Lesson 2-2
Do materials change if they are crushed?

Lesson Overview

1. Timeframe: 2 class periods

2. Learning Performances
   Students describe the patterns observed in the properties and the weight of materials when the materials change appearance by being crushed.

   Students argue that the patterns observed in the properties of materials serve as evidence that the type of material is the same even when the material is crushed.

   Students argue that the patterns observed in the weight of materials serve as evidence that the amount of matter is the same even when the matter is crushed.

   SEP *Planning and carrying out an investigation:* *Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.*

   SEP *Engaging in argument**: Support an argument with evidence, data, or a model.*

   DCI *PS1.A:* *Measurements of a variety of properties can be used to identify materials.*

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

   CCC *Patterns**: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products.*

   CCC *Patterns:* *Patterns can be used as evidence to support an explanation.*

3. Overview
   Lesson 2-2 provides students additional data to support the DCI about conservation of matter. The weight of a material stays the same even when crushed or torn because the matter is conserved even when it changes appearance.

   Day 1
   - The teacher uses student questions on the DQ Board to introduce the question, *Do materials change if they are crushed?*
   - Guided by the teacher, students plan the crush investigation by deciding to record the properties and weight of materials.
   - Students complete the crush investigation, recording property and weight data.

Day 2

- In pairs, students identify and share patterns they find in the crush investigation data.
- Students engage in argument, which is scaffolded by the teacher. They argue from evidence that the type of material remains the same, even when the material is crushed in a landfill. They also argue that the amount of material remains the same, even when the material is crushed in a landfill.

Materials

For each student:

- 1 Science and engineering notebook (SEN)
- 1 Pencil
- 1 Copy of Investigation 2-2: Crush (All days)
- 1 Copy of Self and Peer Check! Arguing from Evidence (Day 2)

For each group:

- 1 Electronic scale
- 1 Clear plastic cup (any size, approx. 10 oz)
- Student suggested materials from lesson 2-1. For example:
  - 1 Soda can (emptied and cleaned)
  - 1 Piece of paper (for the investigation)
  - 1 Cookie in a plastic baggie

For the class:

- PowerPoint Lesson 2-2 (All days)

Preparation

- Students named materials they would like to crush at the end of Lesson 2-1. You can use students' suggestions to carry out Investigation 2-2: Crush. For clarity throughout this lesson, we refer to a soda can, a piece of paper, and a cookie. In your classroom, select materials that your students want to investigate.

Safety

- If students select a soda can, warn them that the edges of aluminum (soda can) may be sharp after crushing.

Introducing the Lesson

Teacher Introduction: *What Happens to Materials When They Are Crushed in the Landfill?*

Review the DQ, *What happens to our garbage?*

Our driving question is a big question, and the big question has sub-questions connected to it. Currently, we are carrying out an investigation of landfill bottles to collect data as evidence to answer this sub-question, Do garbage materials change in a landfill at time point 1?

CLASS CHECK! Planning the Landfill Bottle Investigation Follow-Up

Return Exit Slip 2-1 to students. Based on their responses, review key aspects of the landfill bottle investigation, as needed. If time allows, ask a student who answered the extension question to share their response. The extension question relates to the idea of fair tests, which is part of the science and engineering practice of "planning and carrying out investigations." This is an opportunity to begin introducing the idea. Fair tests are addressed more fully in Unit 2 of the curriculum after students have had experience planning and carrying out investigations in this unit.

Point to DQ Board. Say, *Another sub-question we asked after our virtual landfill fieldtrip was, What happens to materials when they are crushed in the landfill? You made predictions in your SEN about what would happen to various materials in a landfill. We are going to investigate some garbage materials to collect evidence about what happens to these materials as they are crushed.*

Carrying Out the Lesson

SEN Entry: Planning an Investigation by Identifying Properties to Record

Tell students, *To mimic the process of materials being crushed in a landfill, we will be doing the crushing in our classroom! In order to describe what happens to the materials as they are crushed, we observe the properties of each material. Remember, just like in our landfill bottles, we use properties of a material to tell what type of material is present. Let's look at the properties of this soda can together and record its properties in a chart on the board.*

Display PowerPoint Lesson 2-2: Properties, and fill in the "Before Crushing" row with students.

