




## WHY ALL THE PLASTIC? (LEVEL 3)

<b>Description</b>	Learners will plan a campaign to spread awareness about how to reduce, reuse, and recycle plastic. To do this, they will generate solutions using concepts such as the properties of plastics, changes materials undergo over time, and the impact of plastics on the environment.
<b>Leading question</b>	What makes plastic special and dangerous at the same time?
<b>Subjects covered</b>	Science, Art & Design
<b>Total time required</b>	40-60 min a day for 5 days
<b>Resources required</b>	Sticks, plastic bags, organic trash, cloth trimmings, a plastic bowl, salt, sugar, pens, paper
<b>Learning outcomes:</b>	By the end of this project, learners will be able to: Knowledge-Based Outcomes: <ol style="list-style-type: none"> <li>1. Classify materials based on physical properties such as solubility in water and transparency.</li> <li>2. Compare physical, reversible and irreversible changes in materials.</li> <li>3. Identify whether a given material is biodegradable or non-biodegradable.</li> </ol> 21 <sup>st</sup> Century Skill Outcomes: <ol style="list-style-type: none"> <li>1. Think critically in stating a rationale-based hypothesis and testing it.</li> <li>2. Show creativity in brainstorming ways to reduce, reuse, and recycle upcycle plastic.</li> <li>3. Work collaboratively while providing constructive feedback to peers and engaging in group work for the final project.</li> <li>4. Communicate effectively in expressing concerns over plastic use in school and sharing alternatives.</li> </ol>
<b>Previous Learning</b>	None
<b>Supervision required</b>	Medium

### Day 1 -

Today, you will find out how the use of plastic has increased over time.

Time	Activity and Description
10 minutes	<p><b>Introduction:</b></p> <p>In this project, you will design a campaign to spread awareness about using plastics wisely. The leading question for this project is: What makes plastic special and dangerous at the same time?</p> <ul style="list-style-type: none"> <li>- Think and name any 10 things in your home that are made out of plastic.</li> <li>- Now, make a 'no plastic' list. Think and name 10 things in your home that do not have any plastic in it.</li> </ul> <p><b>Note:</b> Ask learners to draw and fill a table such as the one shown below. If needed, inform learners that even items such as books are wrapped in plastic.</p>

	<table border="1"> <tr> <th>Item</th> <th>Made Of</th> </tr> <tr> <td>Tires</td> <td>Rubber</td> </tr> <tr> <td>Clothes</td> <td>Cotton</td> </tr> </table> <p>Think of the 5 most commonly used materials, such as wood, metal, glass or rubber, and then think about the most common uses for the same.</p>	Item	Made Of	Tires	Rubber	Clothes	Cotton				
Item	Made Of										
Tires	Rubber										
Clothes	Cotton										
15 minutes	<p>You will design a home plastic tracker and fill it for one week to find out how much plastic is used at your home.</p> <p><b>Note:</b> Ask learners to draw a table such as the one shown below.</p> <table border="1"> <thead> <tr> <th>Item</th> <th>Single Use?</th> <th>No of times used in a week</th> <th>Total no of uses</th> <th>Reduce / Reuse / Replace</th> </tr> </thead> <tbody> <tr> <td>  Plastic Bag </td> <td>Yes</td> <td> Day 1:     Day 2:     Day 3:    Day 4:      Day 5:    </td> <td> Student  Guess: 8   Family  Guess: 7   Actual  Total: 10 </td> <td><i>To be done on the last day</i></td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>- First, list and draw 10 most commonly used plastic items at your home (such as bottles, straws, cups, packaging, bags, food packaging and toiletry sachets)</li> <li>- For each item, write “yes” if the plastic is single-use, which means that it is only used once before being discarded.</li> <li>- Make a hypothesis about how many times each item will be used at your home this week, and write the number down. Also, write down the number your family guesses.</li> <li>- Every day, count the number of times each item was used and use tally marks to make a note of this.</li> </ul> <p><b>Tip:</b> A hypothesis is a prediction (guess).</p>	Item	Single Use?	No of times used in a week	Total no of uses	Reduce / Reuse / Replace	 Plastic Bag	Yes	Day 1:    Day 2:    Day 3:   Day 4:     Day 5:	Student Guess: 8  Family Guess: 7  Actual Total: 10	<i>To be done on the last day</i>
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15 minutes	<p>Now we will do an experiment to explore how materials change over time using the concept of biodegradability – natural breaking down of things and mixing into the soil. Through this experiment, we will also explore the consequences of plastic on the environment.</p>										

