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***P.O.V.'S BORDERS: ENVIRONMENT* | FOR EDUCATORS**

EARTH LESSON 1: THE FOOD WE EAT, THE SEEDS WE SOW

INTRODUCTION

Food is our most basic necessity: without it, we cannot survive. Although food is basic to our lives, however, there are very complex processes – both biological and cultural – that lead to the vastness of food options we enjoy. This food diversity is a product of seed diversity, and results in cultural diversity. One might even say that seeds *are* culture – neatly packaged for passing down from generation to generation. More and more, we ask what society would be like without cultural diversity. If we follow the seeds = culture idea, we then would need to ask what food would be like without seed diversity. This lesson plan aims to explore the importance of seed diversity for cultural and ecological stability/health.

GRADE LEVEL

This lesson plan is designed to be used with high school students but can also be adapted to other grade levels. (See the Extension Ideas section, below).

SUBJECT AREAS

This lesson plan addresses concepts in Environmental Science/Ecology, Biology/Botany, and the Social Sciences/History.

OBJECTIVES

By the end of this lesson, students will:

- understand and be able to discuss the importance of seed diversity; and
- understand what an heirloom seed is and why they are important to conserve.

ESTIMATED TIME NEEDED

Two to three full class periods, plus time for students to inventory available fruit diversity in their local supermarket either individually or as a class.

MATERIALS

- Computer with Internet access

- Sampling of apples, tomatoes or other seed fruit that is edible without cooking for the class

PROCEDURE

Day One:

1. The teacher should introduce the concept of food/seed diversity and explain to the class that they will be undertaking a study of food diversity in their area.
2. Homework Assignment:

Students should go to their local supermarket to inventory seed fruit diversity. [Note that the term "fruit" used throughout this lesson refers to the botanical meaning of the word – the mature, enlarged ovary of a plant that contains seeds for future plant regeneration.]

In the supermarket, students should make a list of all the varieties of tomatoes, peppers/chilies, onions, apples, lettuce, or other seed-derived food items. Data collection in the supermarket should include the names of each variety and a brief physical description of each variety. For example, for apples, the student would list the varieties (i.e. Granny Smith, Macintosh, etc...) and describe the basic appearance of each one (i.e. light green and almost perfectly round, dark red with a multi-pointed bottom, etc...). Be sure that students list the date of their inventory, the name of the supermarket and its location.

Depending on the diversity of seed fruits that are available in your area, the teacher may want each student to inventory 3-5 fruits each, or for each student to concentrate on only one fruit to inventory. The overall goal for the class is to inventory as many fruits and varieties as possible, however the teacher feels this can be best accomplished based on her/his individual teaching situation.

Day Two:

3. Master Inventory and Discussion:

Compile a master list of varieties of available seed fruits, including their physical characteristics. Facilitate a class discussion around the availability of different varieties of fruits. Was there much difference between the number and selection of varieties among the class' supermarkets? Do some supermarkets cater to a different clientele than others? Do some stores carry more fruit variety than others? Are certain varieties of each fruit available in some areas that are represented in your class and others not as widely available? If differences do exist, what do you think they are they based on (i.e. culture, income, etc.)?

Look at the list of physical characteristics for each variety of fruit. How do they vary

(i.e. in shape, color, size, texture, etc.)? Are physical differences important? If so, why? What difference does it make that there are different varieties of apple, lettuce or tomato? When a choice to purchase a particular variety is made, what is this decision based upon (i.e. culture, taste, aesthetics)?

4. Seed Diversity Exploration and Discussion:

The teacher should bring in (or have students bring in) a few samples of each variety of a particular fruit that can be eaten raw (i.e. apple or tomato). In small groups, have students dissect the fruit to extract the seeds. Notice any differences in the seeds based on the particular variety of fruit.

Does their size differ? Does the physical appearance of the seed reflect the appearance of the fruit? Does the size of the seed reflect the size of the fruit? Of the plant? If one seed from each variety were put into a bowl, would the students be able to distinguish which seed came from which variety of fruit?

Hold a blindfolded taste test for the different varieties of fruit (apples work well for this). Notice whether the appearance of the fruit is reflected in the taste. In other words, is the actual taste the same as the expected taste based on what the fruit looks like? Would you expect an apple that is bright red with some spots to be sweet, tart, bitter? Can the students predict what something is going to taste like based on its appearance?

Day Three (or Alternative/Extension Activity):

5. Heirloom Seeds and Intellectual Property Rights:

Have students play the garden game on the POV website and try to win some heirloom seeds. When finished playing, explore the informational resources linked on the game regarding the story of (name of guy). Discuss what heirloom seeds are and why they are important to conserve.

Main concepts to explore include the local knowledge of seed plants and who "owns" that knowledge. Can knowledge of which plant varieties bear the biggest/juiciest/most drought resistant, etc. fruit be sold? Who is able to sell this common knowledge of plant resources and at what price? Does the sale price make a difference? In other words, if an indigenous person was paid \$100 for his/her botanical knowledge as opposed to \$10,000 would it make a difference?

This botanical knowledge is considered "intellectual property." In other words, knowledge is something that can be "owned." Large agricultural companies are claiming this "botanical property" as their own and are obtaining patents on the chemical information contained within the plant. This prohibits anybody else from using this knowledge (or the resource) without paying a royalty.