Material: Soda Can	**Property**			**Weight (Grams)**
	Color	**Texture (Rough or Smooth)**	**Reflectivity (Shiny or Dull)**	
Before Crushing	*Silver and red*	*Very smooth*	*Shiny*	*10 grams*
After Crushing				

Tell students to think about 2 materials, a soda can that gets crushed and a piece of paper that gets torn into 100 pieces.

Display the following questions:

1. When a material changes shape, is it still the same material? Why do you think this?
2. When a material changes shape, does the amount of the material remain the same? Why do you think this?

Direct students to write the answers to the questions in their SEN.

Direct groups to share their SEN responses in groups.

Identify a group with students who have different ideas. Based on students' responses to the questions in their SEN, demonstrate the way we disagree in science:

- Tell Student A in the group to report on an idea s/he does not agree with. Student A states Student B's idea and reasons for that idea.
- Ask Student B whether the idea was accurately reported or whether s/he wishes to add something.
- Describe that this is a way to find out if everyone in the group understands everybody else's ideas.

Summarize student ideas and plan for the next investigation, *Many of us agree that we identify a material by its properties. But we have different ideas about whether the type and the amount of the material changes when it is crushed. Let's investigate.*

Teacher Background: Why Volume is Not a Suitable Property to Measure

 If some students suggest volume is a useful indicator, include that property in the investigation. Students will probably agree that the amount of a material remains the same as it is crushed or torn. Students may suggest volume, as well as weight, as a measure of the amount of a material. Volume is a correct measurement for solid lumps of material or for liquids, but not for something like a soda can that has space inside it. Students may disagree about whether it would be useful to measure volume. Leave it standing as a question while you carry out the weight measurements in the first investigation. After the investigation, elicit student responses that the weight stayed the same even when the volume changed.

Carrying Out an Investigation: Crush

Direct students to take out Investigation 2-2: Crush using the materials students chose at the end of Lesson 2-1. Describe the investigation questions. *Our purpose is to investigate what happens when we crush some materials. We have different ideas about whether the type and the amount of material changes when the material is crushed in a landfill. Now we are investigating these ideas using the landfill bottles in our classroom.*

Write the two investigation questions on the board:

1. When a material is crushed in a landfill bottle, does the type of material change?
2. When a material is crushed in a landfill bottle, does the amount of material change?

Describe the investigation:

- Review procedures for operating the electronic scale.
- Guide the class through the procedures in Investigation 2-2: Crush.
- Give students time to complete Investigation 2-2: Crush and Questions 1-3.

Conclude the class by saying that *Tomorrow, we will look at our measurement data and find patterns of similarities and differences between materials. Then we use the patterns in the data to answer our investigation questions, When materials are crushed in a landfill bottle, does the type of material change? and When materials are crushed in a landfill bottle, does the amount of material change?*

Break – end of class period 1

Resume during the next class period:

Identifying Patterns in Crush Investigation Data
Direct students to take out their Investigation 2-2: Crush and discuss patterns they found in the data collected. Students have data from the previous day to compare properties and weight of different garbage materials. Direct students to work in partners to answer questions 4 and 5 in Investigation 2-2: Crush. Circulate to guide students as they look for patterns in their data to answer questions 4 and 5. Possible patterns identified: Pattern 1: No change in the properties of color, texture, or reflectivity for any of the materials Pattern 2: No change in the property of weight for any of the materials
Teacher Background: Engaging in Argument from Evidence
 The practice of constructing an argument that shows how the data serve as evidence to support the claim is complex and therefore is developed over several lessons. Guide students from restating the data from the investigation to stating the connection between the claim and the evidence. Data from observations or investigations may be quantitative or qualitative. Any data used to support a claim becomes evidence. However, evidence is not an opinion. Even as students add reasoning to their argument, the reasoning is about how the data as evidence supports (fits) the claim. In fact, being able to distinguish between evidence and opinion is an element for the SEP engaging in argument from evidence in the K-2 grade band. From the K-2 grade band, students should be familiar with making a claim. For the 3-5 grade band, students extend this understanding by providing evidence that supports their claim and reasoning of how their evidence supports their claim. In this unit, students are first exposed to engaging in argument by co-constructing the arguments. The scaffolds around argumentation are released through the course of the unit so that students argue more independently by the end of the unit. In Lesson 2-2, co-construct the first argument with the class and guide groups to make the second argument. In Lesson 3-3, guide the class to make the first argument and guide groups to make the second argument. In Lesson 4-1, guide groups to make the first argument and students make individual arguments. In Lesson 4-2, students construct individual explanations.