	<ul style="list-style-type: none"> <li>- Dig 3 small holes in the soil of the garden/ lawn/ farm (or plant pots if a backyard is unavailable).</li> <li>- Put any plastic trash in one, a fruit core or a green leaf in the other hole, and a third waste of your choice (such as wood or cloth) in the third hole.</li> <li>- Cover all 3 holes with soil and insert a stick marking the name of the material buried.</li> </ul> <p><b>Note:</b> Ask learners to draw the table shown below, fill it, reflect on the hypothesis of what they think they will find after a week and write it down.</p> <table border="1"> <tr> <td><b>Hypothesis:</b></td> <td></td> </tr> <tr> <td><b>Materials Needed:</b></td> <td></td> </tr> <tr> <td><b>Method:</b></td> <td></td> </tr> <tr> <td><b>Observations:</b></td> <td></td> </tr> <tr> <td><b>Inferences:</b></td> <td></td> </tr> </table>	<b>Hypothesis:</b>		<b>Materials Needed:</b>		<b>Method:</b>		<b>Observations:</b>		<b>Inferences:</b>	
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<b>At home activities</b>	<p>Learners can interview any elders to identify at least 10 things that were previously not made out of plastic but now are, and hypothesize (guess) why this is the case.</p> <table border="1"> <thead> <tr> <th>Original</th> <th>Current</th> <th>Hypothesis</th> </tr> </thead> <tbody> <tr> <td>A chair was always made of wood or jute</td> <td>A chair is now often made of plastic</td> <td>Because wood is expensive, heavy and not waterproof</td> </tr> </tbody> </table> <p>Learners will mark on their weekly plastic tracker the uses of plastic for the day across all the items. It is best to add this information at the end of the day when they can find out how much has been used for each of the items.</p>	Original	Current	Hypothesis	A chair was always made of wood or jute	A chair is now often made of plastic	Because wood is expensive, heavy and not waterproof				
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A chair was always made of wood or jute	A chair is now often made of plastic	Because wood is expensive, heavy and not waterproof									

## Day 2

Today, you will explore some properties of plastic and other materials.

Time	Activity and Description
10 minutes	<p>Think about what items you can use instead of the most used plastic items at your home. T do this effectively, think about these questions:</p> <ul style="list-style-type: none"> <li>- What is the use or purpose of the plastic?</li> <li>- How important is plastic?</li> <li>- Are/ were there alternatives to plastic?</li> <li>- What other materials can you use?</li> </ul>

	<p>- What is required from the material to be effective?</p> <p><b>Tip:</b> Learners can use the table they filled at home about items that were previously not made of plastic, but now are, to think of various alternative materials such as cloth, paper, jute, wood etc.</p>																
30 minutes	<p>Let us think about whether the alternative materials you have chosen will work or not! To do this, think and list/ answer:</p> <ul style="list-style-type: none"> <li>- The key characteristics that made plastic so special and used so commonly.</li> <li>- Is the alternative material             <ul style="list-style-type: none"> <li>o hard or soft? How would this matter?</li> <li>o transparent (easy to see through)? How would this matter?</li> <li>o lustrous (shiny)? How would this matter?</li> <li>o as durable (long-lasting) as plastic? How would this matter?</li> <li>o as light as plastic? How would this matter?</li> </ul> </li> </ul> <p><b>Note:</b> Ask learners to draw the table shown below, run experiments on 3-4 types of materials, and write their observations down. Once done, ask them to group materials based on their properties.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Item</th> <th>Material Replaced</th> <th>Hard Soft</th> <th>Transparent Opaque Translucent</th> <th>Luster Shine</th> <th>Heavy Light</th> <th>Durable</th> <th>Good Option</th> </tr> </thead> <tbody> <tr> <td>Plastic Food Packet</td> <td>Wood Box</td> <td>Yes <i>This matters because things inside might not get squashed</i></td> <td>Opaque <i>This matters because we can see the items inside</i></td> <td>Yes, can shine <i>This matters because the packet will look attractive</i></td> <td>Yes ....</td> <td>No easily broken ....</td> <td>No</td> </tr> </tbody> </table> <p><b>Tip:</b> If needed, revise different properties of materials (hard, soft; transparent, translucent, opaque; lustrous, dull etc.)</p> <p>Why is plastic a preferred option and if there are any other real alternatives?</p>	Item	Material Replaced	Hard Soft	Transparent Opaque Translucent	Luster Shine	Heavy Light	Durable	Good Option	Plastic Food Packet	Wood Box	Yes <i>This matters because things inside might not get squashed</i>	Opaque <i>This matters because we can see the items inside</i>	Yes, can shine <i>This matters because the packet will look attractive</i>	Yes ....	No easily broken ....	No
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At home activities	<p>Learners will reflect on the table from the previous day and think through why the items were replaced with plastic over time.</p> <p>Learners will fill in their weekly plastic tracker.</p>																

