Where Does Litter Go?

Organic materials such as banana peels, natural resources that have been processed such as paper and man-made materials such as plastic all have different rates of decomposition. In this lesson, students will get the opportunity to observe that fact in real time and receive the opportunity to make inferences from the evidence they collect and apply it to their everyday lives.

This lesson is designed to use experiential learning techniques to create memorable experiences for students and establish a baseline of knowledge to be built upon further along in their academic careers. By participating in a hands-on experiment, it is the intention of the Clean SoIL curriculum writers to help students build knowledge an experience that can later be used to expand their knowledge on information such as variables in experiments, making inferences, as well as understanding molecules.

This lesson is designed to be conducted over the course of several weeks. It is up to the discretion of the instructor how long they allow the experiment to continue, but it is the suggestion of the writers of this curriculum that the experiment be conducted, at a minimum, of six weeks or at least until the paper and banana peel in the experiment have deteriorated significantly for students to observe.

ILLINOIS SCIENCE STANDARDS

Next Generation Science Standards

- **K-ESS3-3** Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
    - **Science and Engineering Practices**: Obtaining, Evaluating, and Communicating Information
    - **Crosscutting Concepts** – Cause and Effect
    - **Disciplinary Core Idea** – ESS3.C: Human Impacts on Earth Systems

Common Core ELA Standard

- **Speaking and Listening.K.3**: Participate in collaborative conversations with diverse partners about topics and texts with peers and adults in small and larger groups.
- **Speaking and Listening.K.3**: Ask and answer questions in order for seek help, get information, or clarify something that is not understood.
- **Writing.2.8**: Recall information from experiences or gather information from provided sources to answer a question.
- **Writing.2.2**: Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points and provide a concluding statement or section.
- **Writing.2.7**: Participate in shared research and writing projects (e.g. read a number of books on a single topic to produce a report, record science observations).

OBJECTIVE

- Students will communicate solutions to reduce the impact of humans littering on the sides of roads in their local communities by making observations and using that data to impact their understanding.
- Students will use their understandings and data to create a presentation of solutions that show over time the reduction of litter influences the environment for the organisms that live in the habitat.
- Students will gain firsthand experience in observing that different materials vary in the time it takes to decompose.

Materials and Resources

Teacher:

- Banana peel
- Piece of paper
- Plastic bottle
- Prediction Worksheets
- Small Compost Bin
    - Five-gallon bucket or tote with lid
    - Soil
- Spray bottle
- Small Trash Can
- Worksheet: How Can I Reduce My Impact
- Smartboard
- Projector
- Prediction Worksheet
- Worksheet: How Can I Reduce My Impact
- Pencil
- Chromebooks

Talk Moves

The curriculum writers suggest reviewing 9 Talk Moves to help aid in facilitating discussion between students as well as to elicit answers from individual students. The link can be found here.

Safety

Note: Instructors should maintain facility, school, and district policies regarding safety a priority when planning your classroom lesson plans.

Vocabulary

- Decompose- To rot or break down
- Environment - The surroundings or conditions in which a person, animal or plant lives.
- Litter - A mess of garbage or trash scattered about.
- Reduce – To make smaller or less in amount
- Predict- To tell ahead of time that something will happen.
- Observe- To notice or see.
- Experiment- A carefully planned test used to discover something unknown.

Career Awareness

- It is important to explain to students that you don't necessarily have to be the outdoorsy type to work to help the environment. There are so many careers out there to help the Earth. It is important to introduce students to jobs that they might not have heard of.
    - Environmental Engineer
    - Environmental Lawyer
    - Environmental Scientist
    - Environmental Educator
    - City, County, and/or State Solid Waste Management and Divisions
    - Hazardous Waste Management
    - Recyling Coordinators
    - City Planners
    - EPA Regulators

