

9. Embodied Energy: The Life of Fruits and Vegetables

Source: Written by Carol Yorkden-Chamberlain, inspired by conversations with and the work of Eric Krause. (adapt for Intermediate grades)

Description

Energy is embodied in everything around us, from the food we eat to the clothes we wear. Energy - be it from the sun or from fossil fuels - goes into the production, consumption, transportation and disposal of almost everything we come into contact with on an everyday basis. This activity allows students to begin to understand how energy is embodied, or hidden, in food they eat every day.

Background Information

The *embodied energy* of a product is the energy that is used during the product's entire life cycle, from production to disposal. This activity, for the sake of simplicity, will deal only with the transportation aspect of embodied energy. The focus is on how most foods need to be transported from farms to our grocery stores and then to our homes. This transportation, assuming it is by car or truck, requires the burning of fossil fuels, a limited energy resource that also pollutes our air. Recognizing this, we can see how, from an energy and pollution perspective, buying and eating fruits and vegetables grown on local farms is much more environmentally responsible.

Materials

- ▶ two apples, one grown locally, the other not
- ▶ large map of the world (and smaller photocopies for each student)
- ▶ different coloured markers or pencil crayons
- ▶ pictures from a magazine of a truck, boat, car and plane
- ▶ pictures from a magazine of fruits and vegetables from all over the world
- ▶ magazines (or grocery store advertisements) with pictures of fruits and vegetables in them
- ▶ bags/wrappers/stickers from fruit and vegetables (optional)
- ▶ a chart or other source of information showing distances between different countries (optional)

Time Allotment

Introduction: Embodied Energy: 5-10 minutes

Student Activity: 20 minutes

Discussion: 5-10 minutes

Teaching/Learning Strategies

1. Tell students that everything around us has “embodied” or “hidden” energy and that we are going to use the example of an apple to demonstrate/explore this. Ask students where they think the apple came from (*the grocery store, and before that the farm*). Then ask them how they think the apple got from the farm to the store (*via truck*).
2. Explain how the gasoline used to fuel trucks and cars comes from fossil fuels, that fossil fuels are a limited energy resource, and that the emissions from the gasoline cause air pollution and contribute to climate change.
3. Often the same product can have different amounts of embodied energy, depending on where it came from. Use two apples to demonstrate (e.g. one from Ontario and one from British Columbia). Show the approximate location of an Ontario farm and a BC farm on a map. (Assume that the two apples are essentially the same, just from different locations, and that both travel by truck from the farm to the grocery store).
4. Draw a line showing the distance of each farm to your community. Because the BC apple has further to travel, it uses more gas to get it from the farm to the store. Therefore, it has more “embodied” energy than the Ontario apple does. As a result, the BC apple is responsible for using more valuable energy resources and for polluting the air more than the Ontario apple.
5. Based on this information, what are some things we can do (when local fruits and vegetables are in season) to help reduce our impact on the environment?
6. Have students brainstorm other fruits and vegetables that come from all over the world (e.g., oranges, mangos, kiwi, grapes etc.). Make a list of produce and where it is from and put that list on the blackboard.
7. Have students cut out pictures of these fruits and vegetables from the magazines and glue them onto their map (they could also draw a picture on the map directly, or draw a picture and cut it out).
8. Next, have them draw a line (a different colour for each fruit/vegetable) from where the item originates to their hometown.
 - Optional: have students calculate how many kilometres the food for a fruit salad or for a garden salad had to travel before it got to their grocery store.

It is important to stress is that local foods are not always in season. Therefore, it is often necessary to buy foods from far away, especially during the winter. Also, note that not all foods can be grown in Ontario (e.g., oranges, kiwis) and therefore if we want to eat them, we have to get them from their native countries. This is normal and not bad. However, knowing that you can make a difference environmentally by buying local fruits and vegetables when they are in season, why not try to do your part? The concept of a product’s “embodied” energy illustrates one part of the Ecological Footprint and can provide a focus for discussions about reducing our impact on the Earth.

Follow-up Discussion Questions

- ▶ What other ways of reducing our impact on the Earth can you think of?
- ▶ Where are different foods grown all over the world? (Students from different parts of the world can talk about fruits/vegetables from the country they or their parents were born in. Students born in Canada can talk about the fruits/vegetables that come from the region of Canada they or their parents were born in.)
- ▶ What is the growing season is for different fruits and vegetables in different parts of Canada? How and where do they grow?

Extensions for additional classroom projects/activities

- ▶ Ask students to ask their parents where the fruits and vegetables in their house are from and have students report back the next day.
- ▶ Invite students to encourage their parents to buy locally (when the foods are in season).

Recommended Resources

- ▶ Redefining Progress.org website (lots of information about climate change, the Ecological Footprint and sustainability) <http://www.redefiningprogress.org/programs/sustainability/ef/>
- ▶ Wackernagel, Mathis and William Rees. *Our Ecological Footprint: Reducing Human Impact on the Earth*. New Society Publisher: British Columbia, 1996.

Curriculum Connections: Clustering of Expectations

GRADE 3: SCIENCE & TECHNOLOGY—Growth and Change in Plants (2007)

- 3.7 describe the different ways in which plants are grown for food (*e.g., on farms, in orchards, greenhouses, home gardens*) and explain the advantages and disadvantages of locally grown and organically produced food, including environmental benefits

GRADE 4: SCIENCE & TECHNOLOGY—Habitats and Communities (2007)

- 1.1 analyze the positive and negative impacts of human interactions with natural habitats and communities (*e.g., human dependence on natural materials*), taking different perspectives into account (*e.g., the perspectives of a housing developer, a family in need of housing, an ecologist*), and evaluate the ways of minimizing the negative impacts
- 3.10 describe ways in which humans are dependent on natural habitats and communities (*e.g., for water, medicine, flood control in wetlands, leisure activities*)

GRADE 5: SCIENCE & TECHNOLOGY—Conservation of Energy and Resources (2007)

OE 1 analyse the immediate and long-term effects of energy and resource use on society and the environment and evaluate options for conserving energy and resources

- 1.1 analyse the long-term impacts on society and the natural environment of human uses of energy and natural resources, and suggests ways to reduce these impacts (*e.g., turning off the faucet while brushing teeth or washing and rinsing dishes, conserves water; reusing or recycling products, or using fewer products, conserves natural resources and energy*)
- 3.1 identify a variety of forms of energy (*e.g., electrical, chemical, mechanical, heat, light, kinetic*) and give examples from everyday life of how that energy is used (*e.g., electrical energy for cooking; chemical/electrical energy to run our cars; mechanical energy to hit a baseball; light energy for managing traffic on the roads; heat energy to warm homes and schools*)
- 3.2 identify renewable and non-renewable sources of energy (*i.e., renewable: sun, wind, ocean, waves and tides, wood; non-renewable; fossil fuels such as coal and natural gas*)

GRADE 7: SCIENCE & TECHNOLOGY—Interactions in the Environment (2007)

OE 1 assess the impacts of human activities and technologies on the environment and evaluate ways of controlling these impacts

- 1.1 assess the impact of selected technologies on the environment

GRADE 7 : GEOGRAPHY (2005)

- 7g40 • describe positive and negative ways in which human activity can affect resource sustainability and the health of the environment
- 7g41 • describe a variety of ways in which people use and manage renewable, non-renewable, and flow resources to meet their needs