Lesson 3-3

Do garbage materials change in a landfill bottle at time point 3?

Lesson Overview

1. Timeframe: 3-4 class periods

2. Learning Performance

   Students interpret data of the changes in properties of materials and weight of landfill bottle systems to provide evidence for the conservation of matter in a closed system.

   SEP *Analyzing and interpreting data*: *Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.*

   SEP *Using mathematical and computational thinking*: *Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems.*

   DCI *PS1.A*: *The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.*

   DCI *PS1.B*: *No matter what reaction or change in properties occurs, the total weight of the substances does not change.*

   CCC *Energy and matter - Flows, cycles, and conservation*: *Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter.*

3. Overview

   Day 1
   - Students observe and record changes in the properties of materials and weight of landfill bottle systems.
   - Students identify patterns in data to interpret changes in properties and weight.

   Day 2
   - Students argue from evidence to answer the questions, *Do garbage materials change in a landfill bottle?* and *Does the amount of matter change in a landfill bottle?*

   Day 3
   - Groups develop landfill models for time point 3.
   - Students do a gallery walk of landfill models.
   - The class develops the Class Consensus Model of the landfill bottle system.

- Students complete Exit Slip 3-3.

Materials

For each student:
- 1 Science and engineering notebook (SEN)
- 1 Pencil
- 1 Copy of Investigation 2-1: Landfill Bottles (Days 1-2)
- 1 Copy of Exit Slip 3-3 (Day 3)

For each group:
- 1 Landfill bottle
- 1 Electronic scale
- 1 Piece of chart paper (from Lesson 2-1)
- 1 Pad of sticky notes

For the class:
- 1 Piece of chart paper (for the Class Consensus Model)
- PowerPoint Lesson 3-3 (Day 2)
- Optional: camera

Preparation

- Provide a way for the class to develop the Class Consensus Model. Options: large paper, interactive whiteboard drawings, or drawing software. The Class Consensus Model should be large enough for the class to see. Keep the model on display in the classroom or bring it out during science instructional time as needed.
- Optional: Display the garbage disposal system model from Lesson 1-1.

The landfill bottle investigation continues for the following three lessons:

Lesson	Landfill Bottle Investigations
2-1	Time Point 1 - Assembling landfill bottles - Recording properties of garbage materials - Weighing landfill bottles
3-1	Time Point 2 - Observing landfill bottles - Recording properties of garbage materials - Weighing landfill bottles

3-3	Time Point 3 - Observing landfill bottles - Recording properties of garbage materials - Weighing landfill bottles

Safety

- When students make observations of the landfill bottles, instruct them to look through the side of the bottles and waft smell out of the bottles. Students should not place their faces directly over the open landfill bottles.
- Open the closed landfill bottles outside to allow the smell to diffuse.
- Direct students to wash their hands after handling the landfill bottles.

Introducing the Lesson

Reviewing What We Figured Out and Connecting to the DQ

Remind students of the driving question of the unit, *What happens to our garbage?* Review, *Our driving question is a big question, and the big question has sub-questions connected to it. One of our first sub-questions was: Do garbage materials change in a landfill bottle? For the past two weeks, we have been carrying out our investigation to collect data as evidence to answer this sub-question. Today we will record a third set of observations and measurements. After we collect data, we will analyze the data to interpret the changes over the two-week period.*

Direct students to the question posted on the DQ Board from the previous lesson, *What is that smell?* Direct students to talk in partners about what they now think about the smell coming out of the open landfill bottles. *Is there matter leaving these bottles? In what form is that matter?*

Carrying Out the Lesson

Observing and Recording Properties of Materials and Weight of Landfill Bottles

Inform students that they will:

1. Observe and measure the properties of the materials.
2. Measure the weight of the landfill bottles.

Tell students to turn and talk in partners to answer the questions, *What do you predict has happened to the properties of materials? What do you predict has happened to the weight of the landfill bottles after all this time – the same, heavier, lighter?*

Direct students to take out Investigation 2-1: Landfill Bottles and place the landfill bottles on their desks.

