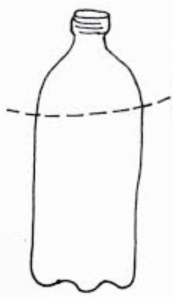


## SOLAR WATER HEATER (LEVEL 3)

<b>Description</b>	Learners will understand and apply the concepts of heat absorption and insulation to design and create a solar water heater. They will also understand the workings of a thermometer and use it to measure the temperature of heated water.
<b>Leading question</b>	How hot can water get if I heat it only using sunlight?
<b>Subjects covered</b>	Science,
<b>Total time required</b>	40-60 minutes a day for 5 days
<b>Resources required</b>	Plastic bottles, drinking straw, sticky tape, watercolour/ coloured papers, sketch pens, one pan/ pressure cooker with a lid, hot water, spoons - 1 wooden, 1 steel and 1 plastic, Solid fat (butter/ ghee/ coconut oil/ <i>dalda</i> ), 3 glasses, paper cutter ( <i>or</i> : scissors), and notebook.
<b>Learning outcomes:</b>	<p>By the end of this project, learners will be able to:</p> <p>Knowledge-Based Outcomes:</p> <ol style="list-style-type: none"> <li>1. Identify the different modes of heat transfer and explain their importance.</li> <li>2. Identify the materials that are good conductors and bad conductors of heat.</li> <li>3. Measure temperature using a thermometer.</li> <li>4. Demonstrate the role of colours in increasing or decreasing the absorption of heat.</li> <li>5. Demonstrate the role of insulators in disallowing the transfer of heat.</li> </ol> <p>21<sup>st</sup> Century Skill Outcomes:</p> <ol style="list-style-type: none"> <li>1. Critically think and analyse how the solar water heater could be improved by conducting experiments and analysing results.</li> <li>2. Think creatively and identify ways to increase the amount of sunlight falling on water.</li> <li>3. Communicate in spoken form through preparing and delivering the sales pitch.</li> </ol>
<b>Previous Learning</b>	NA
<b>Supervision required</b>	Medium

### Day 1 -

*Today, you will learn how sunlight can heat water. You will also make a thermometer to measure the temperature of water.*

Time	Activity and Description		
5 minutes	<p><b>Introduction to the Project</b></p> <p>Do you prefer to take a bath with hot water or cold water?</p> <ul style="list-style-type: none"> <li>- How else do you and your family use hot water in your daily lives?</li> <li>- How do you heat water at home?</li> <li>- How hot do you think water can get if we use only sunlight to heat it?</li> </ul> <p>These are the questions that we will try to answer through this project. To do this, we will make a solar water heater!</p> <ul style="list-style-type: none"> <li>- What are some questions that come to your mind when you think about this project?</li> <li>- The first question that we need to explore is: Can sunlight heat water? This is what we will do today.</li> </ul> <p><b>Note:</b> Throughout this project, learners will need to test their models in the sun. Therefore, please try and conduct this project during a sunny week, ensuring that learners have access to a garden/ open area that gets plenty of sun.</p>		
10 minutes	<p><b>Activity: Using Sunlight to Heat Water</b></p> <p>How do you think we can find out if sunlight heats water or not?</p> <p><b>Note:</b> Encourage learners to share as specific answers about the procedure as possible.</p> <ul style="list-style-type: none"> <li>- We will place equal amounts of water in sunlight and shade for some time.</li> <li>- Then, we will compare how hot the water in each bottle is. If the water kept in sunlight is hotter, we will know that sunlight can heat water.</li> </ul> <p>To do this:</p> <ol style="list-style-type: none"> <li>1. First, we need to make containers to store water. To do this, cut and remove the tops from two medium-sized bottles using a paper cutter or a pair of scissors. <b>Note:</b> This step is important because it will allow learners to insert the thermometers they make into the water. As a safety precaution, you can prepare these in advance and distribute them to learners.</li> <li>2. Think of a symbol (such as a bird, a key or a bottle). Draw this symbol on your bottles using a sketch pen so you can identify it easily!</li> <li>3. Now, draw a sun on the bottle that you will keep in sunlight. This will help you not mix the two bottles up!</li> </ol>  <p><b>Note:</b> Ask learners to draw the table in their notebooks and fill in the hypothesis, the materials needed and the method on their own. Help them using the sample shown below, if needed.</p> <table border="1" data-bbox="378 1753 1429 1812"> <tr> <td data-bbox="378 1753 638 1812"><b>Hypothesis:</b></td> <td data-bbox="638 1753 1429 1812">Sunlight will be able to heat the water.</td> </tr> </table>	<b>Hypothesis:</b>	Sunlight will be able to heat the water.
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	<b>Materials Needed:</b>	2 medium-sized water bottles, scissors/ paper-cutter, sketch pen, water						
	<b>Method:</b>	<ol style="list-style-type: none"> <li>1. Pour equal amounts of water into two similar containers.</li> <li>2. Keep one in sunlight and the other away from sunlight.</li> <li>3. Leave the containers undisturbed for 20 minutes.</li> <li>4. Measure the temperature of water in each container.</li> </ol>						
	<b>Observations:</b>	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="padding: 5px;">Container</th> <th style="padding: 5px;">Temperature after 15 min</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">Kept in sunlight</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">Kept in shade</td> <td style="padding: 5px;"></td> </tr> </tbody> </table> <p style="margin-left: 40px;">Difference in temperature: _____</p>	Container	Temperature after 15 min	Kept in sunlight		Kept in shade	
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Kept in shade								
	<b>Inferences:</b>							

