
Course Makeover Example: Grade 4-5 Enrichment Course

How do curriculum and instruction change as a result of using a sustainability approach? How does the content become richer, and level of inquiry deepen? This document describes how a 4th-5th grade enrichment course changed when a teacher applied sustainability concepts and approaches.

This course makeover was an outcome of the 2006 Summer Sustainability Institute sponsored by the Children’s Environmental Literacy Foundation, with facilitation provided by Creative Change Educational Solutions. During the intensive week-long institute, teachers gained content knowledge, resources, and strategies to rethink their approach to curriculum and instruction using the lens of sustainability. Planning time and one-on-one mentoring at the institute enable teachers to walk away with a unit or course “makeover” like this one that was implemented during the school year.

After the week-long institute, the teachers received on-going support and communication. Teachers sent their in-progress lesson plans to CELF and Creative Change and received feedback and mentoring via phone and e-mail. This document is an outcome of this process.

Teacher’s Comments on the process and the impacts of the Institute:

“The course was profoundly important to me. I was already committed to teaching kids about the environment, but this course drove my commitment up several notches. As a result of what I learned, I do plan to change the focus of my (formerly called) "Save the Earth" enrichment class (held once a week for a quarter of the school year). Formerly, it was mainly about the garbage problem and decomposition, and our wasting of water and paper. This course helped me to refocus on systems thinking, and imbuing the kids with an understanding of the ecosystem, and how various human activities affect it. I will focus on food, because our school (Claremont, in Ossining) has had a "Fit Kids" program for the last two years, which will continue this year, and part of that focuses on nutrition. I think this will dovetail well with that school-wide program. We will analyze the ecological footprint of what and how we eat, and consider solutions and social action in regard to that.”

An overview of the “after” course follows. The overview begins with a summary of the “Big Ideas,” or essential outcomes students should understand as a result of the course. In the Institute, teachers worked on developing and sequencing Big Ideas as a strategy for guiding instruction. This course is an outstanding example of how powerful lessons result from using this approach.

FOOD FOR THOUGHT: Are we Eating up the Earth?

A 7-8 week Enrichment Course on Sustainability

Laura Myerson, Claremont School, Ossining, New York

Course Overview

“Big Ideas” in this course:

1. **All elements in a system are interdependent.** Therefore, as in any system, if one element fails, the functioning of the entire system is disrupted.
2. **The earth is a living system, called the ecosystem. A healthy ecosystem has no waste.** Nature absorbs and transforms waste into food. The environment is both the source of all we need for life, and the sink for its waste. For life to be sustained, the environment must be able to renew its resources to provide what is needed for life, and to absorb and transform its waste. The natural world maintains this balance on its own.
3. **Human beings are part of the ecosystem.** All human activity occurs within, and is dependent upon, the resources available in our environment. Animals, plants and all other living things share the world as means living within the capacity of the Earth to support ongoing life. Human activity has an “Ecological Footprint – how many resources humans demand of the earth and how much waste they create for it to absorb. (*Susan: I think this unit is too short to get into the footprint being measured in land area. Am I wrong?*) If we consume more resources than the environment has the capacity to replenish, or we create more waste than the environment has the capacity to absorb, it will not be able to sustain us. We have to regulate our activity to conform to nature’s laws, or the ecosystem we’re part of will fail.
4. **The way humans grow, process, distribute, consume and discard food and water is one way in which human activity affects the ecosystem.** Growing crops and raising animals for food is often done in such a way that it pollutes the soil and air, and consumes more energy than can be replenished.
5. **Much of what people in our country eat is unhealthy,** poisoned with pesticides, mercury, growth hormones, antibiotics, filled with non-nutritional additives, depleted nutritionally by processing, transporting, storing and packaging. There are healthful alternatives in whole, organic, locally grown foods, reducing or eliminating consumption of meats and fish, reducing serving sizes, and rejecting fat-laden, over-processed fast foods.
6. **Human access to food and water is highly unequal, depending on region, and economic status.** A small number of affluent people, particularly in our country, consume a grossly disproportional amount of food and water, while millions are starving. Insuring that the world can sustain us demands that we insure that it sustains everyone, because we are all elements in the system.
7. **Children can take action to support sustainable farming and eating practices** in their own lives, in their homes, in their school, and in their society.

Lesson One: All elements in a system are interdependent.

Big Idea: A system depends on the functioning of all its elements, which are interdependent. If one element breaks down, the system breaks down.

Learning Outcome: Students will be able to identify the principles for success in the Silent Squares games, and evaluate another system using those principles.

