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EED 480

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**Science Lesson with Cooperative Learning and 5E Framework:**

**Sorting Our Trash - Each Piece is Special and has a Home!**

**Objective**

Students will recognize and learn that trash goes somewhere when we do not want it anymore. Trash is diverse and we can sort it in order to help it get to where it needs to go (such as recyclable materials, landfill, biohazards, and compostable materials). We can also be conscientious about how much trash we make. In addition, students will describe how food production contributes to climate change through the depletion of resources like land, freshwater, and livestock. Students will also consider how food waste in the United States relates to the current climate crisis.

**Big Idea - Trash!**

What makes trash special? Where does our trash go after we don’t want it anymore? Does it all go to the same place? What happens to our trash after the trash workers pick it up?

How much trash do we make in a week? Do we have to make that much trash? What can we do to change that, to make less trash? Do other living things make trash too - how is it similar and how is it different from our/humans’?

**Setting the Stage:** Students need to understand that everything we do produces trash and that all humans produce trash, one way or another. There are different kinds of trash. Every piece of trash has its personality and its own home; it does not all just go into one big trash can. Trash is diverse and needs to be sorted/segregated so that it can be decomposed/broken down, or reused (cradle to cradle), or responsibly thrown away. If we are not responsible with our trash, it becomes a monster that never goes away. It is important that students have the opportunity to investigate their own trash in order to see firsthand what kinds of trash they might make as a class. If students gain a clear understanding of the kinds of trash they produce on a day-to-day basis, they can assist with sorting it properly and understand what happens to it beyond when they throw it away. In this lesson, students learn that trash can be separated into recyclable materials, landfill contents, biohazards, and compostable items. In groups, they look through the classroom’s trash, categorize it by similarities they observe, and discuss why they sorted their trash the way they did with peers. On the second day, students learn about the categories we have in place as a society (recyclable materials, landfill, biohazards, and compostable materials) by observing and describing categorized trash by the teacher and re-categorize what they did in the previous day if they choose. If time allows, students can also make models to show what they predict will happen to their trash as time goes on.

**Next Generation Science Standards**

The lesson focuses on 2-PS1-1 Matter and Its Interactions - Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

The students need to understand how trash is not one ambiguous entity but needs to be sorted because of its diversity and in hopes of not accumulating it on the planet (aka to help it disappear). They need to see that anyone can observe and categorize trash to help the planet be healthy.

**Science and Engineering Practices in the Next Generation Science Standards**

This lesson addresses SP: Planning and Carrying Out Investigations - Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.

During the investigation, students will ask their peers questions about the different trash items they see, and they will write and communicate their group’s consensus by putting them on the classroom poster paper piece (with labels). It is important that students work collaboratively to communicate in written and oral form.

**Disciplinary Core Ideas**

This lesson addresses DCI:

PS1.A: Structure and Properties of Matter… Matter can be described and classified by its observable properties.

**Cross Cutting Concept**

This lesson addresses CCC: Patterns - Patterns in the natural and human designed world can be observed.

**Structure and Function**

In this lesson, the students understand that the trash we as humans make is very different from any other living thing’s trash because our trash does not just disappear - it has to go somewhere! This is important for students to know because they can then make observations when throwing things away and sort trash in its respective categories/containers at home, in the classroom and where possible. They can also begin to make connections to concepts about where things come from and where they might go even after we are not in contact with those items. We are promoting critical thinking when it comes to trash. When students are engaged in such depth with their own trash, they can also begin to question their own consumption. In addition, students will acquire a due diligence to make a difference in their everyday life, to become responsible about their trash.

**Background Knowledge:**

Students have already learned that humans produce trash unlike any other living creatures in history. They know that trash is a big problem in the world because we do not have enough space to put it all, which is why it can end up in the oceans, or in places where it can stay up to 1000 years. Students collaborate in groups using the scientific method and science process skills (observe, infer, form a hypothesis, predict, draw conclusions, and communicate). It is important to establish safety procedures during all science and technology investigations.