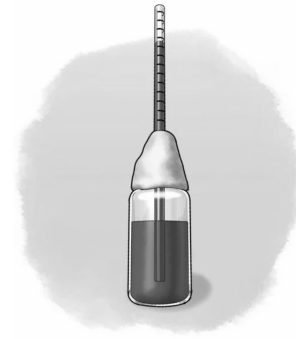
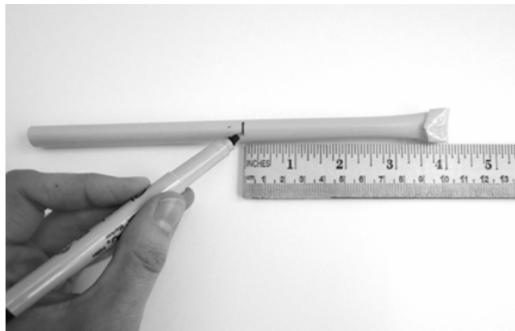
**Note:** Before the next activity, allow learners time to keep one container in sunlight.

**Tip:** If needed, remind learners what each term in the table means:

- Hypothesis: what you think will happen
- Materials needed: things you need to perform the experiment
- Method: what you will do to perform the experiment
- Observations: what you notice
- Inferences: what you learn from the observations

15 minutes	<p><b>Activity: Making a Thermometer</b></p> <p>How will you find out if the water kept in sunlight is hotter than the water kept in shade?</p> <p><b>Tip:</b> To nudge learners towards the ‘thermometer,’ ask leading questions such as: how does a doctor find out whether or not you have a fever?</p> <ul style="list-style-type: none"> <li>- One way to do this is to dip our fingers in water and write our observations as ‘hot,’ ‘warm’ or ‘cold.’</li> <li>- However, what I find ‘hot’ may be ‘warm’ for you, or what you find ‘warm’ may be ‘cold’ for me.</li> <li>- Observations that scientists make are exact and do not vary from person to person. Therefore, to find out how hot or cold the water is, we will measure its degree of hotness or coldness. This is also called <b>temperature</b>. We will measure temperature using a device called a <b>thermometer</b>.</li> </ul> <p><b>Note:</b> Inform learners that they will make one thermometer using the steps given below</p> <p><b>Tip:</b> Learners are likely to need support with making the thermometer. If needed, show step-by-step procedure, and correct and guide as needed at each step. (Refer to <b>Appendix 1</b> to watch a video on the procedure).</p>
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1. Use scissors to make a hole in the cap of the small bottle. Make sure the hole is not wider than the straw.
2. Insert the straw halfway into the cap.
3. Fill the bottle halfway with water and dissolve two pinches of turmeric in it.
4. Now, screw the cap onto the bottle so that the straw dips into the water a little.
5. Remove the straw and mark the point at which it is wet. This point shows the room temperature.
6. Keep the point showing room temperature at 0 against a ruler, and use a sketch pen to make markings 5 mm apart on the straw. These markings show the scale.
7. Insert the straw back into the bottle cap, screw the cap on, and secure it with tape to make sure that the seal is watertight.
8. Our thermometer is ready!