### Day 3 –

Today, you will explore some more properties of plastics as you find alternatives to it.

Time	Activity and Description
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40 minutes	<p>Today, you will perform an experiment to find out how plastics behave with heat and liquids, and think about alternative materials to plastics based on this!</p> <p>Use the same table as yesterday and think about:</p> <ul style="list-style-type: none"> <li>- Do the alternative materials get wet?</li> <li>- Do they allow water to pass through them?</li> <li>- Are they soluble or insoluble?</li> <li>- Can they insulate (keep something hot or cold) the contents?</li> <li>- How do they change with heat and cold?</li> </ul> <p><b>Note:</b> Learners can write their observations in the format shown below.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Item</th> <th style="width: 15%;">Material Replaced</th> <th style="width: 15%;">Water proof</th> <th style="width: 15%;">Soluble In-soluble</th> <th style="width: 15%;">Insulated</th> <th style="width: 15%;">Expandable</th> <th style="width: 15%;">Good Option</th> </tr> </thead> <tbody> <tr> <td>Plastic Shampoo Bottle</td> <td>Mud Container</td> <td>Yes</td> <td>Soluble</td> <td>No, easy to break</td> <td>No</td> <td>No</td> </tr> </tbody> </table> <p><b>Tip:</b> Learners should use alternatives that include: containers made of mud, glass, cloth, foil, and metal. They can conduct experiments on a given object to test for different properties as described below:</p> <ul style="list-style-type: none"> <li>- Waterproofness: Fill it with water to test whether it retains water or allows it to seep through.</li> <li>- Insulation: Fill it with hot water and check if it stays hot after 10-15 mins.</li> <li>- Solubility: Immerse it in water and check if it stays intact or dissolves/ starts to break down.</li> <li>- Expandability: Immerse it in hot water and check if it retains its shape or gets deformed.</li> <li>- Note: it might be difficult to experiment on the last one, but learners can think through railway tracks that usually have a gap that fill in the heat or doors that often expand in the monsoon.</li> </ul> <p>Learners can group different materials based on their properties. Learners can reflect on why plastic is a preferred option and if there are any other real alternatives.</p>	Item	Material Replaced	Water proof	Soluble In-soluble	Insulated	Expandable	Good Option	Plastic Shampoo Bottle	Mud Container	Yes	Soluble	No, easy to break	No	No
Item	Material Replaced	Water proof	Soluble In-soluble	Insulated	Expandable	Good Option									
Plastic Shampoo Bottle	Mud Container	Yes	Soluble	No, easy to break	No	No									
<b>At home</b>	Learners will fill in their weekly plastic tracker.														

### Day 4 –

Today you will explore ways to dispose of plastic effectively and find out how various materials change over time.

Time	Activity and Description
5 minutes	<p>Think about how materials changed during the experiment you performed yesterday.</p> <ul style="list-style-type: none"> <li>- Which materials were waterproof? Which ones were not?</li> <li>- Which materials insulated heat? Which ones did not?</li> <li>- Which ones dissolved in water? Which ones did not?</li> <li>- Which ones expanded with heat? Which ones did not?</li> </ul> <p>Now think about which of these changes can be reversed (undone) and which cannot be.</p>