**Materials:**

A large bag of classroom trash from the previous day or week

Butcher paper to lay on the desks or reusable tablecloths

Gloves

Markers/Crayons/Colorful writing utensils

Open Space

Labels that say and provide pictures of “COMPOST”, “RECYCLING”, “LANDFILL”, and “HAZARD”

**Roles**:

**Materials Manager/Traveler (SPY**)- Responsible for gathering supplies and laying them out at the group’s workstation. As a spy, they will walk around and see how other groups are sorting their trash. If they are unsure of which category a piece of trash belongs, they can get suggestions by looking at or asking how others are organizing their garbage.

**Checker**- Responsible for ensuring that all four labels are represented on the workstation. They also help ensure that the trash is placed in the appropriate place based on the team’s consensus, by describing the makeup of each category with their group and talking about the observations they make about the different articles of trash.

**Recorder/Reporter**- Will record any questions or observations that the group has as they are sorting trash. They will also record the characteristics of each label (compost, recycling.. etc.). In other words, guidelines for what goes where.

**Observer/Illustrator**- Will help ensure that the trash is placed in the appropriate place. They will also facilitate the group in making observations about the similarities in the trash of each label.

**The instructor/ facilitator begins this activity by assigning the materials manager/spy, checker, recorder/reporter, illustrator/observer. The materials managers will be provided with the Trash lab sheet that enables their teams to follow along in their roles.**

**THE 5-E FRAMEWORK**

**DAY 1**

**ENGAGE**

5 MINUTES

Where does trash come from? What happens to it after we throw it away? Provide each group a bag of trash that was collected on the schoolyard and in the community.

Materials Manager**.** Grab a large piece of butcher paper to serve as your group’s workstation. You may choose to work anywhere in the classroom where your group will have enough space. Gather your team’s trash out of the bag and place it on the butcher paper. Gather the rest of your materials. Make sure everyone is wearing their gloves.

5 MINUTES

. Lead your team in laying out each piece of trash so that it is visible and there is enough space to begin forming groups.

**EXPLORE** 20 MINUTES TOTAL

5 MINUTES- Developing Questions

Observer**.** Lead your fellow students in understanding that not all trash is the same. Describe the different pieces of trash your team is working with. How are they similar? How are they different?

Recorder. Observe and ask questions- What questions do you have about the items of trash? How are some pieces of trash similar? How are they different? Record responses on the lab sheets.

15 MINUTES

Checker

With the team, describe the types of groups you will create for you trash. Sort out the trash according to these categories. Teams are permitted to share their questions and investigate their peers responses- **TRAVELER (SPY)**

Recorder. Write down what pieces of trash the team places under each category.

**EXPLAIN/ ELABORATE 15 Minutes total**

10 MINUTES

Checker, With the team, clearly identify the number of categories you have created for your trash. Clearly separate the trash by giving its category a title and/or description.

Observer**.** Describe with your team the categories you came up with. Discuss what attributes make up each group and why each piece of trash was placed where-make connections between artifacts.

5 MINUTES

Recorder. Record responses on the lab sheets of the titles of each category of trash as well as some of the qualities of these objects. What makes them similar and what makes them different.

**DAY 2**

**ENGAGE**

5 Minutes

Begin by asking students to place their garbage from BIC at the corner of their desks. Later, give each team a small bag of trash. Tell students that what they are receiving is technically theirs because it was found either in the classroom or on the schoolyard.

 Is all trash the same? If there are recycling bins for paper or plastic in the classroom, point them out and support students as they describe what goes where. Provide students with statistics and visual representations of food production, food waste, and landfills/recycling centers

Materials Manager**.** Grab a large piece of butcher paper to place your trash on. Gather all the materials your team will need to sort the trash.

**EXPLORE 20 Minutes Total**

Checker **.** Lead your team in allocating space on your butcher paper for each label. Make sure everyone is wearing their gloves.

