GO WILD IN NEW YORK CITY

Inquiry project: Keeping Your Garbage Bin Empty

In this lesson students will measure the amount of garbage they generate in school and develop ways in which they can reduce it by reusing and recycling things. They will finally compare the waste they generate after developing new habits regarding waste production to the initial amount of garbage they had produced.

Learning Goals

At the end of this project, students will be able to:

- Measure the amount of garbage they generate.
- Understand the concepts of Reduce, Reuse and Recycle.
- Understand that the concept of waste is defined by each culture.
- Create ways to reuse different objects they previously threw as garbage.
- Propose ways to recycle things they previously threw as garbage.
- Learn that they can play a role in reducing the amount of garbage generated in New York City.

Background Information

The amount of garbage produced by each American has doubled in the last 50 years. This is also true for New Yorkers, who generate approximately the same amount of waste per person as the national average, which is 4 and a half pounds every day. 33 % of it is composed by paper and paperboard, followed by 15 % of food and 10 % of plastics (see Go Wild in New York City, page 70).

Where does all that garbage go? How is it disposed? Basically, part of the garbage is recycled, while the rest goes to landfills. In 1989, the City launched Local Law 19, which requires that all New Yorkers separate recyclables from household and commercial garbage. Recyclables include paper and cardboard, beverage cartons, bottles, cans, metal and foil. Before it was closed in 2001, most New York City garbage was disposed in the Fresh Kills Landfill on Staten Island, which was so big that it could be seen from space. At present, most of New York City garbage goes to dumps in New Jersey, Pennsylvania and Virginia (see Go Wild in New York City, page 70).

Demographic changes, as well as technological advances and changes in consumption habits have had a profound impact in the increase in the amount of garbage generated in the United States. But there is much to be done in order to stop this trend. The basic elements for reducing solid waste are Reduce, Reuse and Recycle, which students can learn to implement.

To Reduce is to limit the production of garbage before it is generated. Reducing the amount of waste also means using less energy and natural resources to process and

transport it, as well as using less land to bury waste in landfills. Buying goods that use less packaging, sharing or renting items instead of purchasing them, taking our own cloth bags to stores to replace plastic bags, and saying no to menus and disposable food utensils are only a few examples of ways to reduce garbage (see Go Wild in New York City, page 71).

To Reuse means using and item more than once, such as when using a plastic bag from the grocery store to dispose garbage at home or using plastic and glass jars when they are empty. Recharge batteries and donate our old things to charity so that other people can use them are other examples of the many ways of reusing things.

Finally, to recycle means to convert an item into another useful thing. As it was mentioned before, New Yorkers are required to separate paper, cans, bottles and other recyclable items from the rest of household garbage. In turn, these recyclables go to industrial plants in which they are transformed into new paper, new cans, new bottles, etc. Recycling preserves natural resources and limits the amount of garbage that must be buried in landfills. In addition, students can recycle things by themselves, such as transforming and empty jar into a pot to grow a small plant or using cardboard to create toys for younger children (see Go Wild in New York City, page 71, for interesting facts about recycling).

Development of the activity

1. Warming-up

Start this project asking students: What is garbage? Write down their answers on the board and ask them to provide examples of garbage, challenging them with counterexamples to show that something that is considered garbage by one person can be used by another one, as long as s/he finds a way to use it.

Ask them how much food they believe that they generate each day at home and in the classroom, and whether they think it is possible for them to throw away less. Tell them that the class as a whole will measure the amount of garbage they produce every day, during a week, to check their predictions. Ask students to throw away as much garbage as they usually do, not to alter the results of the experiment.

2. Weighing trash

Over the course of the week, have students measure the amount of garbage they threw away and write it down on their science journals. Students will take turns to collect the contents of all trash bins in the classroom and weigh them using a bathroom scale. Divide the amount of garbage by the number of students to calculate the average trash generation in the class.

After collecting data, discuss with students the following questions:

- Were they correct in their predictions? Did they throw away more or less garbage than they expected?
- Does the average weight represent what they individually throw away? Do they think they generate more or less garbage than the average? Use this question to have them reflect on how each person makes a contribution to the whole class amount of garbage, and that if each of them threw away less, the total amount of garbage would significantly be reduced.
- How would they decrease the amount of food they generated? Ask them to propose different ideas of the ways they could do it and write them on the board.

