs;

35 minutes for day programs and 9 way overnights.

Student Learning Outcome: The students learn that the food we eat plays an important role in determining the size of our environmental footprint. They will also determine how different farming, shipping and production practices affect energy usage. They will follow a recipe to prepare a simple snack using low environmental impact whole ingredients.

Knowledge of the Learner

- Prerequisite knowledge, skills and processes: Students will complete one lesson in school.
- Student needs, interests, previous learning: Conduct pre-assessment to see level of prior knowledge and address any special needs of students that might need modification.
- Conceptual difficulties: relating production, farming practices, and cooking practices to the cost and ecological impact of food.
- Differentiation: Students are 4th graders, with a diversity of backgrounds and skill levels.

Knowledge of the Content

Vocabulary: (Supplement A)

Blight	Habitat	Preservatives	Sustainable
Compost	Local/Seasonal	Pollinator	Symbiotic
Crop Rotation	Monoculture	Polyculture	Watershed
Fertilizer	Organic		

Materials:

Cutting boards	Recipe sheets
Processed food containers	Plastic food
Whole food and other ingredients in recipe	Knives
Felt board	Story book
How to read a label poster	Bicycle information poster
US produce map poster	Carbon produced from food production poster

Supplements:

- A: Vocabulary
- B: Do you know where your food comes from?
- C: Estimated Carbon released from food production
- D: Energy generation from a bicycle
- E: Recipe plan for of 2017-18
- F: Sustainable Farming Activity
- G: Who can? We can!

Lesson Setup

- Have food containers ready to pass out to students for them to read the labels.
- Ensure that all ingredients and supplies are ready for making the recipe for the day.

Instructional Delivery

Engage: Pass the Energy (5 mins)

Weather permitting, this should be done outside behind the dining hall.

1. Have all the students hold hands in a circle*.
2. Looking up into the sky, ask the students the following questions:
 - **“Where does all energy on earth comes from?”** (*The Sun!*)
 - **“What kind of organisms on earth soak up that energy and make food out of it?”** (*Plants!*) **“And what is that process called?”** (*Photosynthesis!*)

- **“Plants are then eaten by what?”** (*Animals!*)
3. Explain that these animals are eaten by more animals that spreads the energy throughout the food web.
 4. Tell the participants that we will now demonstrate the transfer of energy throughout the food web by “passing the energy” from the sun around the circle. Pick a volunteer to be the first one to pass the energy by gently squeezing the hand next to them**. Tell the students that as soon as they feel a squeeze, they should **gently** squeeze their other hand to keep passing the energy around the circle. Once the person that started the squeezing gets a squeeze we know that the energy has gone all the way around the circle.

If time permits and the participants want to see how fast they can do it you can do it again and time it.

***If participants are adverse to holding hands please have an adult stand between the students that do not want to hold each other’s hands this often occurs between male and female students.**

**** If you notice that the students are squeezing the hands too hard and causing the other participant to be in pain, please ask everyone to drop hands and review the expectations that we will be gently squeezing hands.**

Explore: Reading Labels (10 mins)

Weather permitting, this should be done outside at the picnic table behind the dining hall.

1. Ask: **“What does it mean to be sustainable?”** (*To be sustainable is to be able to maintain what you are doing. For example, if you were running at a sustainable pace, that means that you could keep running at that pace for a long time.*)
2. Pass out the packages of processed and whole foods.

Demonstrate where the students can find the ingredients list on the food labels.