- How will we use this thermometer to measure the temperature of water?
- Why did we add turmeric to the water?
- Why did we make markings on the straw?
- When we place the small bottle inside hot water, the water will rise in the straw. The yellow colour from the turmeric will help us see the level of the water in the straw clearly. The markings will help us count how many units the water rose.

10 minutes

**Activity: Measuring the Temperature of Water**

**Note:** Ask learners to bring the containers placed in sunlight back and measure the temperature of water kept in sunlight and shade, and fill in their observations and inferences.

**Tip:** Make sure that learners start to count the number of units only after the level of water in the straw becomes stable.

After this, ask them to share their observations and inferences.


The difference in temperature of water kept in sunlight and shade was more than 0 units. This is because the thermometer showed greater temperature in the case of water kept in sunlight than in the case of water kept in shade. This tells us that sunlight can heat water!



<b>At home activities</b>	<ul style="list-style-type: none"> <li>- Ask an elder to teach you how to use a thermometer to measure your body temperature.</li> <li>- Draw a diagram of this thermometer.</li> <li>- Compare this thermometer with the one you made in class today.</li> </ul>
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## Day 2

Today, you will explore ways in which they can make water as hot as possible.

Time	Activity and Description		
5 minutes	<p><b>Recap</b></p> <p>How is the thermometer we made in the class similar to the one that doctors use to measure our body temperature?</p> <p><b>Note:</b> Explain how both thermometers</p> <ul style="list-style-type: none"> <li>- use a liquid that rises up a thin column,</li> <li>- are sealed, and</li> <li>- have markings that help measure the temperature.</li> </ul> <p>Now that we know that sunlight can heat water, today we will explore how we can make water as hot as possible using sunlight. There are two ways in which we can make the water hotter:</p> <ul style="list-style-type: none"> <li>- By increasing the amount of sunlight falling on it, and</li> <li>- By increasing the amount of heat from sunlight that water absorbs.</li> </ul> <p>Today, we will explore different ways to do this!</p>		
15 minutes	<p><b>Activity: Colours and Heat Absorption</b></p> <p>Let us first explore how we can increase the amount of sunlight that water absorbs.</p> <ul style="list-style-type: none"> <li>- What are some ways in which we can do this?</li> <li>- Let us explore how the colour of the container affects the temperature of the water.</li> </ul> <ol style="list-style-type: none"> <li>1. List all the available colours as paper/ watercolour.</li> <li>2. Draw the shown table and fill in the hypothesis, the materials needed and the method on their own.</li> <li>3. Paint/ cover one container, fill it with water and keep it in sunlight.</li> <li>4. Follow the same method as on the previous day and keep one container filled with equal amounts of water in the shade.</li> </ol> <div style="text-align: right; margin-top: 10px;">  </div> <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 20%;"><b>Hypothesis:</b></td> <td>Containers painted dark/ covered with dark paper will absorb more heat.</td> </tr> </table>	<b>Hypothesis:</b>	Containers painted dark/ covered with dark paper will absorb more heat.
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	<b>Materials Needed:</b>	water containers from the previous day; scissors, coloured paper/ watercolour; water						
	<b>Method:</b>	<ol style="list-style-type: none"> <li>1. Colour one container _____ (choice of colour).</li> <li>2. Pour equal amounts of water into the two similar containers.</li> <li>3. Keep one in sunlight and the other away from sunlight.</li> <li>4. Leave the containers undisturbed for 20 minutes.</li> <li>5. Measure the temperature of water in each container.</li> </ol>						
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10 minutes	<p><b>Activity: Increasing the Amount of Sunlight</b> How can we increase the amount of sunlight falling on the solar water heaters that we will be creating?</p> <p><b>Note:</b> Take responses and encourage innovative ideas as long as they are practical and help increase the amount of sunlight.</p> <p>If the ideas:</p> <ul style="list-style-type: none"> <li>- are impractical, ask questions such as: How will you do this? What materials will you need? Do you think we can arrange these materials?</li> <li>- do not increase the amount of sunlight falling on solar water heaters, ask learners to explain how the idea will achieve the objective of increasing the amount of sunlight falling on the container.</li> </ul>							
10 minutes	<p><b>Activity: Measuring the Effect of Heat Absorption</b> Follow the same steps as the previous day to measure the temperature of water in each container and fill out their observations and inferences.</p> <ul style="list-style-type: none"> <li>- Note down the difference in temperature observed and the colour they chose.</li> <li>- Add inferences based on this observation.</li> <li>- What were your inferences when you compared the difference in temperature for different colours?</li> <li>- Based on your inference, what is the most suitable colour to choose for your container if you want the water to be as hot as possible?</li> </ul> <p><b>Note:</b> Don't give the answer away. Let learners choose their own colours.</p>							

