

Community in the Classroom Presentation Plan

Lesson Name Plastics, Recycling, and Composting

Presenter(s) Prof. Michelle Chang, Laura Fredriksen, Maggie Brown, Brooks Bond-Watts, Mark Walker, Amy Weeks, Miao Wen

Grade Level 5 Standards Connection(s) atoms, molecules, substances

Abstract:

The goal of this lesson is to teach children about plastics and how some plastic waste can be degraded naturally and some cannot. We will explain what plastics are through a Red Rover-based game where the students play monomer units linked by "bonds" of different materials to make the polymer chain. At the same time, students will learn concepts about weaker and stronger bonds and plastics and how chemical bonding relates to their ability to be degraded. After this activity, we will show them how to make polymers using glue and borax. We will then ask the students to predict whether certain polymers will degrade or not. We will then ask them to complete a composting experiment to test their predictions. We will close the lesson with a discussion on waste habits.

Vocabulary/Definitions:

Plastic – A substance that is a type of polymer.

Polymer – A substance that is made of individual units that are connected together in a chain through bonds.

Bond – A linkage between two polymer units. Some are easy to break and others are not.

Decomposition – The process of polymer degradation back into individual units.

Biodegradable – Something that can decompose by natural processes. For example, when food goes bad, it is starts to decompose when microbes start to grow on it and is thus called "biodegradable".

Microbes – Microscopic organisms that you cannot see with your eye such as bacteria or fungi

Compost – A pile of material containing microbes along with biodegradable items for them to grow on.

Materials:

What we'll bring:

Paper towels/toilet paper

Rope

Borax

Chemicals, safety equipment and other supplies for nylon demonstration

4-6 bottles of Elmer's glue

4-6 Containers (plastic cups or equivalent size)

What we'll need:

Water

Chalk board or marker board and chalk or markers to write on it.

Classroom Set-up:

The classroom should be set up in groups of small manageable numbers (4-6 groups for 20-30 students)

Classroom Visit

1. Personal Introduction: _____ 5 _____ Minutes

Who are you? What do you want to share with students and why? How will you connect this with students' interests?

We introduce ourselves as chemists who care about the environment. Chemists study materials that can be made into clothing, containers, and other useful things. We also care about what happens to all these things when they are thrown away.



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Topic Introduction:

10 Minutes

Big Idea(s), vocabulary, assessing prior knowledge. What questions will you ask to learn from students?

We open by asking about the vocabulary words. We will probe and figure out what they do/do not know and talk about definitions briefly. Someone should write the words on the chalkboard or marker board.

2. Learning Experience(s):

30 Minutes

Demonstrations, hands-on activities, images, games, discussion, writing, measuring... What will you do, what will kids do? Describe in order, including instructions to kids.

A. Red Rover activity (15 min): We will have 2-3 of the groups assemble in a chain and ask the remaining students to gently try to move across the chain. After that, we will have the other 2-3 groups of students to assemble in a chain by holding onto paper towels or toilet paper. The remaining students will try to break through the paper links, and then we'll ask them how easy they thought it was. We will make the observation that the act of breaking the links was like decomposition, and that the chain the students formed was like a polymer and each individual student was a molecule in the polymer chain.

B. Degradable polymer demonstration (10 min): We make a polymer from glue and Borax with them in small groups. Each individual should be able to make it in a small cup. It will form a silly-putty type material. We will tell them that the glue is forming bonds with the borax in the water and making long chains of individual glue and borax molecules. We will ask them to compare the final product to when glue dries.

C. Nylon pulling demonstration (5 min): This section can be removed if there is not enough time or if the class is more boisterous and takes too long on part A and B. Adipic acid with diamino-hexane in a 5:2 volume ratio, do not mix. Pull the nylon out of the solution interfaces, and then bring it around to show it to students (no touching!). We will ask them to compare this to the borax/glue product and ask them if they think it would be easy to break the bonds in nylon compared to silly putty.

3. Wrap-up: Sharing Experiences and Building Connections

10 Minutes

Putting the pieces together – how will students share learning, interpret experience, build vocabulary?

Talk to them about what they learned about polymers. What do they think about nylon or the silly putty? Do they have strong bonds like hands holding or weak bonds like paper links? Do they think the nylon or the silly putty will degrade in the compost?

4. Close:

5 Minutes

We ask the kids if they can follow up and answer their questions by doing small compost piles or a classroom compost pile (will depend on what the teacher wants to do, we'll talk to him/her beforehand). We will give the teacher information on the materials they'd need to collect to form the pile, and a follow-up sheet the kids can fill out on what degrades and what doesn't.

TOTAL 50 – 60 Minutes



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Follow-up – After Presentation

Follow the activity up by having the students create small compost piles in Ziploc bags that they can observe for weeks to come. Or, if time or supplies permit, build a compost pile in a large bucket. We will discuss what the teacher wants to do ahead of time. If they want to do this, we suggest getting all the supplies together on the day we come, and to initiate the experiment after we leave. If time does not permit, it may also be initiated at a later date. Lesson plan for large compost pile can be found at:

http://curriculalessons.suite101.com/article.cfm/spring_lesson_plans

If the compost pile is not possible, students can also be asked to do a homework project to write down what they threw away that day and which items they think can be degraded or if they can replace a non-biodegradable item with a biodegradable option.

Small compost piles (one for each group)

Materials needed:

Ziploc bags

Potting soil or soil from outside

Fruit/vegetable peels

Breads

Beans (non-dry)

Other vegetative materials

Nylon and/or silly putty used on the activity day (the nylon definitely should not decompose, the silly putty will likely get hard or undergo some sort of change, it depends on the moisture in the bag)

*Do not use animal products in the compost or there will be a smell.

Optional: Ask the students what else they think should go in the bag. What else do they think might decompose?

1. Place everything in a compost bag. Have the students write or draw what they see on the first day
2. Place the Ziploc bags in another part of the room. Keep at room temperature. Do not place in refrigerator.
3. After 1 week, have the students write down what they see, and compare it to what they saw the first day.
4. Continue observations for 1-2 months.
5. Collect all the students' work together and hand it back to them. Have them write up a final observation on which things they put in the bag that looked like they were rotting or decomposing. Ask them if they think the bonds in the polymers we made for them had strong or weak bonds. Close the experiment on a discussion about composting and waste management.
6. Please write to us on what you learned in this experiment!



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