

## Lesson 2: The 4 R's of Waste

Students investigate and teach each other about the four environmental R's – reduce, reuse, recycle and recover.

**Length of Lesson:** 2-3 class sessions

**Subject Area(s):** Science, Language Arts, Math, Technology

### Objectives

Students will:

- Investigate and share information about one of the four environmental R's.
- Determine how one product could be reduced, reused, recycled and/or recovered.
- Make recommendations about an integrated waste management strategy for their school.

### Materials

- Polystyrene foam egg carton (not cardboard egg cartons)
- Several pairs of plastic gloves
- Student Activity Sheet- Reduce, Reuse, Recycle, Recover Investigation
- Access to the Internet
- Access to other areas of the school

### Background Information

- All items are made from natural resources which can be used again. Objects that humans use come from four main natural resource groups: forests/plants, animal, mineral and fossil fuel. What humans do with objects once they are finished with them can have a huge impact on our environment and our lives.
- Note that the egg carton used in the example in this lesson is made of polystyrene foam. Cardboard is also used for some egg cartons. Cardboard cartons are recyclable while polystyrene foam egg cartons are not.
- There are four main actions that we can take, other than throwing away an object, to help our environment. They include 4 R's:
  - Reduce- to use less of an object in the first place
  - Reuse- to use an object over and over again
  - Recycle- to turn an object or its parts into something else
  - Recovery- to use energy from the waste as power
- Effective and responsible waste management includes a balance of all of these actions.

### Procedure

1. Hold up a Polystyrene foam egg carton. Ask students what they think this egg carton is made of, how many egg cartons they think their family uses in an average year, what their family typically does with their egg cartons, and what the environmental impact might be of the number of egg cartons that are currently used.

2. Then challenge student groups to come up with ideas for reducing the number of egg cartons in the waste stream. This could include using fewer egg cartons, reusing the same egg cartons over again, recycling egg cartons into other products and uses, designing a different type of egg carton made from recycled materials, etc. Note: many students will point out that their egg cartons are made of cardboard. These can be recycled as can most paper products. Share answers. Discuss:
  - a. Why would we want to reduce the number of egg cartons in the waste stream?
  - b. How would this reduction impact them personally, their community and the environment?
  - c. What would prevent students from actually implementing one of these strategies?
  - d. How can they apply this model and these strategies to general waste in the United States?
  - e. What are the risks of not reducing our national waste production?
3. Put these four words on the board: reduce, reuse, recycle, and recover. Explain that each of these R's is a waste management strategy that can be implemented to help reduce the amount of waste we produce or do something positive with the waste we produce.
4. Ask students to come up with a class definition for each word and how they think it relates to waste management. (They may have trouble with "recover" since it is a relatively new technology). Simple definitions for each are included in the background section.
5. Ask students to share how they have used one or more of the four R's in the last week. Then ask them to share how they could have used one of the R's but chose not to.
6. Have the class share what they already know about each of the R's and then generate a list of things they'd like to learn.
7. Divide students into groups. Distribute the Reduce, Reuse, Recycle, Recover Investigation student activity sheet.
8. Have students use previous knowledge or online resources such as [www.thinkgreen.com](http://www.thinkgreen.com) or [www.epa.gov](http://www.epa.gov) to complete the information on the sheet.
9. Then have them present their information to the rest of the class, sharing information about their R's human and environmental benefits and the specific roles that they and others could take in more consistently implementing it.
10. Once all groups have presented, discuss:
  - a. How are the 4 R's currently being implemented at the school?
  - b. How can the information they've learned be used to reduce waste production at the school?
11. Challenge students to list 5-10 common waste items that find their way into school trashcans. (They may need to explore some trash cans at the school to help). Items could include paper, milk cartons, glass, bottles, aluminum foil, glossy paper, boxes, cardboard, etc.
12. If possible, allow students to audit specific trashcans and actually weigh their items to draw conclusions about school-wide waste amounts
13. Still in their groups, have students investigate how their trash item is currently disposed of at school. If necessary, have students conduct interviews with appropriate school personnel to determine how this waste is disposed of, whether any of the 4R's are currently being implemented with their product, and what happens if the product is simply placed in the trashcan.
14. After gathering information, have students create at least one strategy to reduce the school's waste production using their product and at least one of the 4 R's.
15. Have students share their strategies with each other and select 3-5 strategies from the entire list that will have the greatest impact. The strategies they select should relate to at least two of the four R's.

16. Then have students design a way to present these strategies, along with their presumed impact, to school officials; custodial, cafeteria or office staff; or any other school-based decision makers.

## Extension

- Have students learn about school or district policies with regard to recycling, reusing and reducing as well as any policies about purchasing recycled materials.
- Have students interview a local business owner to determine how they apply the 4 R's to their own waste management.

## Home Extension

- Encourage students to talk with their parents about the importance of implementing the four R's at home. Challenge them to come up with at least three specific changes they will implement to reflect a balanced home waste management strategy. These could include buying less; buying items that could be recycled; buying in bulk; avoiding single serving containers whenever possible; buying concentrated products that use less; reusing bags; using durable rather than disposable materials; and using washable cups, plates and silverware.
- Challenge students to create a series of meals for one week (breakfast, lunches or dinners) using materials that are or can be reduced, reused, recycled or recovered.