SEN Entry: Constructing Claims About Patterns in Crush Investigation Data

Inform the class, *We are going to use the patterns we identified in our data to make some claims.*

Describe, *You may remember from previous grades that when we have figured something out from an investigation, we make a claim. A claim answers a question that we have investigated.*

What questions did we investigate? (When materials are crushed in a landfill bottle, does the type of material change? When materials are crushed in a landfill bottle, does the amount of material change?)

Can we answer those questions? Let's think about it. What patterns did you notice in the data? (The properties of the materials did not change; the weight of the materials did not change.)

What do these patterns tell us? (The type of material did not change; the amount of material did not change.)

These answers are claims that we can write in our SEN.

1. Write the title on the board, while students write in their SEN: Making claims about patterns in our crush investigation data.
2. Write the two claims on the board, while students write in their SEN:

Claim 1. When materials are crushed, the type of material does not change.
Claim 2. When materials are crushed, the amount of material does not change.

Display PowerPoint Lesson 2-2: Properties.

Describe, *We will show our thinking about what we learned in the investigation. We have agreed to two claims. Let's provide evidence to support our claims.*

Call on students to provide data they will use as evidence from their investigation to support the claims to fill in the "After Crushing" row on the board. Claim 1 relates to the property data. Claim 2 relates to the weight data.

Material: Soda Can	**Property**			**Weight (Grams)**
	Color	**Texture (Rough or Smooth)**	**Reflectivity (Shiny or Dull)**	
Before Crushing	*Silver and red*	*Very smooth*	*Shiny*	*10 grams*
After Crushing				

As students respond, use their responses as an example to emphasize two important aspects of using data as evidence.

1. Evidence is NOT an opinion, e.g., Students say that they think the soda can is the same type of material before and after crushing because they "think so." Respond, *Evidence is not an opinion of what you think. Evidence is data that supports the claim. For example, I know that the soda can is the same type of material before and after crushing because the properties did not change. The soda can was red, smooth, and shiny before and after crushing.*
2. Evidence is specific data, e.g., Students say the weight is the same before and after crushing. Respond, *When I look for evidence, I have to go back to my SEN or investigation to find specific data. For example, I observed that the soda can weighed 10 g before and after crushing. Writing 10 g is more specific evidence than just "the same."*

Teacher Background: Arguing from Evidence

Most student groups will make an argument to support the claim, just because the teacher said it was true. However, if students refute the claim, you should accept their work and include it in the class discussion without critiquing it. Ensure that further test cases provide evidence that directly confronts any obvious flaws in their arguments, and then give the class opportunities to revise their arguments. The goal is that students hear one another's arguments and convince one another based on evidence from the investigation. This will help prepare students for middle school where they will be expected to present and refute arguments as part of the argumentation practice.

Arguing From Evidence to Support or Refute a Claim

Describe how scientists argue from evidence, *Scientists like us will disagree at times and argue in a special way. We are all trying to find out answers from the evidence we can observe and record. We respect everybody's ideas and test the ideas that match the evidence. Different ideas help all of us think more clearly about what to observe and how to decide which ideas match our evidence. The goal of the argument is not to show who is right, but to decide which ideas best match our evidence.*

Describe that an argument can be supported or refuted based on the evidence presented, *To provide an argument to agree or disagree with these claims, we have to give our reasoning as well as our evidence. For example, to support a claim 1, my argument would be as follows* (Fill in the table on the board as a series of steps and describe each step.):

Question: When materials are crushed in a landfill bottle, do the materials change?

Claim: When materials are crushed, the type of material does not change.
Describe, *Our claim answers the question.*

Evidence: The soda can was red, smooth, and shiny before and after crushing. The paper was white, smooth, and dull before and after crushing, etc.
Describe, *The evidence comes from the data we collected, and it is very specific.*

Reasoning: There was no change in the properties (color, texture, or reflectivity) for any of the materials. Materials are identified by their properties. Since none of the properties changed, crushing a material does not change the material.