5 MINUTES
Developing Questions

Observer**.** Lead your team in describing the trash they worked with yesterday, and the trash they are separating today. Identify each label and discuss the relationship between them. How are they similar? How are they different?

Recorder**.** Observe and ask questions- What questions do you have about the four categories of trash (compost, recycling, landfill, hazard)? What observations do you have about the trash? How do the labels relate? How are they different? Record your team’s observations and questions on the lab sheets.

15 Minutes

Checker**.** With the team, describe what sort of items belong in each category. Begin to sort the trash following these guidelines. Teams are permitted to share their questions and investigate their peers’ responses-

**TRAVELER (SPY)**

RECORDER Write down what pieces of trash the team places in each category on the lab sheets.

**EXPLAIN/ELABORATE**

5 Minutes

Observer**.** Lead your team in observing the different pieces of trash in each label. What patterns do you notice? Is there more trash in one category? How are today’s categories similar to yesterdays? How are they different? RECORDER -record your teams responses on the lab sheets.

5 Minutes

Checker**.** Describe with your team the guidelines you set for each label. How did you decide what went where?

**RECORDER** write down your team’s characteristics for each label on the lab sheet provided.

 **EVALUATE**

10 Minutes

Draw Conclusions. Communicate Results. Students observe the types of categories they used for sorting their trash on the second day compared to the categories they created on the first day. Have students record any similarities or differences they found from both experiments.

Each group is then given an opportunity to share their findings with the class. It is important students share what they know about the four categories of trash and the impact it has on the planet. This permits them to work on the science process skill, communicate.

Then display images of food waste and the effects of single use plastics have on the environment. Show students what recycled items can turn into, what landfills turn into, and what compost can turn into.

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| TEAM NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_SCIENTIST: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ONE QUESTION WE HAVE ABOUT THE ITEMS?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ WHAT PATTERNS DO YOU NOTICE? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ HOW ARE YOU SEPARATING THE TRASH?Explain: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

DAY TWO OBSERVATION:

TEAM NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ILLUSTRATION OF THE RESULTS

COMPOST

RECYCLING

LANDFILL

HAZARD

WHAT PATTERNS DO YOU NOTICE?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

WHAT CHARACTERISTICS DO YOU NOTICE IN EACH GROUP?

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 Processing the Recycling Lesson

National Science Teaching Standards Met by the Recycling Lesson

Students need to understand that trash is a natural occurrence that has a life cycle. By using trash from the school and Breakfast in the Classroom, students are able to begin to trace the lifespan of trash. Students can see that trash begins with humans before they return to it as they sort it out. It is here that students begin to think more critically about the products they use because they have an opportunity to look at it again, but this time as waste. Students also consider patterns between the garbage based on its makeup, quantity, etc. Students discover what is classified as compost, recycling, landfill, and hazardous trash.

If students gain a clear understanding of the different types of garbage, they can begin to investigate what happens next in the life cycle of trash. In this lesson, students understand that they are the products of trash, and that not all trash is the same. During their Project Based Learning, they will investigate different avenues for each subgroup of trash. Landfill items will end up in mountains of trash that live on the planet for decades, while recyclables will be turned into something new. In their PBL, students will learn about food waste in the United States as part of the project on our environmental footprint with garbage. Approximately 30-40 percent of food in the United States is thrown away. In the culminating activity, students will investigate the process of composting and conduct an experiment in which they create their own compost bins. It is essential for students to accurately separate trash in order to conduct their experiments.

*DISCIPLINARY CORE IDEAS*

The Science lesson focuses on NGSS **PS1.A**, Structure and Properties of Matter… Matter can be described and classified by its observable properties. Students plan an investigation to sort out their trash in the observable patterns and relationships between them. Students need to understand their personal relationship to trash and the different categories of trash in order to better understand their environmental impact.