Vocabulary: system, interdependence, element, ecosystem

Procedure:

- 1. Students brainstorm how what we eat has to do with saving the earth.** Discuss, make web.
- 2. Students play “Silent Squares.”**
- 3. Discussion Goal:** You can’t succeed on your own; your success depends on everyone else’s. Therefore, to succeed, you must be aware of what other people need, and work to provide for their needs as well as your own.
- 4. Together, plot elements of body system.** Is it a functioning system? What are the elements? When is the body not functioning properly? When there’s disease. Holistic approach. [Your body is a self-regulating system (elimination of waste, sweat, shivering, panting, etc. Voluntary and involuntary cooperation)]
- 5. Generalize principle of interdependence across domains:** Students generate examples of other systems with which they’re familiar (school, sports teams, the ecosystem, the country, etc.) Groups choose one domain and discuss the elements involved. Using a work sheet to guide them, they will create a list of elements in their system, explain how they are interdependent, and show how the failure of one element will result in success or failure of the system as a whole. Groups share.

Lesson Two: The earth is a system, called the ecosystem.

Big Idea: Nature provides all the resources to maintain life on earth, and absorbs and transforms life’s waste into food. The environment is both the source of all we need for life, and the sink for its waste. For life to be sustained, the environment must be able to renew its resources and to absorb its waste and transform it into food. The natural world maintains this balance on its own.

Learning Outcome: Students will be able to identify the elements in the life of a tree, and how they are dependent on one another. They will be able to construct the waste cycle and recognize that one element’s waste is another’s food. They will relate this phenomenon to their experience in “The Silent Squares” game. Students will construct a web or timeline to show the development of a tomato.

Vocabulary: ecosystem, resources, waste, bacteria, decomposition, source and sink, sustainable and unsustainable

Procedure:

1. **The teacher will read “The Strongest Tree.”** As a class, in discussion, create a web with tree in middle, showing the elements in the tree system: leaves, flowers, fruit, pollen, birds, bees, worms, sun, poop, bacteria, mushrooms, soil, water.
2. **Discuss: What is the waste in this system?** What happens to the waste? Direct discussion toward understanding that there is waste for individual elements in the system, but not for the system. E.g., leaves are waste for the tree, but bacteria and worms use it to make soil. An animal excretes waste, but it fertilizes the soil, etc.
3. **Make a compost pile** in large planter. Kids predict which objects being buried will decompose in 4 weeks’ time. Bury small plastic cube, piece of bread, piece of plastic bag, piece of baby’s diaper, piece of tomato, piece of apple, small eraser, paper clip, lettuce, etc.

Lesson Three: Human beings are part of the ecosystem.

Big Idea: Human needs are dependent on natural resources. Our “ecological footprint” is the impact we have on the earth when we take resources from it to satisfy our needs, and leave waste in it. If humans’ ecological footprint is larger than the earth’s capacity to renew the resources we use and absorb our wastes, we “overshoot” the earth’s biocapacity. The more this happens, the more nature’s self-renewing balance is damaged, and the ecosystem fails.

Learning Outcome: Students will be able to distinguish between human needs and wants. They will identify the resources and waste of a human activity of their choice.

Vocabulary: renewable and non-renewable resources, biocapacity, ecological footprint, overshoot

Procedure:

1. **The earth’s resources are finite.** It’s a closed system, with nothing going in or out. Water, air, soil, etc. the same as when the dinosaurs roamed the earth. Pass out words and play song by Tom Chapin, “Someone’s Gonna Use It After You.”
2. **So what resources do we need? Students list needs vs. wants.** (Needs are things we can’t live without). Discuss.
3. **Groups or pairs choose one need (e.g. shelter).** Prepare a concept map to present to the class on how we satisfy that need. (Use a template to guide them) What resources are used? Where do those resources come from? Who extracts them? What other parts of the ecosystem are effected by their use of those resources? What wastes are created by the human activity involved in satisfying this need? (building shelter, growing food, getting water, etc.)? How can this need be satisfied with the smallest possible ecological footprint? If too many people are demanding these resources from the environment, what impact can this have on the ecosystem?

Lesson Four: The way humans grow, process, distribute, consume and discard food and water is one way in which human activity effects the ecosystem.

Big Idea: Growing crops and raising animals for food is often done in such a way that it pollutes the soil and air, and consumes more energy than can be replenished.

Learning Outcome: Students will read about, identify, and quantify the sources of energy and waste involved in growing, processing, distributing and preparing a meal of hamburger, fries and a cola.