Give time for groups to observe and record changes in properties of materials and weight in Investigation 2-1: Landfill Bottles.

When all groups have completed their data recording, direct students to join their investigation partner group from Lesson 3-1. Each group of students with the open and closed systems share their data and record the new data on properties and weight in the open and closed systems.

Identifying Patterns in Data to Interpret Changes in Properties and Weight

Direct the students to work with their investigation groups to find patterns in their data for the open and closed systems.

Describe the process to the class: *As scientists, we make sense of our data and look for patterns of similarities and differences. After we find the patterns, we try to look for a cause to explain those patterns. Record your responses in Investigation 2-1: Landfill Bottles.*

Circulate to guide students and allow time for students to complete Questions to answer at Time Point 3 in Investigation 2-1: Landfill Bottles.

Break – end of class period 1

Resume during the next class period:

Engaging in Argument to Support Claims About Patterns in Garbage Materials' Properties

Direct students to take out Investigation 2-1: Landfill Bottles. Call on students to summarize the data from the landfill bottle system investigation, *We observed the landfill bottles over time at time points 1, 2, and 3.*

- *What patterns did you find in our properties data over time?* (In both open and closed systems, the properties of some materials stayed the same, but the properties of other materials changed. The properties of the aluminum foil stayed the same, but the properties of the orange changed.)
- *What patterns did you find in our weight data as we traced the weight of the closed system and the open system over time?* (We found the weight of the closed system stayed the same, but the weight of the open system decreased.)
- *Does anyone have any other observations of the open system?* (The weight decreased because smell came out of the bottles. Also, water evaporated.)
- *Our investigation question is, Do materials change in a landfill bottle at time point 3? How do the data help you answer this question?* (The data show that some properties stay the same and other properties change.)

Refer to the graphic organizer in Investigation 2-1: Landfill Bottles and inform students that the class will write an argument that answers the first investigation question, *Do materials change in a landfill bottle?*

Review what a claim is, *Now that we have data, we are going to use the patterns we identified in our data to make some claims. Remember, a claim is the answer to the question that we have investigated. Think back to when we made our claim for the crush investigation. We asked the question, What happens to materials when they are crushed in the landfill? We made the claim, When materials are crushed, the type of materials doesn't change. Today, you will make one claim that answers each of our current investigation questions, Do materials change in a landfill bottle? and Does the amount of matter change in a landfill bottle?*

Display PowerPoint Lesson 3-3: Engaging in Argument. Tell students that they will use the data from their investigations to write the argument. Complete the argument with the class, filling in the graphic organizer as you go. Instruct students to fill in the "Arguing from Evidence" graphic organizer in Investigation 2-1: Landfill Bottles.

Select data from one group as an example.

Question: Do materials change in a landfill bottle?	
Claim: Some materials change, but other materials do not change.	
Evidence:	**Why did you include these data?**

At time point 1, the orange was orange. At time point 3, the orange was brown, etc.	These data show that there was a change in properties.
At time point 1, the plastic spoon was white. At time point 3, the plastic spoon was white, etc.	These data show there was not a change in properties.
Reasoning: Materials are identified by their properties. I know the orange changed because the properties changed. I know the plastic spoon did not change because the properties did not change.	

Describe that the claim, evidence, and reasoning comprise an argument that answers the investigation question, *Do materials change in a landfill bottle?*

Teacher Background: Conservation of Matter

 The data from the open and closed systems show a decrease in the weight of the open system but no change in the weight of the closed system (conservation of matter). In the open system, gases escape so the weight decreases. We cannot tell from the evidence that matter was also conserved in the open system, but we can infer it based on the evidence from the closed system. You can stress that conservation of matter has been tested and found to be true across many investigations.

Students may suggest water evaporation as a cause for the weight decrease in the open system. This explanation is correct and acceptable at this point in the unit, but it is incomplete. Students may also say that the food rotted, and the smell shows that some matter produced from the rotting left the bottle.

