

# THINKING AND ACTING LIKE A SCIENTIST

## TEACHER'S GUIDE

# Take It Apart

How can we disassemble one object to  
make a new object?

GRADE 2

Physical Science





# Take It Apart

<b>Grade Level/Content</b>	2/Physical Science
<b>Lesson Summary</b>	In this lesson, students take an object apart and put it together again in a new way, inspired by a twisted version of Humpty Dumpty.
<b>Estimated Time</b>	2, 45-minute class periods
<b>Materials</b>	Objects that can be taken apart (household fans, telephones, clocks, coffee makers, DVD players, computers, calculators, radios, etc), tools to take apart things (flat head and Phillips head screw drivers in various sizes, pliers, Allen wrenches, hammers, etc.), safety goggles, camera, container to hold small parts, glue and/or tape, <a href="#">Investigation Plan</a> , <a href="#">Observation Form</a> , journal
<b>Secondary Resources</b>	<ul style="list-style-type: none"><li>◦ <a href="#">Humpty Dumpty – Fixed Fairy Tales</a> (3:17)</li><li>◦ <a href="#">How Is It Recycled?</a></li><li>◦ <a href="#">11 Artists Doing Amazing Things with Recycled Materials</a></li><li>◦ <a href="#">City Museum of St. Louis</a></li></ul>
<b>NGSS Connection</b>	<b>2-PS1-3</b> Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
<b>Learning Objectives</b>	<ul style="list-style-type: none"><li>• Students will observe the characteristics of an object and disassemble the object.</li><li>• Students will reassemble the pieces into a new object and observe the characteristics of the new object.</li><li>• Students will describe how they disassembled and reassembled an object and compare and contrast the characteristics of the original object to the new object.</li></ul>
<b>Cross-Curricular Project Connections</b>	Upcycled Gifts, Classroom Re-imagined

## How can we disassemble one object to make a new object?

Children love to take things apart. The inner engineer in them wants to break things open and see how they work. Encouraging them to do so sparks their curiosity and lets them play a driving role in their learning process. In this lesson, students are asked to observe an object carefully and notice how it is made up of various parts. Then, they are asked to take the object apart and create something new.

Although it can be daunting to think about letting your class loose to destroy objects, it's a great opportunity for you to model creating a culture of risk-taking. The more willing you are to try new things, make mistakes, and learn from them, the more willing they will be to do the same.

**Investigation is based on the Van Andel Education Institute (VAEI) Instructional Model for Inquiry-Based Science.**  
**In all investigations:**



Students don't know the "answer" they are supposed to get.



Students play a driving role in determining the process for learning.



Teachers and students construct meaning together by journaling.



Students are working as hard as the teacher.

# Part 1

## INVESTIGATION SETUP

Students will need the following:

- Objects that can be taken apart (household fans, telephones, clocks, coffee makers, DVD players, computers, calculators, radios, children's toys, etc.) *Ask parents and/or teachers to donate old household appliances, electronics, and/or toys.*
- Tools to take apart things (flat head and Phillips head screw drivers in various sizes, pliers, Allen wrenches, hammer, etc.)
- Safety goggles
- Camera
- Containers to hold small parts
- Glue and/or tape
- [Investigation Plan](#)
- [Observation Form](#)
- Journal

# Part 2

## INVESTIGATION FACILITATION



### Question

*Introduce the investigation question.*

#### **How can we disassemble one object to make a new object?**

##### STUDENT ENGAGEMENT

Bring in an upcycled piece of art such as an animal made out of metal objects, mosaic made out of buttons, house made out of tires, people made out of flatware, etc. (Store owners and/or artists may be willing to let you borrow the object or might come in to show it to the class themselves.) If you can't find an actual object, search for images online and show students the photos. Ask students to identify any recognizable parts and pieces in the object. Then, introduce the investigation question.