10 minutes	<p>Now, we will dig out the trash that we buried on Day 1 and check what happened to them over time.</p> <p>Based on what you see, fill out the observation table in which you wrote your hypothesis with this information:</p> <ul style="list-style-type: none"> <li>- Observations (what happened to each type of trash?)</li> <li>- Inferences (why do you think this happened?)</li> </ul> <p><b>Tip:</b> <i>Though it may be too early to see observable changes in wood or cloth, learners can still notice observable changes in the food item and compare it with little to no change in plastic.</i></p> <p>Based on your observation table, think about:</p> <ul style="list-style-type: none"> <li>- What do you think happens when plastics are left in landfills (buried in the ground as trash)?</li> <li>- What do you think will happen to our land usage – homes/ forests?</li> <li>- What do you think will happen to birds if they eat plastic?</li> <li>- How would plastic in the soil affect plants?</li> </ul>												
10 minutes	<p>Take three bowls of water.</p> <ul style="list-style-type: none"> <li>- In one bowl, immerse a plastic item</li> <li>- In the other two bowls, immerse other items such as salt, sugar or cooked rice.</li> <li>- Observe water happens to the three items when you stir them into the water.</li> </ul> <p><b>Note:</b> <i>Ask learners to fill their observations in the table below:</i></p> <table border="1" data-bbox="394 1146 1479 1341"> <thead> <tr> <th>Material</th> <th>Plastic</th> <th>Material 2</th> <th>Material 3</th> </tr> </thead> <tbody> <tr> <td>Observations:</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Inferences:</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Based on the table, think about:</p> <ul style="list-style-type: none"> <li>- Which materials are soluble? Which are not?</li> <li>- Which materials float in water? Which sink?</li> <li>- Are there any changes in plastic? What about other materials?</li> <li>- Are these changes reversible or irreversible?</li> </ul> <p>Now think about:</p> <ul style="list-style-type: none"> <li>- What if the plastic ends up in the oceans and seas?</li> <li>- What do you think happens to marine animals if they eat the plastic?</li> <li>- What do you think will happen to us when we eat seafood with plastic in it?</li> </ul>	Material	Plastic	Material 2	Material 3	Observations:				Inferences:			
Material	Plastic	Material 2	Material 3										
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Inferences:													

5 minutes	<p><b>Note:</b> Lead an experiment burning a little piece of plastic (with caution). Ask learners to observe and note what happens to the piece of plastic, the smells that come out, and connect it to the chemicals being released.</p> <p>Now think about:</p> <ul style="list-style-type: none"> <li>- What happens if you burn plastic?</li> <li>- How do you think burning of plastic will affect air quality given that it is made of chemicals?</li> </ul>
10 minutes	<p>What is the waste management system that you see around you? How is plastic discarded and where does that go?</p> <p>Illustrate and label the process of plastic disposal in your home/school. You can also if possible track how the plastic items are trashed. For example:</p> <ul style="list-style-type: none"> <li>- Step 1: Buy relevant plastic item</li> <li>- Step 2: Item is thrown into the dustbin / trash bags in their home</li> <li>- Step 3: Item is then segregated and thrown into a trash chute</li> <li>- Step 4: Item is then collected by the garbage truck</li> <li>- Step 5: Item is then thrown into the sea / landfill</li> </ul> <p><b>Tips:</b></p> <ul style="list-style-type: none"> <li>- Use the options of land, water and burning to help the learners come up with different ways of disposing of plastic. Identify whether the changes caused to plastic are reversible or irreversible.</li> <li>- If they have access, investigate the lifecycle of the plastic based on the attached. (Check Appendix)</li> </ul> <p><a href="https://www.wwf.org.uk/sites/default/files/2020-02/WWF_Plastics_Explainer.pdf">https://www.wwf.org.uk/sites/default/files/2020-02/WWF_Plastics_Explainer.pdf</a></p>
<b>At home</b>	Learners will fill in their weekly plastic tracker.
<b>Literacy/ Numeracy Extension</b>	<p>As learners discovered, plastic is “indestructible” and they will write an essay with illustrations on what they think happens to plastic when it is thrown away into seas, landfills or is burned?</p> <p>Learners can write the essay from the perspective of a fish and / or a bird that has to manage the plastic pollution and think and suggest an innovation or idea to clean the oceans and landfills?</p>

## Day 5 -

Today, you will make a practical guide on reusing, reducing and replacing plastic.

Time	Activity and Description
5 minutes	Share your plastic trackers with each other and discuss what you found.