By the end of the unit, students explain that microbes decompose food materials, producing gases. Along with water vapor, these gases escape from the open system, which explains the weight decrease in the open system only.

Engaging in Argument to Support Claims About Patterns in Landfill Bottle Weight

Tell students they will work in groups to write an argument to answer the other investigation question, *Does the amount of matter change in a landfill bottle?*

Describe the task as group work:

1. Each student will write a claim and share their claim for the question, *Does the amount of matter change in a landfill bottle?* in the "Arguing from Evidence" graphic organizer in Investigation 2-1: Landfill Bottles.
2. Students compare claims.
3. If students disagree, direct the group to examine the data tables for specific evidence and challenge them to continue to provide relevant data.
4. Remind students, *When data are selected to answer a question, we call the data "evidence." For example, in the open system at time point 1, what was the weight? At*

time point 3, what was the weight? This is evidence that the weight has changed. In the open system, the data show a decrease in weight, which is evidence that the smell leaving the bottle has weight. What are the data for the open system?"

5. Students complete the argument using the graphic organizer in Investigation 2-1: Landfill Bottles.
6. The group decides on the final argument and gets ready to report to the class.

As groups fill out the graphic organizer, guide students to reason that weight does not change in the closed system, even when the fruit seemed to disappear. Once students complete their arguments, facilitate a class discussion.

INDIVIDUAL CHECK! Arguing About the Amount of Matter in a Landfill Bottle
Allow students to revise their arguments after discussing with the class. Collect the graphic organizer in Investigation 2.1: Landfill Bottles. Use the criteria outlined in Teacher Rubric 3-3 to provide specific comments to students on the feedback form at the bottom of the graphic organizer.

Sample argument for Claim 2:

Question: Does the amount of matter change in a landfill bottle?	
Claim: The amount of matter does not change in a closed landfill bottle system, but the amount of matter does change in an open landfill bottle system.	
Evidence:	**Why did you include these data?**
The weight of the closed system was 1,550 g at time points 1, 2, and 3.	These data show that the weight stayed the same in the closed system.
The weight of the open system decreased, and there was a smell coming from the open system.	These data show that there was something leaving the open system.
Reasoning: The weight stayed the same in the closed system, even when some of the garbage materials seemed to disappear. So, no matter what changes happened in the closed system, the amount of matter stayed the same. In the open system, the amount of matter decreased because some matter left the system as a smell. We know that smells are a type of gas that have weight. So when the smell left the open system, the amount of matter decreased.	

Guide students to the scientific idea that matter is always conserved, not just in the closed landfill bottle system.

- *We observed that the weight of the open system decreased. What happened to the matter in the open system?* (The matter left the system. The matter turned into a gas that left the system.)

- *When the matter left the open system, where did it go? Does the matter still exist?* (out of the bottle; into the classroom; into our noses; still exists)

Remind students that they are making observations of the landfill bottle systems and that these systems are part of a larger system. Ask, *If we look at the larger system that includes both the inside and outside of the landfill bottle, can we argue that matter is always conserved?* (Yes.)

Break – end of class period 2

Resume during the next class period:

Developing Landfill Models at Time Point 3

Review the results of opening the closed system from last class. *We talked about conservation of matter. What was the reason for the difference in weight data between the open and closed systems?* (The smell escaped from the open system. For the closed system, when we opened the lid last class, the smell escaped. We know that smell, in a gas form, has weight.)

Pass out chart paper from Lesson 2-1 with group landfill bottle models.

Describe that each group will be collaborating in developing another model of the landfill bottle systems at time point 3. In the next box of the chart paper (below the model at time point 1), each group develops a model of the landfill bottle systems at time point 3. These models should include processes in the landfill bottle systems.

Give an example of a process, such as, *In the school garbage handling system model we created in the beginning of the unit, garbage was transported from the school dumpster to the landfill. This was a process, and we used arrows to represent the movement of garbage.*

Describe that the model represents what is going on in the landfill bottle system. Everyone in the group should contribute ideas to the group work. To set up the group work, display the prompts below on the board to talk about the landfill bottle system. Fill in student responses (purple) to set up for the Class Consensus Model to be completed later in the lesson.