## Evaluation

You can evaluate your students using the following three-point rubric:

- **Three points:** Students generate several ideas for reducing egg cartons in the waste stream and effectively relate these strategies to the overall waste problem in the US; work effectively in groups to research their waste management strategy; complete their activity sheet with correct information; and design an appropriate strategy to reduce waste at their school.
- **Two points:** Students generate some ideas for reducing egg cartons in the waste stream and somewhat effectively relate these strategies to the overall waste problem in the US; work somewhat effectively in groups to research their waste management strategy; complete their activity sheet with mostly correct information; and design an appropriate strategy to reduce waste at their school.
- **One point:** Students unable to generate ideas for reducing egg cartons in the waste stream or to relate these strategies to the overall waste problem in the US; unable to work in groups to research their waste management strategy; complete their activity sheet with some correct information; and unable to design an appropriate strategy to reduce waste at their school.

## Standards Correlation

**This lesson plan may be used to address the National Science Education Standards listed below.**

Subject: Science as Inquiry

Standard: Abilities necessary to do scientific inquiry

Benchmarks:

- Identify questions that can be answered through scientific investigations.
- Use appropriate tools and techniques to gather, analyze and interpret data.

Subject: Physical Science

Subject: Science and Technology

Standard: Abilities of technological design

Benchmarks:

- Identify appropriate problems for technological design.
- Implement a proposed solution.

Subject: Science and Technology

Standard: Understandings about science and technology

Benchmarks:

- Scientific Inquiry and technological design have similarities and differences.
- Perfectly designed solutions do not exist.

Subject: Science in Personal and Social Perspectives

Standard: Populations, resources and environments

Benchmarks:

- When an area becomes overpopulated, the environment will become degraded due to the increased use of resources.
- Causes of environmental degradation and resources depletion vary from region to region and from country to country.

Subject: Science in Personal and Social Perspectives

Standard: Natural hazards

Benchmark: Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal.

Subject: Science in Personal and Social Perspectives

Standard: Risks and benefits

Benchmark: Individuals can use a systematic approach to thinking critically about risks and benefits.

Subject: Science in Personal and Social Perspectives

Standard: Science and Technology in Society

Benchmark: Societal challenges often inspire questions for scientific research, and social priorities often influence research priorities through the availability of funding and research.

**This lesson plan may be used to address the North American Association for Environmental Education Learning Guidelines listed below.**

Strand 1: Questioning, Analysis and Interpretation Skills

Guideline: Organizing Information

Benchmark: Present environmental data in a variety of formats including charts, tables, plots, graphs, maps, and flow charts.

Strand 1: Questioning, Analysis and Interpretation Skills

Guideline: Drawing conclusions and developing explanations

Benchmarks:

- Consider the possible relationships among two or more variables.
- Use their proposed explanations to form new questions and suggest new avenues of inquiry.

Strand 2: Knowledge of Environmental Process and Systems

Guideline: Human/environment interactions

Benchmark: Explain how human-caused environmental changes cause changes in other places.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Guideline: Identifying and investigating issues

Benchmarks:

- Clearly articulate and define environmental issues.
- Identify key individuals and groups involved, their viewpoints and the types of action they support.
- Investigate the issue using secondary sources and original research where needed.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Guideline: Sorting out the consequences of issues

Benchmarks:

- Describe the effects of human actions on specific elements, systems and processes of the environment.
- Analyze issues by looking at tradeoffs that have been made.
- Speculate about the effects of a proposed state or local environmental regulation.
- Predict the consequences of inaction or failure to resolve particular issues.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Guideline: Identifying and evaluating alternative solutions and courses of action

Benchmark: Independently and in groups, develop original strategies to address issues.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Guideline: Forming and evaluating personal views

Benchmarks:

- Discuss personal perspectives with classmates, remaining open to new ideas and information.
- Justify their views based on information from a variety of sources.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Guideline: Evaluating the need for citizen action

Benchmarks:

- Discuss whether action is warranted.
- Identify different forms of action that citizens can take in the economic, political and legal spheres, as well as actions aimed at directly improving or maintaining some part of the environment or persuading others to take action.
- Speculate about the likely effects of specific actions on society and the environment, and the likelihood these actions will resolve a specific environmental issue.
- Point out advantages and disadvantages of their personal involvement, considering factors such as their own skills, resources, knowledge, and commitment.

Strand 3: Skills for Understanding and Addressing Environmental Issues

Guideline: Planning and taking action

Benchmark: Develop action plans they can carry out individually, in small groups, or within a class, club, or larger organization.

Strand 4: Personal and Civic Responsibility

Guideline: Recognizing citizens' rights and responsibilities

Benchmark: Identify rights and responsibilities associated with citizenship, including personal and civic responsibilities.

Strand 4: Personal and Civic Responsibility

Guideline: Accepting Personal Responsibility

Benchmarks:

- Analyze some of the effects that their actions have on the environment, other humans, and other living things.
- Identify ways in which they feel responsible for helping resolve environmental issues within the community.