Vocabulary: fossil fuel, overgrazing, topsoil erosion, pesticides, groundwater, run-off

Procedure:

- 1. Introduce: Biography of a Tomato.** Everything has a biography. Students work in groups to show generation of tomato from seed to your plate. Students will most likely give the simplest scenario (closest to local, organic). They will be asked to explain what the waste is and what happens to it. Discuss in what way this system is sustainable (waste = food). Then meet as a whole class to map the development of a tomato produced by Industrial Agricultural model. Why is this unsustainable (waste = pollution)?
- 2. Compare.** Students will tell their partners what is different about the two scenarios, particularly in terms of waste sources and sinks. Which do they think is better for the earth, and for us? Why? How can we eat tomatoes without using so much energy and creating so much waste?
- 3.** Groups of 4 will split up responsibility for reporting on hidden energy use in the (1) hamburger, (2) fries, (3) cola, (4) restaurant. They will propose an alternative meal that uses less energy and/or renewable energy.

Lesson Five: Much of what people in our country eat is unhealthful. There are healthful alternatives we can choose.

Big Idea: Due to current farming practices, much of our food is poisoned with pesticides, mercury, growth hormones, antibiotics, filled with non-nutritional additives, depleted nutritionally by processing, transporting, storing and packaging. There are healthful alternatives in whole, organic, locally grown foods, reducing or eliminating consumption of meats and fish, reducing serving sizes, and rejecting fat-laden, over-processed fast foods.

Learning Outcome: Student will be able to construct a Venn diagram contrasting industrial farming practices with organic farming.

Vocabulary: antibiotics, growth hormones, processing, additives, whole foods

Procedure:

1. Students to brainstorm what things make foods they eat healthful or unhealthful.
2. Students look at images of factory farm, discuss treatment of animals.
3. Put group of students in a box. Tell them they'll live there for 24 hours. Discuss: How happy and healthy will they be? How will your muscles feel? How will you exercise? How will you relieve yourself? How long will it be before a fight breaks out? If it does, how would it be if I tied your hand to prevent fighting? Would that be the best solution? How long will it be before a cold or other sickness breaks out? How would it be if I gave all of you antibiotics to prevent contagion? Would there be a better solution?
4. If you were a cow, how would you like to live? What conditions would make you healthy and happy? If you were a farmer, how would you like to raise your animals and plants?
5. Students will create criteria for what's healthful. Why does it matter?

Lesson Six: Human access to food and water is highly unequal, depending on region, and economic status.

Big Ideas: A small number of affluent people, particularly in our country, consume a grossly disproportional amount of food and water, while millions are starving. If we want the world to sustain us, we have to ensure that it sustains everyone, because we are all elements in the system. If one group of people take far more than they need, it deprives others of their share, and upsets the balance of nature. Eventually, the excessive demands on the ecosystem will deplete it of non-renewable resources and it will no longer be able to sustain anyone.

Learning Outcome: Students will experience the inequitable distribution of resources globally, interpret a pie chart showing the division of world resources by population, and discuss and write about the connection between the life style of the rich, and even their own life style, to hunger and poverty here and around the world. What if everyone in the world engaged in the overconsumption characterized by the American way of life? They will consider the ethical, social and security implication of inequality in their community, country and the world.

Vocabulary: Scarcity, distribution, discrimination

Procedure: “Let Them Eat Cake!” lesson from Facing the Future.

Lesson Seven: Children can take action to support sustainable farming and eating practices in their own lives, in their homes, in their school, and in their society.

Big Ideas: Students can find out information about the environmental impact of the foods served in the school cafeteria, and make recommendations about how to reduce our school's ecological footprint.

Learning Outcome: Students will be able to evaluate according to parameters they develop cooperatively based on what they've learned and already know, e.g., fresh or processed, high fat or low fat, high (hidden) energy/pollution factors vs low, dangerous foods (such as tuna), whether the foods could be purchased locally, production methods, etc.

Vocabulary:

Procedure:

1. Students set up parameters for evaluating food based on sustainability and taste/aesthetic principles.
2. Students examine a menu of meals from the cafeteria for one week. Groups each take a different day's lunch to study. Individual group members can take on one element in the meal to study. Using the parameters they set up for what makes food healthy, they will write a report card for that day's meal.
3. Students will also make written comments and recommendations on the report card about (realistically) how to make school lunch's more sustainable.
4. Finally, students must write why it matters whether food is processed, purchased locally, etc. This report card should incorporate vocabulary and concepts discussed in the course of the 7 classes.
5. The above is an assessment of what they've learned.