*SCIENCE AND ENGINEERING PRACTICES*

 This lesson addresses SP 3: Planning and Carrying Out Investigations. Students are planning out how to group different pieces of trash based on observations and patterns they notice. On the second day, they are planning out an investigation with new guidelines and have to consider not only patterns, but the properties of each piece of trash. For instance, trash that was once food or trash that can be repurposed. This lesson also addresses SP 8: Obtain, evaluate, and communicate information. During the investigation, students will ask their peers questions about the trash, and communicate any observations and patterns they see. They will also obtain pre existing information about recycling and other categories of trash, and have to communicate with one another on the second day. At the end of the investigation, students will reflect and evaluate their findings. They will have traced part of the life cycle of trash and better understand their environmental impact. Students can begin to explore the next step in the cycle of trash.

*CROSS-CUTTING CONCEPTS*

Patterns

Since this is the start of a larger PBL where students will be actively repurposing their trash, the goal of this lesson is for students to understand that not all trash is the same. The basis of the investigation is observing patterns in the trash. For instance, large quantities of a particular artifact, colors, or a material. Each type of trash like compost, recycling, landfill, and hazardous material has its unique characteristics. Developing patterns not only allows students to follow the life cycle of trash, it also causes them to reflect on their personal relationship to trash. For instance, a lot food is wasted if there is a larger quantity in the compost pile.

*Background (Prior) Knowledge:*

If this lesson is taught in 1st-3rd Grade, it can be used as an introductory lesson to recycling. That is why it is a two-day lesson in which students first notice patterns, and then are introduced to set groups or patterns that society has established for trash. Younger students might be aware of recycling bins for paper and plastic at home or in the classroom. In this case, this investigation will be a gateway for students to learn about their relationship with trash and the process of it. Older students might be more familiar with the four groups of trash. However, it is still great to use this lesson to activate students' prior knowledge and assess what they already know.

ASSESSMENTS

Collaborative Project Peer Assessment

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 1Counter Warmer | 2Server | 3Sous Chef | 4SuperStar Chef |
| Work | Did very little during work period | Did most of the work assigned to the team | Did all work assigned to him/her well | Graciously accepted extra work |
| Organization  | Did their own thing | Followed directions | Helped organize the group | Took charge & organized the group |
| Contribution  | Held our group back | Helped our group succeed | Our group was better because of him/her | Group was much better because of him/her |
| Motivation | e/she prevented me from doing my best | He/she expected too much from me | He/she pushed me to be better | He/she brought out the best in me |

Group members Overall Performance Total from above

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 2 3 4 \_\_\_\_\_\_\_/16

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 2 3 4 \_\_\_\_\_\_\_/16

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 2 3 4 \_\_\_\_\_\_\_/16

Self-Assessment of Collaborative Performance:

|  |  |  |
| --- | --- | --- |
|  | Did I... |  |
| Work | do the work assigned to me? |  |
| Organization | help keep the group organized? |  |
| Contribution | put my 100% effort into the assignment? |  |
| Motivation | push myself to do my best? |  |

Peer Assessment:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 |
| Work | He/she did very little work throughout the activity. | He/she did most of the work assigned to the team. | He/she did all of the work assigned to them. | He/she graciously accepted the work given to them. |
| Organization | He/she did their own thing. | He/she followed directions. | He/she helped to organize the group. | He/she took charge and organized the group. |
| Contribution | He/she held your group back. | He/she helped our group succeed. | Our group was better because of him/her.  | Our group was much better because of him/her. |
| Motivation | He/she prevented us from doing our best work | He/she expected too much from me. | He/she pushed me to be better. | He/she brought out the best in me. |

|  |  |  |
| --- | --- | --- |
| Group Members | Overall Performance | Total from Above |
|  | 1 2 3 4 | \_\_\_\_\_/16 |
|  | 1 2 3 4 | \_\_\_\_\_/16 |
|  | 1 2 3 4 | \_\_\_\_\_/16 |
|  | 1 2 3 4 | \_\_\_\_\_/16 |
|  | 1 2 3 4 | \_\_\_\_\_/16 |