Can we put a patent (what's put on new inventions!!) on nature? Who owns nature? If nature is something that is commonly owned (shared and taken care of by many people), should we be able to profit from it?

What if this knowledge has been passed down through several generations in the form of seeds? If we consider seeds to be small packages of intellectual property (because knowledge of the plant that grows from the seed – i.e. growing range, size of fruit, sweetness or juiciness of the fruit, resistance to fungus or drought, etc...), what does it mean that large agricultural companies are taking this "property" as their own? What do you think about the statement that seeds equal culture? How might this be a true statement?

Related Articles Found Online:

- *Monsanto and the Mustard Seed* by Vandana Shiva
http://www.earthisland.org/eijournal/new_articles.cfm?articleID=294&journalID=49
- *The Spinning Wheel and the Seed: Gandhi's Legacy, Humanity's Hope* by Dr. Vandana Shiva
http://www.navdanya.org/movement/gandhi_pf.htm
- *Pushing Hope's Edge: Rediscovering the Power of Food* by Francis Moore Lappe and Anna Lappe
www.dietforasmallplanet.com/documents/United_Methodist_Women_06_20_01.PDF
- *Seeds of Justice, Seeds of Hope* by Anna Marie Carter
<http://www.futurenet.org/25environmentandhealth/carter.htm>
- *The Scarcity Myth* by Frances Moore Lappe
http://www.theecologist.org/archive_article.html?article=377
- *The Role of Indigenous Seeds in Africa's Food Security* by Clyde Sanger
http://web.idrc.ca/es/ev-5538-201-1-DO_TOPIC.html
- *Heirloom Seeds* by Gregg Bance
<http://www.farm-garden.com/primers/4/heirloom-seeds.htm>
- *Zapatista Seed-Saving Project Puts its First Collection of Traditional Corn Seeds into Deep Freeze Storage in the Highlands of Chiapas, Mexico* by Global Exchange
<http://www.globalexchange.org/countries/mexico/biodiversity/354.html>
- *A Harvest of Silence* by FAO
<http://www.fao.org/worldfoodsummit/english/newsroom/focus/focus7.htm>
- *Saving the Seeds of the World: A Voice of the Bioneers* by Kent Whealy
http://www.earthisland.org/eijournal/new_articles.cfm?articleID=262&journalID=48
- *A Better Way to Feed the Country* by Frances Moore Lappe and Anna Lappe
http://seattlepi.nwsourc.com/opinion/71311_foodop.shtml

ASSESSMENT SUGGESTIONS

- Have students write a short essay about seed diversity and why it is important to conserve.
- Have students debate intellectual property and heirloom seeds. One group could be the indigenous people who have been using and passing down seeds for several

generations. The other group could be a large agri-business that wants to patent a particular seed variety.

EXTENSION IDEAS

- Prepare a meal/pot luck using as many varieties of each plant as possible. Celebrate the diversity available to you! Are any heirloom varieties available that you could include in your celebration?
- How do different cultures use the same fruit? I.e. How do people from India vs. North America vs. Asia vs. Italy use tomatoes in their cooking? Are some uses more similar than others? Why do you think this is?
- For younger students – read the book about Johnny Appleseed. Have an apple taste test in class. Plant some apple seeds to watch grow in the classroom.
- Grow a particular seed-bearing plant and study its growth and development from seed to seed (through process of growth and reproduction). Fast-growing annuals are particularly useful for this activity.

RELATED NATIONAL SCIENCE EDUCATION STANDARDS, GRADES 9-12

Science Standards

Science as Inquiry

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

Life Science

- Biological evolution
- Interdependence of organisms

Science and Technology

- Abilities of technological design
- Understandings about science and technology

Science in Personal and Social Perspective

- Personal and community health
- Natural resources
- Environmental quality
- Natural and Human-induced hazards
- Science and technology in local, national and global challenges

Health Standards

Students will comprehend concepts related to health promotion and disease prevention.

- Analyze how the environment influences the health of the community

Students will analyze the influence of culture, media, technology and other factors on health.

- Analyze how cultural diversity enriches and challenges health behaviors
- Evaluate the impact of technology on personal, family and community health
- Analyze how information from the community influences health

RESOURCES FOR TEACHERS AND STUDENTS

United States Environmental Protection Agency

<http://www.epa.gov/>

Includes information on land use and environmental impact, environmental justice, smart growth and sprawl, and many other related topics. Includes an alphabetical list of all topics contained on the site.

Natural Resources Defense Council

<http://www.nrdc.org/>

Includes information on land use and abuse, smart growth and sprawl, and other related topics. Also includes links to related sites/organizations.

United States Geological Survey

<http://www.usgs.gov/>

Site of the federal agency that is primarily concerned with the study and mapping of the earth and how it has changed over time. Includes information on land use history in North America and other land use change documentation. Includes index of topics.

National Sierra Club

<http://www.sierraclub.org/>

Site includes articles on various localities across the U.S. that are dealing with land use/abuse issues. Also includes the Land Use/1999 Sprawl Report (see how your state rates!).

Maptech.com

<http://www.maptech.com/mapserver/index.cfm>

Use USGS maps to create/save/print "My Map" with your own icons. Database of maps includes entire United States.

Topozone.com

<http://www.topozone.com/>

Free, downloadable topographical maps for the entire U.S.