Accommodations

- Vocabulary cards will be included in the resource section of this text this will help assist students that need visual or textual language. These cards will also be available in pdf form for easy access on devices for the classroom or printing for the educator.
- The educator can make concessions for the students that have accommodations for presenting in front of others, as they will be in groups this student can give their group peer feedback.
- Recordings of the quiz and other materials will be made available on the Clean SoIL website for ease of access for those students with accommodations for hearing or read aloud.
- Further accommodations and modifications will be made available on the Clean SoIL website or within the printed resource section for the curriculum

Engagement (10 minutes)

- To engage students, the instructor will show a short video:
    - https://www.youtube.com/watch?v=UCxDOPPXZnQ
    - Play up until the 1:25 mark.
- The instructor will ask students:
    - Do we know what it is called when people throw trash on the ground instead of in the garbage can?
    - What kinds of litter did we observe in the video?
    - What do we know about the different kinds of things we throw away that make up litter?
    - Have you seen this happen before? If so, where?
    - What would happen if the litter didn't get cleaned up?
    - Where would it go?
- Questions the instructor should use to help identify the problem after the main discussion include, but are limited to:
    - What new questions do we have now?
    - What do we need to know more about now?
- Questions instructors can use to draw out and clarify students' ideas and questions can include, but are not limited to:

- What ideas do you have?
- What questions do you have?
- Can you say more?
- What makes you think that?

Exploration (30 minutes)

- The instructor will begin the lesson by explaining to students that the class is going to be conducting an experiment to see what happens to litter over time.
- The instructor will break students into groups.
  - Each student will receive a prediction worksheet that can be found on the Clean SoIL resource page.
- Next, the instructor should present the class with a banana peel, a water bottle, and a piece of notebook paper.
  - Students will be instructed to work in groups to predict what will happen to three different kinds of litter over time.
- The instructor should guide these predictions using questions like:
  - Do you think the items will change? Why?
  - How do you think each item will change?
  - Which item do you think will change the most? Why?
  - Which item do you think will change the least? Why?
  - If you think the items will change, how long do you think it will take for that change to happen?
- The instructor will ask students to share what they came up with as a group with the class.
- After sharing, the instructor should collect and save all predictions worksheets.
  - This should be done so students can compare and contrast their predictions with their observations of the results at the end of the lesson.
- The banana peel, the piece of paper and the water bottle should be placed in a 5-gallon bucket filled partially with soil.
- The instructor will tell the class that they are going to place the items in the 5-gallon bucket so they can watch and see how the objects break down over a series of several weeks.
  - Note: The experiment maintains one environment where all the items break down in order to focus on the decomposition rates of each item rather than what factors aid decomposition.
  - It is important to keep the water bottle, piece of paper and banana peel as separate as possible in the 5-gallon bucket so that each item can be observed apart from the others.

(Ongoing)

- The objects in the 5-gallon bucket should be sprayed with water intermittently, about 2-3 times a week, throughout the experiment. This can be assigned to students as a classroom chore or job such as ‘line leader’ or ‘library helper.’
  - Note: The writers of the Clean SoIL curriculum highly recommend that each group should have their own 5-gallon bucket to observe and maintain throughout the experiment but recognize that teachers may not have the resources to make this possible. One bucket with a single banana peel, plastic bottle and piece of paper will work as well.

- Throughout the semester, the class should take time each week to record findings on an observations' worksheet.
    - Observations can and include, but are not limited to:
        - Recording how it smells
        - What does each item look like?
        - Is there anything growing in the bucket?
        - Are the items changing or staying the same?
- Instructors should be sure to draw out what students wonder and have students record questions that they have on their observation worksheet as well.
- Each time that observation worksheets are used, the instructor should take the time to facilitate a short discussion about the students' questions and wonderings.
- Questions instructors can use to facilitate discussion include, but are limited to:
    - What were questions or wonderings you wrote down on your last worksheet?
    - Based on your observations, what do you wonder?
    - What makes you ask that?
    - Can you share more about why you asked that question?
    - Based on what is happening, what question do we think needs to be answered or what problem do what think needs to be solved?
    - Why do we think that?