Describe, *Reasoning connects the evidence to the claim. I ask myself "Why did I include that evidence?" I included the properties in my evidence because I know that materials are identified by their properties.*

Sample argument for Claim 1:

Question: When materials are crushed in a landfill bottle, does the type of material change?	
Claim: When materials are crushed, the type of material does not change.	
Evidence:	**Why did you include these data?**
The soda can was red, smooth, and shiny before and after crushing.	No change in properties shows that the materials did not change.
The paper was white, smooth, and dull before and after crushing.	No change in properties shows that the materials did not change.
Reasoning: There was no change in the properties (color, texture, or reflectivity) for any of the materials. Materials are identified by their properties. Since none of the properties changed, crushing a material did not change the material.	

Direct students to develop an argument in their groups to support or refute Claim 2: When materials are crushed, the amount of the material does not change. Tell students they will be developing their argument in the graphic organizer in Investigation 2-2: Crush.

Describe the argument in this way:
First, your group decides to agree or disagree with the claim.
If you agree, give your evidence that supports the claim and say why that evidence supports the claim.
If you disagree, give your evidence that refutes the claim and say why that evidence refutes the claim.
Write down your final argument.

Sample argument for Claim 2:

Question: When materials are crushed in a landfill bottle, does the amount of material change?	
Claim: When materials are crushed, the amount of material does not change.	
Evidence:	**Why did you include these data?**
The soda can weighed 10 g before and after crushing.	There was no change in the weight of the soda can.

The paper weighed 6 g before and after crushing.	There was no change in the weight of the paper.
The cookie weighed 8 g before and after crushing.	There was no change in the weight of the cookie.
The cup weighed 5 g before and after crushing.	There was no change in the weight of the cup.
Reasoning: There was no change in the weight of any material, so crushing a material did not change the amount of material.	

As groups work, circulate to:

1. Reinforce detailed data as evidence
2. Emphasize why particular data was selected as evidence
3. Encourage participation of all students

SELF AND PEER CHECK! Arguing from Evidence

Describe, *Now that you've completed your arguments, work in your groups to reflect on and improve your arguments before sharing with the class.*

Have students complete Self and Peer Check! Arguing from Evidence.

Call on groups to share claim, evidence, and why evidence supports or refutes the claim.

Possible group responses:

- The weight of the materials stays the same even if the size of the original material gets smaller.
- The weight before and after crushing the materials is the same so the amount of the materials does not change.

Teacher Background: Testing Additional Materials

If students decide to test another material, allow for additional time for investigation. Let students test other material options. If students decide to test a liquid material, let them measure the weight of two liquids, combine the two liquids, and then measure the combined weight.

Teacher Naming Conservation of Matter Idea

Tell the class, *You've discovered a big idea in science! Everything, including the materials we tested, is made up of matter. When matter has a physical change of size or shape, the amount of the matter stays the same or is conserved. That's called conservation of matter. The weight of materials did not change, so we know that matter was conserved. Cool!*

SEN Entry: Conservation of Matter

CLASS CHECK! Conservation of Matter

Have students answer the following question in their SEN individually.

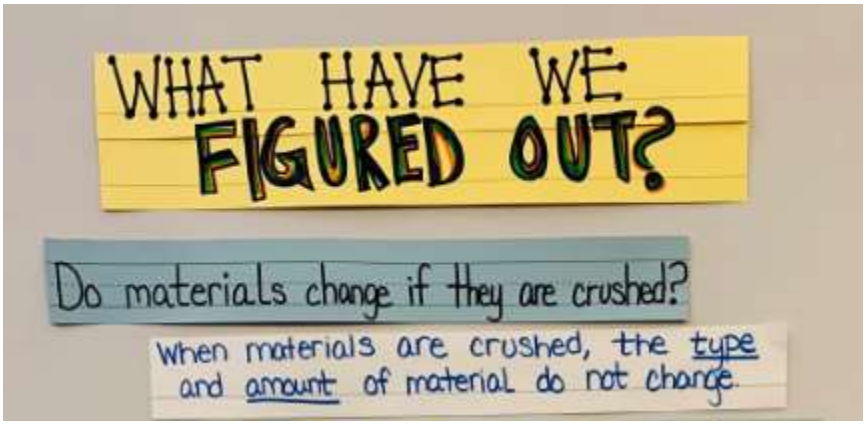
QUESTION: Imagine that we tear a piece of paper into very small pieces. Then we tear the paper into even smaller pieces until we can't see the pieces anymore. Is the paper still there? Support your answer with evidence from the crush investigation.

EXTENSION: What data could you collect to investigate whether the amount of paper has changed?