<b>At home activities</b>	Find out some applications of heat absorption and colours in our daily lives.
<b>Optional Literacy Activities</b>	<p><b>Newspaper Article</b> Write a newspaper article on how solar water heaters are more environment-friendly than geysers and immersion rods.</p> <p>You can use this format to plan and write your article.</p> <ol style="list-style-type: none"> <li>1. Introduction: <ul style="list-style-type: none"> <li>- Start by introducing the topic and why it's important to think about the environment when choosing our appliances.</li> <li>- Explain briefly what solar water heaters, geysers, and immersion rods are.</li> </ul> </li> <li>2. Solar Water Heaters: <ul style="list-style-type: none"> <li>- Explain how solar water heaters work and why they are good for the environment.</li> <li>- Highlight that solar water heaters use the sun's energy, which is renewable and doesn't harm the environment.</li> </ul> </li> <li>3. Geysers and Immersion Rods: <ul style="list-style-type: none"> <li>- Describe how geysers and immersion rods work and mention their impact on the environment.</li> <li>- Explain that they use electricity, which can come from polluting sources and contribute to environmental problems.</li> </ul> </li> <li>4. Conclusion: <ul style="list-style-type: none"> <li>- Summarise the main points of the article, emphasising that solar water heaters are a better choice for the environment.</li> <li>- Encourage readers to consider using solar water heaters to help protect the planet.</li> </ul> </li> </ol>

### Day 3 –

*Today, you will explore ways in which you can trap the heat in the water to make it heat faster.*

Time	Activity and Description
10 minutes	<p><b>Recap</b> What are some applications of heat absorption and colours in our daily lives that you found out about?</p> <ul style="list-style-type: none"> <li>- Do you know that henna or <i>mehndi</i> darkens over time because it absorbs heat from our skin?</li> <li>- What makes it possible for sunlight to heat water?</li> <li>- Can an ice cube heat a glass of water it is kept in? Why?</li> </ul> <p>The Sun is much hotter than the water in our containers! This is why sunlight is able to transfer the heat of the Sun to the water.</p> <ul style="list-style-type: none"> <li>- An ice cube is colder than water. This is why heat from an ice cube cannot transfer to water.</li> </ul>