3. Ask the students the following questions:
 - **“Does anybody have a food without a label?”** (*These foods are called whole foods.*)
 - **“Does anybody have a ‘food’ with 5 or more ingredients?”** (*It is a general rule that the less processed a food is, the better it is for you and for the earth. Usually more ingredients means that it is more processed. The more processed a food is, the more energy it takes to make it.*)
 - **“Are there any ingredients that you cannot pronounce or that you have no idea what it is?”** (*In order to prevent foods from spoiling during long distance transport and to prolong shelf life, manufacturers often use chemicals or preservatives to keep our food fresh. Some of these ingredients are not actually food, and are not healthy for us or for the environment.*)
 - **“Are all whole foods healthy for the earth?”** (*No – it depends on how they are produced. Even fruits and vegetables, which are whole foods, can have negative impacts on the environment. In order to make fruits and vegetables look attractive, and to get the most as possible from their plants, farmers may use pesticides and chemicals on their crops. These chemicals can negatively affect us when we eat the food and negatively affect the environment when it rains and they end up in our waterways. Many times, food products that do not look the way that consumers expect them to look are thrown away – this is a waste!*)
4. Point out the garden. Ask the students: **“Is eating food grown in a garden sustainable?”** (*Yes – if we use sustainable methods to grow the food. We can grow food again next year in the same place if we do it right and keep the earth healthy.*)

5. Tell everybody who has a whole food that they will keep it for the next activity. Collect all of the processed food labels except for one. Give a whole food, including meat and eggs, to everybody who does not already have a food.

Explain: Food and Fuel (10 mins)

Weather permitting, this should be done outside at the picnic table behind the dining hall.

1. Explain that in the activities that the students will be doing at Arlington Echo today, they will be learning about energy and how using energy, especially energy from fossil fuels, can be harmful to our natural environment. Ask the students the following questions:
 - **“Does anybody know any examples of fossil fuels?”** (*Coal, natural gas, oil, etc.*)
 - **“Does anybody know where fossil fuels come from?”** (*Decomposed organic matter (animals and plants) from millions and millions of years ago.*)
 - **“So, do these fuels also get all of their energy from the sun?”** (*Yes!*)
2. Explain that burning fossil fuels releases carbon, which is a greenhouse gas, into the atmosphere. Having lots of greenhouse gases in the atmosphere causes climate change.
3. Explain that the production, packaging, and shipping of each food product produces greenhouse gases, such as carbon. Tell the students that they are now going to use the food products that they have been assigned to get in order from most to least – at one end of the line should be the food that they think produces the most greenhouse gases, and at the other end should be the food that they think produces the least.
4. Give the students two minutes to discuss and get in order. Do not tell them the order! Once they are finished, go in order from most to least and have them explain why they chose to put the food in the order that they did. Once they have finished explaining, show them the poster showing the amount of carbon released from food production (**Supplement C**) and reorder the students into the following order:
 - 1) Local, in-season fruits and vegetables]
 - 2) Fruits and vegetables that were shipped from afar
 - 3) Local seafood
 - 4) Seafood that was shipped from afar
 - 5) Chicken
 - 6) Pork
 - 7) Bread
 - 8) Processed food
 - 9) Steak/Hamburger

We know that it is not always possible to buy locally, due to factors including financial restrictions, convenience, seasonal availability, etc. It’s okay that we can’t always go to a farm stand to buy local food, but when possible buying or growing sustainable produce is much better for us and our environment. This is not the only way to be sustainable. Every little step we take makes a big difference!

5. Ask the students, **“What can we do to reduce the amount of energy required to produce the food we eat?”** Here are some ideas:
 - Eat your leftovers
 - Eat less beef
 - Eat less meat
 - Avoid excess packaging, especially plastic and Styrofoam
 - Compost
 - Don’t throw away food by the sell-by date

Elaborate: Recipe Activity (20 mins)

This activity takes place in the upper resource lab on the right side.

1. Explain that today, the students will be preparing a recipe, using mostly whole and local ingredients. (See **Supplement E** to see what you might be preparing on the date of your program.)
2. In order to make the recipe, the students will need to use a blender. Explain that the students will use the blender hooked up to the bike to make this recipe. They will be using potential energy stored in their muscles to pedal the bike. The back wheel of bike wheel is connected to a strap that spins a magnet within a coil of wire. As the magnet spins, electricity flows through the coil and is then stored in the battery, which we will use to power the blender. An average biker can produce about three watts in a minute – this energy could light a 25-watt light bulb for 8 minutes.