### Personal Knowledge

*Students capture what they already know about objects that are made from the pieces of other objects.*

- Ask students to think of examples of objects that are made from the parts of something else. *(Students may think of mosaics, stained glass, or a refurbished phone. Conversely, students may not be able to think of any examples.)*
- Acknowledge the examples students have and/or let them know it's ok if they don't have any examples.

##### RISK-TAKING

Leaving space for silence is a subtle, yet effective way to build a classroom culture that supports risk-taking. If students don't have answers right away, or if there is a lull after an initial round of answers, give ample wait time so students get comfortable with silent thinking time and a level of uncertainty.

Students choose an object to disassemble and reassemble inspired by a twisted version of Humpty Dumpty.

### Part 1: Disassemble

- Divide students into groups of 3 or 4 based on what object they want to disassemble. Give each group an [Investigation Plan](#) and review Part 1 as a class.
- Have students discuss in their groups the characteristics of their object. They should note its size, shape, and arrangement of parts. Have them record this information on the [Observation Form](#).
- As they discuss, take a photo of each group's object.
- Then, have students work together to disassemble their object.
- Encourage students to use whatever tools they need, but the hammer should be used only as a last resort and only with teacher supervision.
- Once the object is disassembled, have the groups separate the various parts into containers.
- Take a photo of the disassembled objects.

### Part 2: Reassemble

- Show the video of a [twisted version of Humpty Dumpty](#). Discuss as a class how the author of this video re-imagined the story of Humpty Dumpty into something new. Explain that they can use the story as inspiration to reimagine the parts and pieces of their object into something new.
- Review Part 2 of the **Investigation Plan** as a class.
- Then, encourage students to reassemble their object's parts into something new. They may use the video as inspiration directly (*candlestick, well, horse, crown, king's men, etc.*) or they may make something loosely (or creatively) tied to the video as long as they can explain the connection.
- Students do not have to use all the parts of their initial object, but they cannot add anything other than glue and/or tape. They may create more than one new object from the parts of the original.
- Once the object is reassembled, have students discuss in their groups the characteristics of their new object. They should note its size, shape, and arrangement of parts. Have them record this information on the **Observation Form**.

### CRITICAL THINKING

If students have trouble thinking of an idea or display signs that they don't think they are creative, conduct a *Mindset Minute*. Remind students that creativity is not something you either have or don't have. Explain that it is like a muscle and can be strengthened with practice just like a muscle. Have students brainstorm for 1 minute: *How can I strengthen my creativity muscles?*

### STUDENT ENGAGEMENT

Students like to visually see where they are in a process. To keep them engaged, create a *Progress Bar* on the board. You can use these steps for the bar: Disassemble Object → Watch Video → Reassemble Object → Analyze Data → Present. Color in each step of the process as you complete it. Progress Bars give your lesson an instant game-like quality.

#### INVESTIGATION PLAN

##### TAKE IT APART

##### Part 1: Disassemble

1. Look at your object carefully. Observe the size and shape and how the parts are put together.
2. Discuss with your group and record your observations on the **Observation Form**. Be sure to include quantitative data (things you can measure) and qualitative data (things you can describe).
3. Take your object apart carefully. Try not to break any parts as you take it apart. Use the tools available.
4. Once your object is taken apart, separate the pieces into containers.

Wear safety goggles at all times.

##### Part 2: Reassemble

1. Think about the twisted tale of Humpty Dumpty. Discuss in your group how the author re-imagined the familiar story.
2. Talk about ways you can re-imagine the parts of your object. Decide on one or more objects to build from the parts.
3. Put the pieces together in a way that makes one or more new objects. You do not have to use all of the pieces from the original object. You can only add glue or tape.
4. Once your new object is made, observe the size and shape and how the parts are put together.
5. Discuss with your group and record your observations on the **Observation Form**. Be sure to include quantitative data (things you can count or measure) and qualitative data (things you can describe).

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## Investigation Plan



## Observation

Students record their observations about the characteristics of their original and reassembled objects.