Landfill bottle systems	open and closed
Components	soil, water, garbage materials
Flows of matter	
Inputs	air, bugs in the open system none in the closed system
Outputs	smell, water vapor in the open system none in the closed system
Evidence of processes	Properties of materials change over time. Weight in landfill bottles changes over time. Matter flows out of the open system. Rotting materials produce smelly gases. Mold grows on food materials.

Allow time for the group work. As you conference with each group, remind students to label, use a key for symbols, include components of the system, show processes in the system, describe changes or no changes, and provide evidence for the processes in the system and changes.

Making Predictions From Model of Landfill Bottle System

As groups finalize their time point 3 models, remind students that models are a tool for thinking. They are helpful to scientists. Scientists make predictions about what might be causing their observations. These predictions lead scientists to new investigations.

Review and connect investigations, *Our weight data is very interesting when we compare the open and closed landfill bottle systems. We argued that the weight of the closed system stayed the same because the amount of matter stayed the same. The matter is conserved. Where have we tested the conservation of matter before?* (paper tear, carton crush, sugar and water mixing). *We found in all these instances including the closed system landfill bottle that regardless of any change to the matter, the weight stays the same.*

Tell students to discuss the answers to these questions in their groups using the model as a thinking tool,

- *Why do you think the weight of the open system decreased over time?* (Because the gas escaped. Gas has weight because it is matter.)
- *Why did the weight of the closed system remain the same?* (Because the gas cannot escape. There is a lid blocking the gas from escaping.)
- *What do you predict if we open the lid of the closed system? Share your predictions with your group.*

Let's observe what happens when we open the closed systems. Direct groups with closed systems to open the lids of their landfill bottles. The smell will be strong, and you may consider opening the bottles outside. Give students time to react.

After students have had time to react, close the lids of landfill bottles. Save all landfill bottles for Lesson 4-2. Tell students, *Wow! That smelled really bad! Let's close the bottles back up.*

How did your prediction match the observation? Do you have any questions? Write on sticky notes and add to DQ Board.

Gallery Walk of Landfill Models

As groups finish models, post them on the classroom walls.

Tell groups to:

1. Walk around the room to observe the other models.
2. Write respectful comments and questions about other models on sticky notes.
3. Read the comments and questions on their own models once the gallery walk is done.

Give time for students to respond to the comments and questions on their models by making any revisions to the model or adding labels or notes that help describe their model.

SMALL GROUP CHECK! Gas and Conservation of Matter
Circulate through the gallery walk to check the extent to which group models represent gas leaving the open landfill bottle system. These models should represent both the particles and their motion, i.e., the gas particles leave the landfill bottles, as students observe a smell that travels around the room. The idea of gas particles alone is insufficient. The critical idea of conservation of matter is that some matter particles that were part of the garbage at time point 1 left the open landfill bottle as part of the smell at time point 3. If some models include wavy lines (instead of dots as particles) to represent gas, remind students of the balloon and syringe investigations in Lesson 3-2.

Possible teacher prompts to guide student thinking:
-*What would the wavy line look like if we enlarged it?*
-*Where does the gas come from?*
-*Why did the weight of the open system decrease?*
-*Why did the weight of the closed system stay the same?*
-*How might you revise your model to include this thinking?*

Possible teacher prompts to EXTEND student thinking:
-*What do you predict will be the weight of the closed system 1 month from now? 1 year? 10 years? Why?*
-*What would happen to the weight of the closed system if we opened the bottle? Why?*