(See **Supplement D** for more information.)

3. Have the students look at the recipe and the ingredients. If you need to multiply the recipe, have students do math to get the correct amounts (use measurement conversion charts). Arlington Echo staff will go over the lesson that will be made on your day of program. Make sure that the students are active participants in the process of measuring and making the food.
4. Have the students go in pairs to the bike, where each student will complete 20 full rotations of the pedals while the partner counts.
5. After the recipe is complete, clean up. Compost from peeling or chopping the ingredients goes into a bucket. Explain that when we compost during meal cleanup, Arlington Echo staff adds the compost to the compost bins behind the dining hall and that we use it in the gardens when it is finished.
6. Between lessons, wash materials (if students ate from them) in the Resource Lab sink.

The Story of Bob and Simone – Sustainable Farming Activity (10 mins)

[OVERNIGHT 6-WAY ROTATIONS ONLY]

Introduction:

This activity will demonstrate what it means to be a sustainable farm by exploring different farming practices.

Materials:

Sustainable Farming felt board
Felt board farm pieces
“A Tale of Two Farms” Story
Numbered action cards

Instructions:

1. Keep students seated at the table. Set up the sustainable farming felt storyboard. Explain that the students will use the board to see how various scenarios affect two different farms (Bob’s Farm and Simone’s Farm). If there is time, introduce the activity with the following questions:
 - **“What do we call people who grow crops?”** (*Farmers!*)
 - **“What are we learning about today that may involve farmers?”** (*Food, plants, compost, energy, etc.*)
 - **“Why do we need farmers?”** (*Because they grow the crops that we need to live!*)

- **“Why should a farmer practice sustainability?”** (*Because we will still need crops far into the future.*)

Distribute the numbered action cards to students. Each card corresponds to an action in the story of Bob and Simone. As you read the storybook to the students and come across the actions, announce the action number. The student holding that action number will come to the board, receive the necessary pieces from the instructor, and follow the instructions in the story to place them on the board.

Debrief:

Explain that the goal of the activity is to decide which farm was more sustainable. Ask the students the following questions and let them discuss the answers:

- How did the different events in the story affect the farms? Were there certain events in the story that affected one farm more than the other?
- What were some things that affected the farms that were beneficial? Harmful?
- What are some advantages and disadvantages of each farm?
- Which farm would you consider to be more sustainable?
- Which farm “won” in the end? Let the students debate the answer.

Evaluate: Who Can? (5 mins)

[OVERNIGHT SIX-WAY ROTATIONS ONLY]

1. Ask students about the benefits of eating local foods. You may guide the discussion using the following questions:
 - **“When we buy foods that are imported across the country, how does that impact our environment?”** (*Uses lots of gas, vehicles emit fumes, food is not as fresh due to long travel times so preservatives must be added, extra packaging is required to travel farther distances, chemicals are used to make produce ripen upon arrival, etc.*)
 - **“What options do we have to get fresh produce?”** (*Buy local produce from store, go to a farmer’s market, grow your own.*)
 - **“Food accounts for 1/3 to 1/4 of our carbon footprint. A lot of the energy that goes into food gets wasted; 27% of the food produced in the United States is thrown away! What can you do at home or at school to make wise food choices to protect the bay and have a Sustainable Table?”** (*Use reusable bags, buy products with less packaging, refuse a bag at the grocery store when not needed, reduce the amount of food waste you make, eat leftovers, do not throw away food by its sell-by date. (all food lasts longer than by the sell-by dates! Fruits and vegetables can last for weeks and meats for days), and teach others what you have learned.*)
2. Ask students to come up with things they can do to help reduce the energy needed to produce our meals. Tell the students each time you say, **“Who Can?”** they are to shout back **“We Can!”** Call on students to say something that they could do to reduce energy costs. After each student shares their idea, shout out **“Who Can?”** (**Supplement F**).