Collect the SENs to get a sense of students' initial ideas about conservation of matter. Do not correct students' responses (e.g., if they say the paper disappears) as they are still developing their understanding of conservation of matter. Use their responses to inform your subsequent instruction. You could also identify which students may need additional support in the upcoming lessons, especially in Lesson 3.3.

Tracking What We Figured Out (optional)

Your students might benefit from a visual display that tracks the sub-question of the lesson and how that question leads towards answering the driving question. See the example below of a visual tracker that can be posted next to the DQ Board. Guide students to think about the sub-question and what they have figured out so far. Create the visual display using their responses. In addition to the class visual display, students may complete individual graphic organizers (located at the end of the handouts in this lesson). Students can add to their graphic organizers after each lesson.



Evidence Statements Lesson 2-2

LP2-2 ES
- Students describe the properties and measure the weight of materials before and after crushing.

LP2-2 ES
- Students argue that the patterns in the properties of materials (e.g., color, texture, reflectivity) serve as evidence that the type of material remains the same even when the materials are crushed or torn.

LP2-2 ES
- Students argue that the patterns in weight data serve as evidence that matter continues to be present even when it changes appearance or seems to disappear (conservation of matter).

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 *Planning and carrying out an investigation:* Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

K-2: Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.

3-5: Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

Middle School: Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.

SEP *Engaging in argument*: *Support an argument with evidence, data, or a model.*

K-2: Construct an argument with evidence to support a claim.

3-5: *Support an argument with evidence, data, or a model.*

Middle School: Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon.

DCI *PS1.A:* *Measurements of a variety of properties can be used to identify materials.*

K-2: Matter can be described and classified by its observable properties. Different properties are suited to different purposes.

3-5: *Measurements of a variety of properties can be used to identify materials.*

Middle School: 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.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. 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.

CCC *Patterns*: *Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products. Patterns can be used as evidence to support an explanation.*

K-2: Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

3-5: *Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products. Patterns can be used as evidence to support an explanation.*

Middle School: Patterns can be used to identify cause and effect relationships. Macroscopic patterns are related to the nature of microscopic and atomic-level structure. Graphs, charts, and images can be used to identify patterns in data.

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. **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).
Connection 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 _____

Investigation 2-2: Crush
What happens to materials when they are crushed in the landfill?

Investigation plan		✓
1	Gather materials: ☐ 1 Electronic scale ☐ 1 Clear plastic cup (any size, approx. 10 oz) Crush materials: ☐ 1 Soda can (emptied and cleaned) ☐ 1 Piece of paper ☐ 1 Cookie in a plastic baggie ☐ _____ ☐ _____	
Plan for each material		
2	Prepare the electronic scale: ☐ Place the scale on a flat surface. ☐ Press the power button to turn on the scale.  ☐ Make sure the scale unit is in grams (using the kg/lb button).  ☐ Place the clear plastic cup on the scale. ☐ Calibrate the scale by pressing the “0.0 TARE” button. 	
3	☐ With your group, select 1 material. ☐ Identify and record the properties of the material (color, texture, reflectivity and) in the table. ☐ Measure and record the weight of the material in the table. ** Make sure to place the material in the plastic cup when you weigh it. See the paper example to the right: 	
4	Crush the material over the clear plastic cup. Make sure all pieces of the material are in the cup – don’t lose any pieces. Record the properties in the table.	

5	Prepare the electronic scale using the instructions in step 2. Weigh the crushed material. Record the weight in the table.	
6	Repeat steps 2 - 5 for each material.	
7	Answer the questions at the end of the investigation.	

Investigation Table

Material		Property			Weight (grams)
		Color	Texture (Rough or Smooth)	Reflectivity (Shiny or Dull)	
Material 1 _____	Before Crushing				
	After Crushing				
	Weight Difference				
Material 2 _____	Before Crushing				
	After Crushing				
	Weight Difference				
Material 3 _____	Before Crushing				
	After Crushing				
	Weight Difference				
Material 4 _____	Before Crushing				
	After Crushing				
	Weight Difference				

1. Compare the **properties** of the materials before crushing and after crushing. What do you observe?

_____

_____

_____

_____

2. Compare the **weight** of the materials before crushing and after crushing. What do you observe?

_____

_____

_____

_____

3. Other observations:

_____

_____

_____

_____

Finding Patterns in Our Investigation

4. Look at the data about the properties of the materials.

    a. Can you identify the materials after crushing?