	<ul style="list-style-type: none"> <li>- Based on this, we can say that heat travels from higher temperatures to lower temperatures.</li> </ul> <p>When water gets heated in our containers, its temperature becomes greater than that of the surroundings.</p> <ul style="list-style-type: none"> <li>- What will happen to the heat in the water when this happens?</li> <li>- How can we prevent this from happening?</li> <li>- So far, we explored ways to make water as hot as possible using only sunlight. But only heating is not enough! To heat water quickly, we need to make sure that the heat remains trapped and does not escape to the surroundings.</li> <li>- Today we will explore materials that we can use in our solar water heaters that do not allow heat to pass through them and escape to the surroundings.</li> </ul>										
15 minutes	<p><b>Activity: Conductors and Insulators of Heat</b></p> <p>Let us perform an experiment to identify which materials allow heat to pass through them and which don't.</p> <p><b>Note:</b></p> <ul style="list-style-type: none"> <li>- Inform learners that they will test plastic, wooden and steel spoons to check if they allow heat to pass through or not.</li> <li>- Ask them to fill in their hypothesis in the shown format.</li> <li>- Explain the method to them and demonstrate the experiment using the steps described in the method (Refer to <b>Appendix 2</b> to watch a video on the procedure).</li> <li>- Fill in your observations and inferences.</li> </ul> <div data-bbox="1036 793 1481 1066" style="text-align: right;"> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;"><b>Hypothesis:</b></td> <td>The steel spoon will allow heat to pass through while plastic and wooden spoons will not.</td> </tr> <tr> <td><b>Materials Needed:</b></td> <td>1 steel spoon, 1 plastic spoon, 1 wooden spoon, some solid fat, hot water, 3 glasses</td> </tr> <tr> <td><b>Method:</b></td> <td> <ol style="list-style-type: none"> <li>1. Fill hot water into each glass, close to its brim.</li> <li>2. Take some solid fat in each spoon.</li> <li>3. Place one spoon inside each glass by inserting the holding part into the water.</li> <li>4. Note the observations after 5 minutes.</li> </ol> </td> </tr> <tr> <td><b>Observations:</b></td> <td> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"><b>Spoon</b></td> <td><b>What happened to the fat after 5 minutes?</b></td> </tr> </table> </td> </tr> </table>	<b>Hypothesis:</b>	The steel spoon will allow heat to pass through while plastic and wooden spoons will not.	<b>Materials Needed:</b>	1 steel spoon, 1 plastic spoon, 1 wooden spoon, some solid fat, hot water, 3 glasses	<b>Method:</b>	<ol style="list-style-type: none"> <li>1. Fill hot water into each glass, close to its brim.</li> <li>2. Take some solid fat in each spoon.</li> <li>3. Place one spoon inside each glass by inserting the holding part into the water.</li> <li>4. Note the observations after 5 minutes.</li> </ol>	<b>Observations:</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"><b>Spoon</b></td> <td><b>What happened to the fat after 5 minutes?</b></td> </tr> </table>	<b>Spoon</b>	<b>What happened to the fat after 5 minutes?</b>
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		Wooden	
		Plastic	
		Steel	
	<p><b>Inferences:</b></p> <p>Which materials allow heat to pass through? Which don't?</p> <ul style="list-style-type: none"> <li>- Materials such as metals allow heat to <b>conduct</b> or pass through them. Such materials are called <b>conductors of heat</b>. Materials such as wood and plastic <b>insulate</b> from heat or don't allow heat to pass through them. Such materials are called insulators of heat.</li> </ul> <p>What kind of material do we need to use in our solar water heater to trap heat — a conductor or insulator?</p> <ul style="list-style-type: none"> <li>- Which easily available insulator you can use to trap heat, and</li> <li>- How will you use this insulator?</li> </ul>		
15 minutes	<p><b>Activity: Planning the Solar Water Heater</b></p> <p>So far, we learned about how</p> <ul style="list-style-type: none"> <li>- colours can help water absorb more heat from sunlight,</li> <li>- increasing the amount of sunlight falling on water acts as a “high flame on a stove,” and</li> <li>- using an insulator in our model can help us trap heat and make water heat faster.</li> </ul> <p>How can we make a solar water heater using these concepts and materials available to us?</p> <ul style="list-style-type: none"> <li>- First, draw a diagram showing what your model will look like. Make sure you plan for             <ul style="list-style-type: none"> <li>- as much heat absorption as possible using colours,</li> <li>- as much sunlight falling on water as possible, and</li> <li>- as much heat getting trapped in water as possible.</li> </ul> </li> </ul> <p>Once done, share your drawing and idea with an adult and receive feedback on the following:</p> <ul style="list-style-type: none"> <li>- What they like about the model, and</li> <li>- What ideas they have to             <ul style="list-style-type: none"> <li>- increase heat absorption,</li> <li>- increase the amount of sunlight falling on water, and</li> <li>- trap as much heat as possible in the water.</li> </ul> </li> </ul>		
<b>At home activities</b>	<ul style="list-style-type: none"> <li>- Find out some examples of heat travelling from higher temperatures to lower temperatures in your daily lives.</li> <li>- Now, identify conductors and insulators of heat in each of these examples.</li> <li>- Bring any additional materials that you need for your solar water heater.</li> </ul>		

## Day 4 –

Today, you will assemble your solar water heaters and also compare the temperatures achieved on Day 1 and Day 4 to check if the methods you implemented work or not.