Note: The Clean SoIL curriculum writers suggest that when groups revisit the 5-gallon bucket to make their observations that groups go to the bucket one by one to make it more engaging.
Note: The Clean SoIL curriculum writers also suggest that for each visit students have a new observation worksheet to use.

Explain (20 mins)

- Towards the end of the semester, the instructor will have students break back into their groups.
    - An instructor can also begin this portion of the lesson once both the banana peel and piece of paper have noticeably deteriorated.
- The instructor will give students their original prediction worksheets back as well as their observations.
- Once students have their prediction and observation worksheets back, the instructor will have the students get into their groups to talk about their findings.
- Guiding questions that the instructor can use can include, but are not limited to:
    - Which item changed the most?
    - Which item changed the least?
    - Is there anything that surprised you? If so, what?
    - Were there any items that changed faster than you thought they would? What were they?
    - Were there any items that took longer to change than you thought they would? What were they?
    - Why do you think that is?
    - Based on what happened during our experiment, what types of litter would not break down or go away?
    - After our experiment, what questions from your observation worksheet have been answered?

** Note: The questions listed above are available in a graphic organizer that can be found on the Clean SoIL Resource page.*

- After students have answered these questions within their groups, the instructor will have the students participate in a Think-Pair-Share with someone from a different group than theirs to compare their findings.
- The instructor will then ask the class to share their findings and how these compared with their predictions.
    - An example of a potential response from a student could be, "We thought the banana peel would break down first, but it was the paper that changed the most."

Elaborate (20 minutes)

- Once the class has established how their predictions differed or matched their observations, the instructor will shift the conversation to talking about the conclusions or assumptions they might be able to make from their observations.
- Students will use the evidence from their observations to discuss how quickly each item changed and how that pertains to their disposal of these items in their everyday life.
- Some guiding questions can include, but are not limited to:
    - What would happen if a plastic bottle were thrown on the ground?
        - Would it break down based on what we saw during the experiment?
    - What if a banana peel is thrown on the ground?
    - What is the effect of litter on the environment?
    - Based on what happened during our experiment, what types of litter would not break down or go away?
    - What choices can we make to keep litter from hurting our environment?

- For K-1, the writers of this curriculum suggest that the class produces a solution together.
        - The teacher will write the ideas of students down on the whiteboard. From these ideas, the class will decide on a solution.
    - The instructor will have students draw the solution to the best of their ability.
- For grade 2, the writers of this curriculum suggest the class works together to brainstorm solutions but breaks into groups to discuss and decide on their own simple solution.
    - For example, a solution might be using a reusable water bottle instead of a disposable plastic one.
- Before the students break out to communicate their solution, the instructor will facilitate a class discussion about how they can communicate solutions.
- Questions can include, but are not limited to:
    - What are the different ways we could share our solutions with others?
    - Which would be the best way for you to communicate your solution?
- Students will then get to choose whether they want to demonstrate their solution in song/rap form or if they want to create their own drawing. Other options may be approved by the instructor based on the in-class discussion.
        - Including a simple sentence explaining the solution is recommended for grades 1-2. It is ultimately the decision of the instructor whether or not to include this.
        - An example solution could be "I will use fewer plastic bottles."

Evaluate (10 minutes)

- Once students have completed their drawings, the instructor will facilitate a Turn and Talk where students will share with their partners what they drew.
- Drawings can then be displayed in the classroom or hallway of the school.
- Students will demonstrate their ability to meet the objective by making predictions about our experiment and then making 2 or more meaningful observations about how the items used in the experiment changed.
- To end the lesson, the instructor will host a discussion with the class to recap what was learned by asking students:
    - What something you learned from the experiment?
    - What surprised you?
    - What would you want to know more about?

References

NGSS Lead States. 2013. *Next Generation Science Standards: For States, By State*s. Washington, DC: The National Academies Press.