3. Reduce, Reuse and Recycle

Explain students the concepts of Reduce, Reuse and Recycle. Ask them to categorize the examples written on the board in one of the three classes, and to provide more examples of each one.

Then, bring all classroom garbage bins and use a few items inside them to have students think of specific ways to reduce, reuse or recycle those things. Another option to do this is to prepare in advance items usually regarded as garbage (pieces of paper, food packages, empty jars, etc). First, ask students to imagine that they come from another planet and find these objects. What would they use them for? Give students different garbage items and have them work in groups to discuss this question. Then, ask each group to present their ideas to the rest of the class. Discuss with students the notion that waste is a cultural concept, and that some things that we regard as trash can be considered useful in another cultures and also by another people in our same culture.

Second, give students other garbage items (in this case, give the same items to all groups) and have them find ways to reduce, reuse or recycle them. What parts of the object (for example, the packaging) could be avoided? What would they use the item again for? How would they recycle it into another useful thing? Each group will present their ideas to the rest of the class. Write students' answers on the board and discuss how a single item can be reused or recycled in many ways, using students' different examples for the objects provided.

4. Weighing trash II

After having discussed these concepts, propose students to conduct a second experiment. Have them weigh the classroom garbage during a second week, in the same way they did it at the beginning of the project. Ask them to throw as little garbage as they can, using the principles learned. Talk to your students about the importance of conducting a fair experiment, for example remarking that it would not be fair to keep garbage that they usually throw away in the classroom bin to throw it somewhere else.

Compare the results from the first and second week. How much were they able to reduce the amount of garbage they generated?

Assessment

This project provides various opportunities to assess students' learning (see Learning Goals) in formative and summative ways. Student's skills and conceptual understanding can be assessed through:

-Students' performance in conducting the experiment (formative)
-Students' journals (formative)
-Students' presentations of ideas about reducing, reusing and recycling the items provided and their contribution to the whole class discussion (formative)

Most important, this activity provides an authentic way to assess students' learning, by comparing the amount of waste generated by the class as a whole during the first and second weeks. Students will be able to see by themselves whether they were able to decrease the amount of garbage they produced by making personal decisions.

Finally, as another way of summative assessment, students can create, either individually or in groups, a list of changes that they think they are able to implement in their own lives in order to produce less waste. After two weeks, each student can revisit their lists and reflect on whether s/he put those ideas into practice and what were the challenges and rewards involved in it.

Extensions

As a follow up of this activity, students can develop a school campaign to make other students, and also teachers, aware of the ways they can reduce, reuse and recycle things in school. They can create posters to hang on school walls and give presentations of their work to other grades. They can act as mentors of younger students, teaching them how to conduct the same project. This could lead to a collaborative engagement of the whole school population to reduce school waste.

Connection to New York City Standards

This activity addresses the following NYC Performance Standards for Middle School Science:

S3d Earth and Space Science Concepts: The student produces evidence that demonstrates understanding of natural resource management

S4b and d Scientific Connections and Applications: The student produces evidence that demonstrates understanding of:

b. The designed world
d. Impact of technology, such as risks, and problems and solutions

S5d to and f Scientific Thinking: The student:

d. Proposes, recognizes, analyzes, considers, and critiques alternative explanations; and distinguishes between fact and opinion
e. Identifies problems, proposes and implements solutions, and evaluates the accuracy, design and outcomes of investigations
f. Works individually and in teams to collect and share information and ideas

S6a to d Scientific Tools and Technologies: The student:

a. Uses technology and tools to observe and measure objects, organisms and phenomena
b. Records and storage data using a variety of formats
c. Collects and analyzes data using concepts and techniques in Mathematics Standards 4
d. Acquires information of multiple sources

S7a, b, d and f Scientific Communication: The student:

a. Represents data an results in multiple ways
b. Argues from evidence
d. Explains a scientific concept or procedure to other students
f. Communicates in a form suited to the purpose and the audience

S8 b and c: Scientific Investigation: The student demonstrates competence in investigations that integrate:

c. Field work
d. Design