- As students observe both their original object and their reassembled object, they should discuss each object's characteristics (size, shape, arrangement of parts) and record their observations on the **Observation Form**.
- They should record both quantitative characteristics (measurements) and qualitative (descriptions) as data.

### INTEGRITY

Encourage students to record data objectively. Emphasize that scientists record their observations carefully so that later they can study them to look for patterns and trends. Sometimes, the difference between "science" and "playing around" is writing things down!

OBSERVATION FORM TAKE IT APART		
Original Object: _____		
Size	Shape	How the Parts Are Put Together
New Object(s): _____		
Size	Shape	How the Parts Are Put Together
<small>Note: Record both quantitative data (things you can measure) and qualitative data (things you can describe).</small>		
<small>Van Andel Education Institute   VAEI.org</small>		

Observation Form

## Part 3

### INVESTIGATION ANALYSIS AND DEVELOPMENT OF CLAIM



## Data Analysis

Students make sense of their data by organizing it and representing it visually.

Have students analyze their data (the characteristics they listed for each of the objects). They may wish to use the [Data Analysis](#) prompt as a guide.

- Have students **evaluate** their data for trustworthiness. Did they record observations objectively and truthfully?
- Then, have them analyze their data to find patterns and trends. They may **organize** the data and/or **represent** it visually to construct meaning. They may want to use a *Venn Diagram* to compare and contrast the characteristics of the original object and the reassembled object. They may also want to use photos as evidence.
- Have students **interpret** what the identified patterns mean. They should discern that compared to an original object, a new object(s) can have different characteristics, even though both were made from the same set of pieces.
- Ensure students have enough data that it can be used as evidence to support a claim.



## Secondary Knowledge

Students write a claim and provide evidence and reasoning to support it.

Use these resources (or your own) to further student understanding that an object made up of a small set of pieces can be disassembled and made into a new object.

[How Is It Recycled?](#)

[11 Artists Doing Amazing Things with Recycled Materials](#)

[City Museum of St. Louis](#)

### COLLABORATION

You may want to encourage collaboration by conducting a *Give One, Get One* activity. Have students use these resources to find two things that are made from the parts of something else. To get a third, they have to share one of theirs with a classmate, so all students end up with two things they found on their own and one thing they got from someone else.



## Explanation

Students write a claim and provide evidence and reasoning to support it.

- Have students use what they've discovered from the analyzed data to write an explanation that answers their investigation question. Students may wish to use the [Explanation](#) prompt as a guide. Have them write their explanation in their journal.
- Have students review the investigation question: How can we disassemble one object to make a new object?
- Have students develop a **Claim** to answer the investigation question.
- Then, have them write down the **Evidence** that supports their claim.
- Finally, have them add **Reasoning** to their claim. Reasoning should include the information obtained from this investigation as well as science principles they have learned.

### Claim

*We can disassemble a toaster to make a flower in a garden.*

### Evidence

*We took apart an old toaster. We separated it into different pieces. We were able to use the base as a garden and then we used other pieces to make the flowers. We used the knobs as the center of the flowers.*

*We used the thicker wires as stems. We used the thinner wires as petals.*

*The toaster was square and boxy. The only part that was round was the knobs. It was 6 inches tall. The new object was boxy at the bottom, but then took a different shape with the added flowers. There were more round parts (such as the petals). It was 12 inches tall.*

### Reasoning

*Investigation:* We were careful to only use parts from the original object in our new object. The only thing we added was some glue. We were able to make a garden with flowers out of a toaster.

*Science:* We read and discussed articles about other ways objects are disassembled and made into new objects. We read about an artist, Robert Bradford, who makes sculptures out of old toys. We read about how paper products are broken apart and recycled into paper for newspapers or books. We also saw that the parts of a plane can be put back together to make a playscape at the City Museum of St. Louis.

*Continued*

- Once the explanation is written, have students discuss their results using a [Present and Defend](#).