Developing the Class Consensus Model of Landfill Bottle System

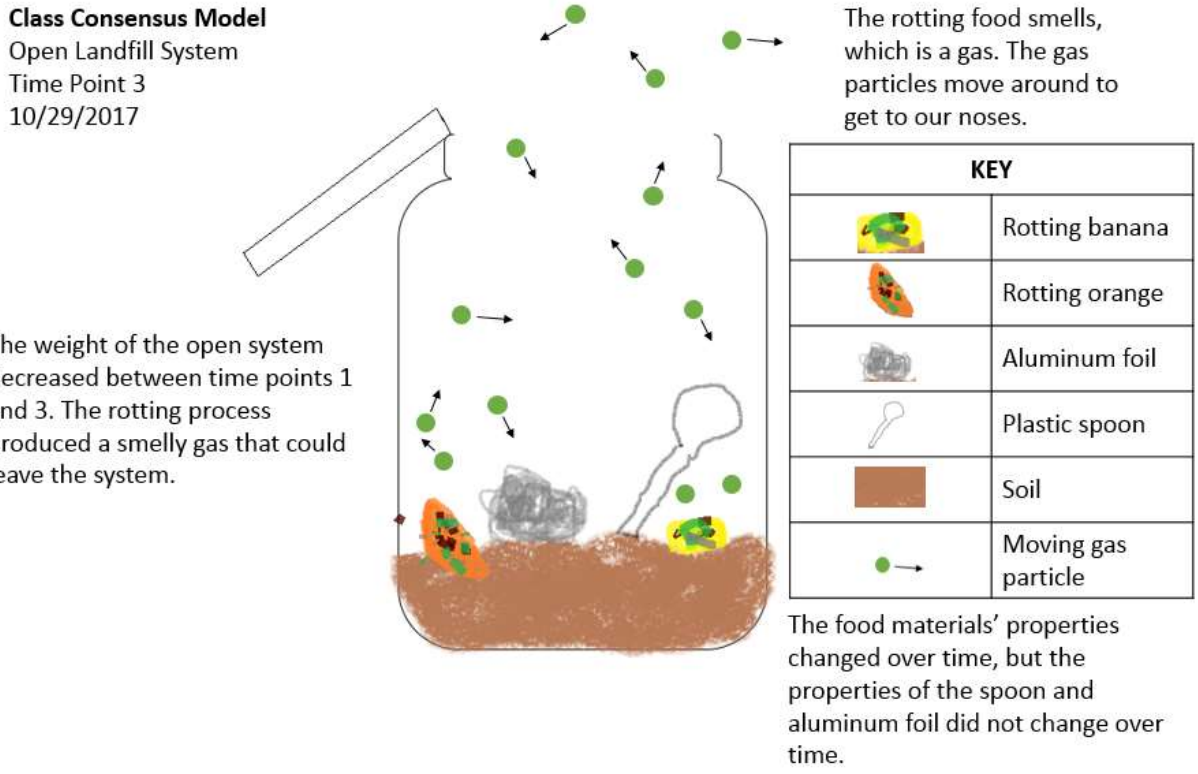
Develop the Class Consensus Model for the processes that occurred in the open landfill bottle system. Tell students that as scientists we try to convince each other of our ideas with evidence from our data. Say, *The gallery walk helped us understand the ideas of the other groups. How were their ideas similar to yours? We will describe similar ideas in the class consensus model.*

Considerations to include in the Class Consensus Model based on class agreement:

- Processes shown in the various group models (gas production by rotting fruit, changes in properties)
- How best to represent the ideas
- Labels (title of the model, open system, closed system)
- Symbols and a key for the symbols

Guide students to think about the limitations of the model. Ask, *How is the paper, or diagrammatic, model you have developed similar to and different from the physical model of a landfill bottle system?* (The paper/diagrammatic model and the physical model are similar in that they both have the same components. They are different in that the physical model allows us to make observations. The diagrammatic model shows invisible processes. The physical model shows the current time point. The diagrammatic model shows multiple time points.)

Sample Class Consensus Model:



Closing the Lesson

Exit Slip 3-3

CLASS CHECK! Conservation of Matter Extension Task

Have students work on Exit Slip 3-3 individually. Collect the exit slips and use the key to assess students' responses and determine the extent to which students can apply their understanding of conservation of matter to a context outside the unit phenomenon. You could also use responses to identify which students may need additional support.