    _____

    _____

    b. Look for a pattern in the properties before and after crushing. Are the properties the same or different before and after crushing?

    _____

    _____

    _____

5. Look at the data about the weight of the materials.

    a. Look for a pattern in the weight of the materials. Is the weight of the materials the same or different before and after crushing?

    _____

    _____

    _____

    b. Compare the pattern of properties with the pattern of weight. What happens to the **amount** of material after crushing?

    _____

    _____

    _____

    _____

    _____

Name _____ Date _____

Arguing from Evidence

Question: _____

_____

Claim: _____

_____

Evidence:	**Why did you use these data?**
_____ _____ _____	_____ _____ _____
_____ _____ _____	_____ _____ _____
_____ _____ _____	_____ _____ _____

Reasoning: _____

_____

_____

SELF AND PEER CHECK! Arguing From Evidence

Lesson 2-2

Instructions: The purpose of this activity is to help you reflect on and improve your understanding of writing arguments from evidence. Read each question below and answer "Yes" or "No" based on the argument you wrote. Then use the results to revise your argument.

Argument	
Does my argument include a claim, evidence, and reasoning?	☐ Yes ☐ No
Claim	
Does my claim answer the investigation question?	☐ Yes ☐ No
Evidence	
Does my evidence include specific data from the investigation?	☐ Yes ☐ No
Does my evidence identify a pattern in the data about more than one garbage material (soda can, cup, paper, cookie)?	☐ Yes ☐ No
Does my evidence include a comparison of the weight of the garbage materials before and after crushing?	☐ Yes ☐ No
Reasoning	
Does my reasoning describe how my evidence supports my claim?	☐ Yes ☐ No

Identify one area for improvement to keep in mind the next time you write an argument in science class.

_____

_____

_____

Investigation 2-2 ANSWER KEY

1. Compare the **properties** of the materials before crushing and after crushing. What do you observe?
   The properties (color, texture and reflectivity) were the same before and after crushing.

2. Compare the **weight** of the materials before crushing and after crushing. What do you observe?
   The weight was the same before and after crushing.

3. Other observations:
   Answers will vary.

Finding Patterns in Our Investigation:

4. Look at the data about the properties of the materials.
   a. Can you identify the materials after crushing?
      Yes, because the properties are the same before and after crushing.

   b. Look for a pattern in the properties before and after crushing. Are the properties the same or different before and after crushing?
      All of the properties stay the same after crushing.

5. Look at the data about the weight of the materials.
   a. Look for a pattern in the weight of the materials. Is the weight of the materials the same or different before and after crushing?
      The weight of all the materials stay the same before and after crushing.

   b. Compare the pattern of properties with the pattern of weight. What happens to the **amount** of material after crushing?
      The pattern tells us that there is the same amount of matter before and after crushing. Even when you crush the materials, the amount of matter stays the same. Nothing goes away.

Arguing from Evidence ANSWER KEY

Claim 1:

Question: *When materials are crushed in a landfill bottle, does the type of material change?*	
Claim: *When materials are crushed, the type of material does not change.*	
Evidence:	**Why did you include these data?**
The soda can was red, smooth, and shiny before and after crushing.	*No change in properties shows that the materials did not change.*
The paper was white, smooth, and dull before and after crushing.	*No change in properties shows that the materials did not change.*
Reasoning: *There was no change in the properties (color, texture, or reflectivity) for any of the materials. Materials are identified by their properties. Since none of the properties changed, crushing a material did not change the material.*	

Claim 2:

Question: *When materials are crushed in a landfill bottle, does the amount of material change?*	
Claim: *When materials are crushed, the amount of material does not change.*	
Evidence:	**Why did you use these data?**
The soda can weighed 10 g before and after crushing.	*There was no change in the weight of the soda can.*
The paper weighed 8 g before and after crushing.	*There was no change in the weight of the paper.*
The cookie weighed 6 g before and after crushing.	*There was no change in the weight of the cookie.*
Reasoning: *There was no change in the weight of any material, so crushing a material did not change the amount of material.*	

Name _____ Date _____

What Have We Figured Out?

Our Driving Question:

What did we ask?	What did we do?	What did we figure out?	Do you have any new questions to add to the DQ Board?

What did we ask?	What did we do?	What did we figure out?	Do you have any new questions to add to the DQ Board?