### DISCOURSE

Have students conduct a [Present and Defend](#) to develop presentation skills as well as audience participation. Research teams present a summary of their investigation to the class. The class analyzes the information presented and asks clarifying questions, challenges and/or supports the arguments made, and even presents alternative explanations as appropriate. Research teams defend their explanation with evidence and reasoning.



### Evaluation

*Students reflect on the investigation.*

Ask students:

- What else would you like to disassemble and reassemble as something new?
- If you could change anything about the process, what would you change?

## Part 4

### INVESTIGATION ASSESSMENT AND EXTENSION



### Application

*Students demonstrate understanding of how an object made of smaller parts can be disassembled and made into a new object.*

- Challenge the class to make gifts out of material they have at home or at school.
  - Encourage students to learn more about how the object they dismantled works by looking it up on [How Stuff Works](#).

#### Assessment

During the investigation, evaluate how well:

- Students observe the characteristics of an object and disassemble the object.
- Students reassemble the pieces into a new object and observe the characteristics of the new object.

Evaluate presentations and explanations for how well:

- Students describe how they disassembled and reassembled an object and compare and contrast the characteristics of the original object to the new object.

## Take This Lesson Across the Curriculum

### Upcycled Gifts

You are throwing a party and you want to give your guests gifts, but you've used all of your budget on party supplies and food. Create upcycled gifts for your guests using material from your home or classroom.

Reading/Language Arts	Math	Science	Social Studies
<p><b>Inspiration All Around</b></p> <p>Read <i>The Raft</i>, by Jim LaMarche and discuss the importance of appreciating the simple joys of the world and exploring one's own talents.</p> <p>CCSS.ELA-LITERACY.RL.2.10</p>	<p><b>Parts and Pieces</b></p> <p>Your new gift is made of several parts and pieces. How many of each part will you need? Make a list so you can be sure you have enough materials.</p> <p>CCSS.MATH.CONTENT.2.OA.C.4</p>	<p><b>Upcycle</b></p> <p>Disassemble an object in your home or classroom and reassemble it into a new item to give as a gift.</p> <p>NGSS: 2-PS1-3</p>	<p><b>Supply and Demand</b></p> <p>The guests are coming any minute. How can you make your gifts in the shortest amount of time possible?</p> <p>NCSS: D2.Eco.3.K-2</p>

### Classroom Re-imagined

Authors sometimes re-imagine stories that are familiar to them. So, it's your turn to re-imagine something familiar to you—your classroom! Using only materials in the classroom, how would you re-imagine it to be your dream classroom?

Reading/Language Arts	Math	Science	Social Studies
<p><b>Fairy Tales Re-imagined</b></p> <p>After watching the <a href="#">twisted version of Humpty Dumpty</a>, compare and contrast the two versions of the story.</p> <p>CCSS.ELA-LITERACY.RL.2.9</p>	<p><b>Make It Fit</b></p> <p>All of your ideas have to fit within the space. Measure your creations to make sure they aren't too big or too small for the space.</p> <p>CCSS.MATH.CONTENT.2.MD.A.3</p>	<p><b>Upcycle</b></p> <p>Create a detailed drawing of how you might upcycle the items in the classroom for a new and improved space.</p> <p>NGSS: 2-PS1-3</p>	<p><b>Do Your Research</b></p> <p>You never know where you might find inspiration. Explore what classrooms looked like in the past.</p> <p>NCSS: D2.His.4.K-2.</p>

For additional lessons or to customize this lesson, go to [www.nexgeninquiry.org](http://www.nexgeninquiry.org).



# INVESTIGATION PLAN

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### Part 2: Reassemble

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# OBSERVATION FORM

## TAKE IT APART

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

DATE: \_\_\_\_\_

Original Object: \_\_\_\_\_

Size	Shape	How the Parts Are Put Together

New Object(s): \_\_\_\_\_

Size	Shape	How the Parts Are Put Together

***Note: Record both quantitative data (things you can measure) and qualitative data (things you can describe).***