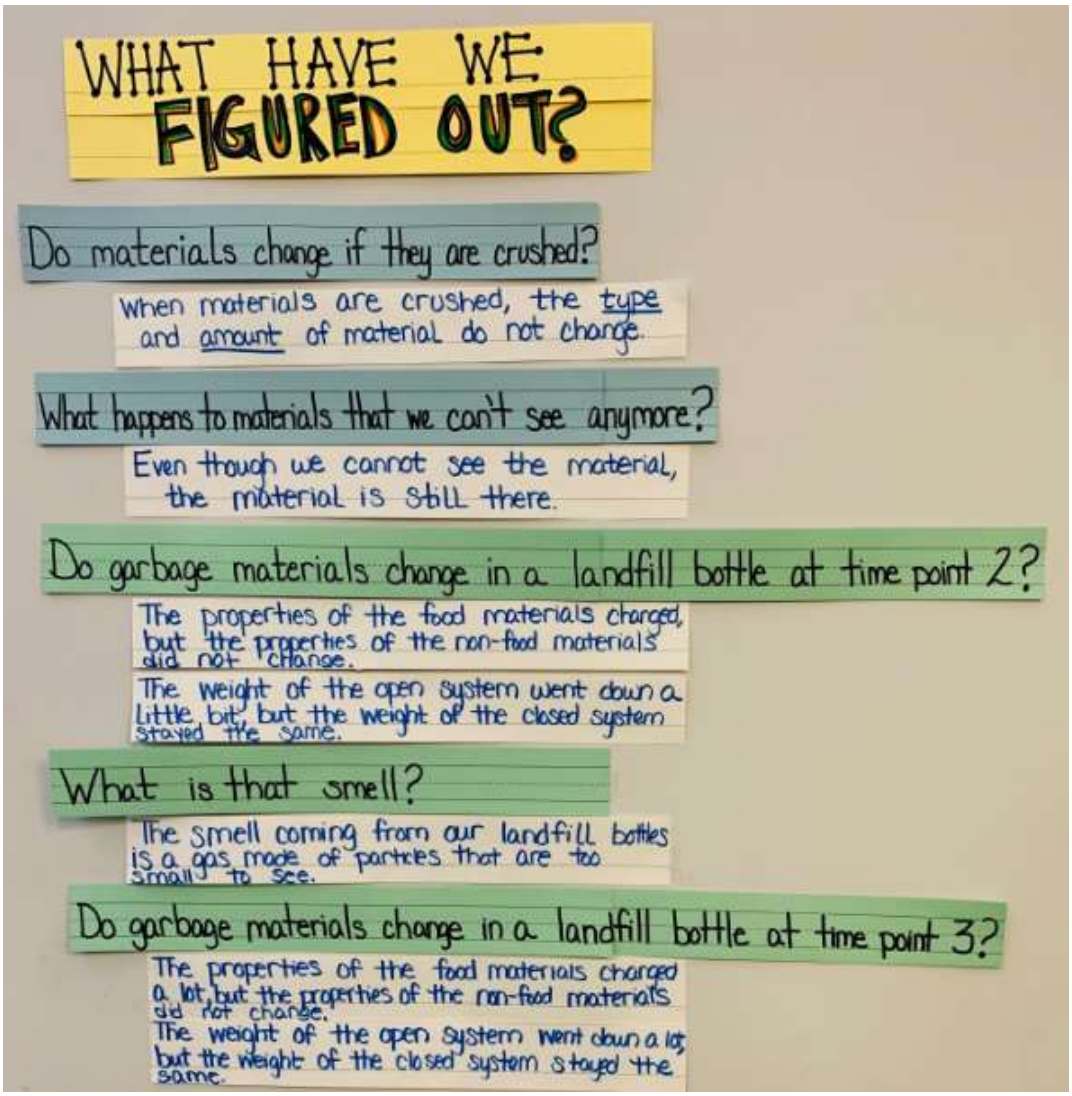
Connecting to the Next Question

Read aloud students' questions added to DQ Board. Give affirmations to students' questions and make the observation that many questions refer to what is causing the smell. Comment that you have been wondering the same thing! *What is causing that smell? Let's start by*

figuring out what happens when materials are mixed. Point to a question on the DQ Board that is similar to, *What happens to these materials when they are mixed?*

Tracking What We Figured Out (optional)

Guide students to think about the sub-question of the lesson and what they have figured out so far. Create the class visual display using their responses. In addition to the class visual display, students may complete the individual graphic organizers (located in Lesson 2-2). Students can add to their graphic organizers after each lesson.



