



Wave of Plastic: Meaningful Watershed Educational Experience  
Student Workbook Lesson Two -What is Plastic?

Part 1- Introduction: Building Understanding

Objectives:

- We will obtain, evaluate, and communicate information about the materials used to make plastics, how plastics are made, the changes that plastics undergo as they are used and discarded, and why the manufacture, use, and disposal of plastic can be problematic.

DIRECTIONS

As you review the resources provided by your teacher, use the charts below to help collect, synthesize, organize, and share information about the properties, manufacture, and use of plastic.

1. What are plastics?	
Resources that I used	Notes

2. How are plastics made?	
Resources that I used	Notes

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3. How and why are plastics used?	
Resources that I used	Notes

4. What happens to plastics over time?	
Resources that I used	Notes

5. What are some of the negative consequences for the use and disposal of plastic?	
Resources that I used	Notes

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Part 2- Investigation: Integrating Information & Ideas

**Objectives:**

- We will gather and make sense of information to describe that everyday items that are made from plastic are synthetic materials made from natural resources and impact society.
- We will investigate alternatives to plastic that may be used to manufacture everyday items.
- We will investigate how types of plastic polymers degrade over time.

**DIRECTIONS**

Review the resources provided by your teacher and answer the questions below.

1. In your own words, describe what it means for a material to biodegrade.

Then, in the space below, use words, pictures, and symbols to illustrate the difference between an item 'breaking *down*' through biodegradation and an item 'breaking *up*' into smaller pieces.

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2. In the space below, use words, pictures, and symbols to illustrate what happens to most types of plastics over time.

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## “Make Your Own Biodegradable Plastic”

(This page should be completed after students participate in the activity)

1. What materials did you use to make your own plastic? List each material below. Then, identify whether you think the material will biodegrade (or break *down*) in under 100 years.

Material	Will it biodegrade (in under 100 years)?	How do you know?

2. How could bio-plastics potentially impact per-capita consumption and disposal of plastic waste?

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3. Describe the potential benefits and drawbacks of bio-plastics plastics on per-capita consumption and disposal of plastic waste.

Benefits	Drawbacks

## “Updating Our Personal Waste Inventories”

### DIRECTIONS

1. Return to the Personal Waste Inventory that you created in “*Lesson One, A Planet Full of Plastic.*”
2. Choose 5 items that you discarded. In the chart below, make a prediction about how long you think it will take to degrade (break down). Provide evidence to support your prediction (for example, is the item made from synthetic or natural materials). With the support of your teacher, research the actual time that it will take for that item to break down.
3. Then answer the question below.

Item	My prediction: How long it will take to degrade?	Evidence for my prediction: How long it will take to degrade?	Actual Time this item will take to degrade?
1.			
2.			
3.			
4.			
5.			

1. What is something that surprised you about what happens to the items on your list over time. Why was that surprising?

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## “What Happens to Our Waste?” (extension)

### Part 2 (extension) Investigation: Integrating Information & Ideas

#### Objectives:

- We will explore how and why different waste materials degrade over time.
- We will define and describe the processes of degradation that we investigate.
- We will develop questions to drive the investigation.
- We will use what we understand about biodegradability to make predictions about the effects independent variables (such as water, soil, material type) will have on the intended variables (mass and other observable features) of a variety of waste items.
- We will develop a plan for collecting, recording, and analyzing data that will help answer questions about the degradability of different materials. We will identify and justify appropriate variables and determine the methodologies for collecting data.
- We will use the data collected in our investigation as evidence to support claims about the effects of independent variables (such as water, soil, material type) on the dependent variables (mass and other observable features) of a variety of waste items.
- We will synthesize evidence from our investigation and apply our understandings of biodegradability to draw conclusions about the degradation of different waste materials.

### DIRECTIONS

1. Define and describe the processes of degradation that you will investigate.
2. Use what you understand about biodegradability to develop questions and make predictions about the effects of independent variable (such as water, soil, material type) will have on the intended variables (mass and other observable features) of a variety of waste items.

1. What is biodegradation and why is it important?

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2. What items of waste will you and your team choose to investigate? What are your predictions about the effect of exposure to water and soil on the mass and other observable features of each item.

Item	Prediction Describe what evidence of degradation you might observe.	Reasoning Why you think you might observe that evidence of degradation?

**DIRECTIONS**

1. Plan, implement, and evaluate an investigation that will generate data to provide evidence to support conclusions that you draw.
3. Why do you think we will be looking at mass as a dependent variable in this investigation? What other observable features could you measure? (A dependent variable is one that is being studied and measured as data points).

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4. What are the independent variables in your model? How do you think each might affect the dependent variables?

Independent Variable	Predicted Potential Impact



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5. What are the steps in your investigation?

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**DIRECTIONS**

1. Use the data collected in your investigation as evidence to support claims about the effects of independent variable (such as water, soil, material type) will have on the intendent variables (mass and other observable features) of a variety of waste items.

6. How would you describe the results of your investigation?

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7. What claims can you make about the effects of independent variables (such as water, soil, material type) on the dependent variables (mass and other observable features) you observed?

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8. What conclusions can you draw about the degradation of different types of waste?

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**Part 3 – Application: Applying What We Learned Through Informed Action**

**Objectives:**

- We will describe that everyday items that are made from plastic are synthetic materials that come from natural resources and impact society.
- We will design and administer a survey to collect information about the preferences and choices of people in your school community regarding plastic use.
- We will share what we've learned in the lesson investigations and from the survey results.

**DIRECTIONS**

Review the Plastic-Use Survey that was created by the University of Maryland Center for Environmental Science. Then answer the questions below.

1. Describe connection between personal choices about plastic use and the accumulation of waste in our environment?

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2. What are some factors that you think might influence the preferences that people have and the choices that they make when it comes to plastic use?

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3. What do you wonder about the choices that people in your community make regarding plastic use?

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**Part 4- Assessment: Demonstrating Our Understandings**

**Objectives:**

- Students will construct a convincing argument, supported with evidence, that supports or refutes claims for either explanations or solutions.
- Students describe a chain of reasoning that describes plastic as a synthetic material derived from natural resources that affects society in positive and negative ways.

**DIRECTIONS**

Use the Claim, Evidence, Reasoning model to respond to the question below.

<b>Claim/Evidence/Reasoning Writing Rubric</b>				
	0	1	2	3
<b>Claim</b> – statement or conclusion that answers the original question/problem.	Does not make a claim.	Makes an inaccurate claim.	Makes an accurate but incomplete claim.	Makes an accurate and complete claim.
<b>Evidence</b> – scientific data that supports the claim. The data needs to be appropriate and sufficient to support the claim.	Does not provide evidence.	Only provides inappropriate evidence (Evidence that does not support the claim.).	Provides appropriate, but insufficient evidence to support claim. May include some inappropriate evidence.	Provides appropriate and sufficient evidence to support claim.
<b>Reasoning</b> – justification that links the claim and evidence and includes appropriate and sufficient scientific principles to defend the claim and evidence.	Does not provide reasoning	Only provides reasoning that does not link evidence to claim.	Repeats evidence and links it to some scientific principles, but not completely.	Provides accurate and complete reasoning that links evidence to claim. Includes appropriate and sufficient scientific principles.

- ★ Plastic is a synthetic, human-made material derived from natural resources (primarily “fossil fuels” like natural gas, oil, and petroleum).

Describe how the properties of plastic impact communities over time.

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