35 minutes	<p>Reflect on what makes plastic dangerous and complete your trackers with how they will reduce, reuse or replace each item on the list.</p> <table border="1" data-bbox="394 323 1437 741"> <thead> <tr> <th data-bbox="394 323 531 426">Item</th> <th data-bbox="531 323 737 426">No of times used in a week</th> <th data-bbox="737 323 850 426">Single use</th> <th data-bbox="850 323 1003 426">Total no of uses</th> <th data-bbox="1003 323 1437 426">Reduce / Reuse / Replace</th> </tr> </thead> <tbody> <tr> <td data-bbox="394 426 531 741">  Plastic Bag                 </td> <td data-bbox="531 426 737 741">                     Day 1: Day 2: Day 3: Day 4: Day 5:                 </td> <td data-bbox="737 426 850 741">Yes</td> <td data-bbox="850 426 1003 741">                     Student Guess: 5  Family Guess: 5  Actual Total: 3                 </td> <td data-bbox="1003 426 1437 741">                     Reduce: This is how we can reduce the use  Reuse: This is how we can repurpose and use it  Replace: Based on the alternative developed by the students                 </td> </tr> </tbody> </table> <p>Think about how plastic use can be reduced in your neighbourhood. Make a campaign to convince people in your community to use effective alternatives.</p> <p><b>Note:</b> Help learners to think of various ideas such as making posters, writing letters to the administration, celebrating a 'No-Plastic Challenge' for a day, installing a recycling bin, etc.</p>	Item	No of times used in a week	Single use	Total no of uses	Reduce / Reuse / Replace	 Plastic Bag	Day 1: Day 2: Day 3: Day 4: Day 5:	Yes	Student Guess: 5  Family Guess: 5  Actual Total: 3	Reduce: This is how we can reduce the use  Reuse: This is how we can repurpose and use it  Replace: Based on the alternative developed by the students
Item	No of times used in a week	Single use	Total no of uses	Reduce / Reuse / Replace							
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<b>Literacy/ Numeracy Extension</b>	Learners can calculate how close they were to their estimates and hypothesize when they created the plastic diary and represent this with a bar graph.										

<b>Additional enrichment activities:</b>	<p>Learners can implement the campaign they put together by creating a work plan, distributing roles and responsibilities, and conducting it.</p> <p>Ask: If you could create your own material as an alternative to plastic, what would it be called?</p> <ul style="list-style-type: none"> <li>- How would it be created/sourced?</li> <li>- What properties would it have?</li> <li>- How is it better than plastic?</li> <li>- In which cases will it not be able to replace plastic?</li> </ul>
<b>Modifications for simplification</b>	If a few of the experiments are not feasible to conduct, you may ask learners to hypothesize what would happen and provide a home assignment to get them to verify it.

## ASSESSMENT CRITERIA

A majority of my students were able to:

- Identify different properties of materials.
- Name changes that happen to different materials due to heat, water etc.



- Identify changes that are reversible and irreversible
- Understand the concept of biodegradable objects
- Explain what makes plastic special and also dangerous

## APPENDIX

**PLASTIC IS NOT FANTASTIC**

It's long-lasting, cheap to produce and very useful, but plastic is causing huge damage to our incredible planet.

**358** There are **358 items of litter** per square km on Britain's sea floor (on average).

**REDUCE, REUSE**

Although many of us recycle single-use plastics, only 9% of the world's total is actually recycled. So it's better to use less in the first place, for example by using reusable water bottles. Around **33% of all plastics** find their way into fragile ecosystems, like rivers and oceans.

**99%** Once it's in water, plastic breaks up into small particles called microplastics. By 2050 **microplastics could be found in 99% of all seabird species.**

**2050** By 2050, oceans could contain more plastic than fish.

**TURTLE-LY EPIC!** Rare Olive Ridley turtles hatched on a beach in Mumbai after volunteers spent **two years** clearing tonnes of plastic. Turtles hadn't been seen there for decades before people worked together to clean up the beach.

**TUMMY ACHE** Animals can mistake plastic rubbish for food, get tangled in packaging or old fishing lines, or choke on plastic-clogged water.

**400** It takes **400 years for a plastic water bottle to degrade**. That's why single-use plastic items (like plastic straws, bottles and bags) are particularly bad – sometimes they're only used for seconds, but they stick around for centuries.

**SAVE THE WHALES** WWF is monitoring levels of pollutants, including plastics, in whales by taking skin and blubber samples from them.

**MORE, MORE, MORE** We are producing around **20 times more plastic** than we did 50 years ago and this could double again in the next 20 years.

**WE CAN FIGHT AGAINST PLASTIC!**

Visit the WWF website for more engaging classroom resources and activities.  
[wwf.org.uk/schoolsandplastic](http://wwf.org.uk/schoolsandplastic)  
**#FORYOURWORLD**