Evidence Statement Lesson 3-3

LP3-3 ES

- Students compare and contrast data to provide evidence that 1) in both the open and closed systems, some properties change but others do not change, and 2) matter is conserved in both systems, but the weight of the closed system stays the same because the gas cannot escape.

Connections to Targeted 5th Grade NGSS Performance Expectations

5-PS1-2 Measure and graph quantities to provide evidence that, regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.

5-PS1-3 Make observations and measurements to identify materials based on their properties.

Building Progressions

SEP *Analyzing and interpreting data*: *Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.*

K-2: Use observation (firsthand and or from media) to describe patterns in the natural world in order to answer scientific questions.

3-5: *Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.*

Middle School: Analyze and interpret data to determine similarities and differences in findings. Analyze and interpret data to provide evidence for phenomena.

SEP *Using mathematical and computational thinking*: *Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems.*

K-2: N/A

3-5: *Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems.*

Middle School: Use mathematical representations to describe and/or support scientific conclusions and design solutions.

DCI *PS1.A*: *The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.*

K-2: Different kinds of matter exist and many of them can be either solid or liquid, depending on the temperature. Matter can be described and classified by its observable properties. Different properties are suited to different purposes. A great variety of objects can be built up from a small set of pieces.

3-5: *The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.*

Middle School: Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.

DCI *PS1.B*: *No matter what reaction or change in properties occurs, the total weight of the substances does not change.*

K-2: Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.

3-5: *No matter what reaction or change in properties occurs, the total weight of the substances does not change.*

Middle School: Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substance are regrouped into different molecules that have different properties from those of the reactants. The total number of each type of atom is conserved, and thus the mass does not change.

CCC *Energy and matter - Flows, cycles, and conservation*: *Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter.*

K-2: Objects may break into smaller pieces and be put together into larger pieces, or change shape.

3-5: *Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter.*

Middle School: Matter is conserved because atoms are conserved in physical and chemical processes. Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. The transfer of energy can be tracked as energy flows through a designed or natural system.

Connections to CCSS for English Language Arts-Literacy
W.5.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly. **W.5.2.E:** Provide a concluding statement or section related to the information or explanation presented. **SL.5.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher- led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly. **SL.5.1.B:** Follow agreed-upon rules for discussions and carry out assigned roles. **SL.5.1.C:** Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others. **L.5.6:** Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal contrast, addition, and other logical relationships (e.g., however, although, nevertheless, similarly, moreover, in addition).
Connections to CCSS for Mathematics
5.NBT.3.B: Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. **MP1:** Make sense of problems and persevere in solving them. **MP2:** Reason abstractly and quantitatively.

Name _____ Date _____

Exit Slip 3-3

Carla bought a container of ice cream at the supermarket. When she came home, she forgot to put the container in the freezer. After one hour, the ice cream melted in the container.

1. Is the same material, or matter, in the container now?

   _____

   _____

2. Carla weighed the container before and after the ice cream melted. Would the container weigh the same, weigh more, or weigh less? How do you know?

   _____

   _____

   _____

3. Carla left the container out for two weeks. If she weighed the container after two weeks, would the container weigh the same, weigh more, or weigh less? How do you know?

   _____

   _____

EXTENSION:

4. You see a puddle of water on the side of the road. The next day, the puddle of water is gone. What happened to the water? Did it disappear?

   _____

   _____

Name _____ Date _____

Exit Slip 3-3 ANSWER KEY

Carla bought a container of ice cream at the supermarket. When she came home, she forgot to put the container in the freezer. After one hour, the ice cream melted in the container.

1. Is the same material, or matter, in the container now?
   Yes, the material/matter is the same before and after it melts.

2. Carla weighed the container before and after the ice cream melted. Would the container weigh the same, weigh more, or weigh less? How do you know?
   The weight would stay the same because the container is a closed system. Because matter cannot come in or out of the system, matter is conserved.

3. Carla left the container out for two weeks. If she weighed the container after two weeks, would the container weigh the same, weigh more, or weigh less? How do you know?
   The weight will stay the same after two weeks because the system is still closed. Because matter cannot come in or out of the system, matter is still conserved.

EXTENSION:

4. You see a puddle of water on the side of the road. The next day, the puddle of water is gone. What happened to the water? Did it disappear?
   The water did not disappear. The water evaporated but still exists. It changed from a liquid to a gas.

Arguing from Evidence

(Properties) ANSWER KEY

Question: Do materials change in a landfill bottle?	
Claim: Some materials change, but other materials do not change.	
Evidence:	**Why did you include these data?**
At time point 1, the orange was orange. At time point 3, the orange was brown, etc.	These data show that there was a change in properties.
At time point 1, the plastic spoon was white. At time point 3, the plastic spoon was white, etc.	These data show there was not a change in properties.
Reasoning: Materials are identified by their properties. I know the orange changed because the properties changed. I know the plastic spoon did not change because the properties did not change.	

Arguing from Evidence

(Weight) ANSWER KEY

Question: Does the amount of matter change in a landfill bottle?	
Claim: The amount of matter does not change in a closed landfill bottle system, but the amount of matter does change in an open landfill bottle system.	
Evidence:	**Why did you include these data?**
The weight of the closed system was 1,550 g at time points 1, 2, and 3.	These data show that the weight stayed the same in the closed system.
The weight of the open system decreased, and there was a smell coming from the open system.	These data show that there was something leaving the open system.
Reasoning: The weight stayed the same in the closed system, even when some of the garbage materials seemed to disappear. So, no matter what changes happened in the closed system, the amount of matter stayed the same. In the open system, the amount of matter decreased because some matter left the system as a smell. We know that smells are a type of gas that have weight. So when the smell left the open system, the amount of matter decreased.	

Lesson 3-3 Teacher Rubric
Arguing About the Amount of Matter in a Landfill Bottle

	Claim	Evidence	Reasoning
0	Claim is incorrect, irrelevant, or missing. Examples: • *(None)* • *We weighed the landfill bottle at different time points.*	Evidence is incorrect, irrelevant, or missing. Examples: • *(None)* • *The food materials vanished.* • *The properties of the orange changed, but the properties of the plastic spoon did not.*	Reasoning is incorrect, irrelevant, or missing. Examples: • *(None)* • *Since the properties of the food materials changed, the amount of matter must have also changed.*
1	Claim is correct and answers the investigation question. Example: • *The amount of matter does not change in a closed landfill bottle system, but the amount of matter decreases in an open landfill bottle system.*	Evidence supports claim using data from open OR closed landfill bottle system. Examples: • *The weight of the closed landfill bottle system was 1,550 g at time points 1, 2, and 3.* • *The weight of the open landfill bottle system decreased over time, and there was a smell coming from the bottle.*	Reasoning links evidence from open OR closed landfill bottle system to claim. Examples: • *In the closed system, the weight stayed the same, so the amount of matter did not change.* • *In the open system, the weight decreased because a gas (which has weight) left the bottle so there was less matter in the bottle.*
2		Evidence supports claim using data from open AND closed landfill bottle systems. Example: • *The weight of the closed landfill bottle system was 1,550 g at time points 1, 2, and 3. The weight of the open landfill bottle system decreased over time, and there was a smell coming from the bottle.*	Reasoning links evidence from open AND closed landfill bottle systems to claim. Example: • *In the closed system, the weight stayed the same, so the amount of matter did not change. In the open system, the weight decreased because a gas (which has weight) left the bottle so there was less matter in the bottle.*

TOTAL: _____ out of 5