Time	Activity and Description
5 minutes	<p><b>Recap</b></p> <p><b>Note:</b> Ask learners to share examples of heat travelling from higher temperatures to lower temperatures in their daily lives. Also, ask them to point out conductors and insulators in each of these examples.</p> <p>Today, we will make our solar water heaters and test them!</p>
5 minutes	<p><b>Activity: Plan Revision</b></p> <p>Make any changes to the drawing based on the feedback that improves the plan by:</p> <ul style="list-style-type: none"> <li>- increasing heat absorption,</li> <li>- increasing the amount of sunlight falling on water, and</li> <li>- trapping as much heat as possible in the water.</li> </ul>
15 minutes	<p><b>Activity: Making Solar Water Heaters</b></p> <p>Make your solar water heaters based on the plan diagram.</p> <p><b>Note:</b> Learners are likely to need help with cutting off bottle heads. As a safety precaution, please do it, instead of allowing learners to do it themselves.</p>
15 minutes	<p><b>Activity: Testing Solar Water Heaters</b></p> <p>Test your solar water heaters using the thermometer used on the previous days, and record the experiment in the table format used on previous days.</p> <p><b>Note:</b> Inform learners that the</p> <ul style="list-style-type: none"> <li>- hypothesis should show a clear temperature mark that they think their solar water heater will reach, and</li> <li>- Inferences should show anything that does not work in the model right now that they need to fix, or improve.</li> </ul>
<b>At home activities</b>	<ul style="list-style-type: none"> <li>- Talk to an elder and find out about devices, other than a water heater, that work on solar energy.</li> <li>- Bring any additional materials that you need for your solar water heater.</li> </ul>
<b>Optional Numeracy Activities</b>	<p><b>Timing Temperature Changes</b></p> <ol style="list-style-type: none"> <li>1. Materials Needed: <ul style="list-style-type: none"> <li>- Containers of different materials (plastic, glass, metal)</li> <li>- Water</li> <li>- Kettle/ pan</li> <li>- Stove</li> <li>- Timer or clock</li> <li>- A thermometer (learners can make this)</li> </ul> </li> <li>2. Instructions:</li> </ol>

	<ul style="list-style-type: none"> <li>- Take help from an adult to             <ul style="list-style-type: none"> <li>- heat water in a pan on a stove, and</li> <li>- fill each container with the same amount of hot water.</li> </ul> </li> <li>3. Start the timer/ note the time on the clock as the hot water is poured into each container.</li> <li>4. Take the temperature of water every 5 minutes.</li> <li>5. Record the time it takes for the water in each container to cool down to room temperature.</li> <li>6. Compare the cooling times of the different containers.</li> <li>7. Plot two sets of graphs:             <ul style="list-style-type: none"> <li>- First set: Showing rate of cooling or how the temperature of water decreased over time in each container (time on the x-axis   temperature on the y-axis).</li> <li>- Second set: Showing time taken by water in the container of each material to reach room temperature (temperature on y-axis   material on x-axis).</li> </ul> </li> </ul> <p>Compare the two graphs for each material. Is there a relationship that you can see between the rate of cooling and the time taken for water to reach room temperature?</p>
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## Day 5 -

Today, you will launch the Water Conservation Event!

Time	Activity and Description
5 minutes	<p><b>Recap</b></p> <p><i>Note: Ask learners to share examples of other devices that run on solar energy, in addition to solar water heaters.</i></p> <p>Today, we will make fixes to our models and “sell” them to our peers!</p>
5 minutes	<p><b>Activity: Final Product Fixes</b></p> <p><i>Note: Ask learners to make any final fixes or changes in their solar water heaters based on their inferences from the previous day.</i></p>
15 minutes	<p><b>Activity: Preparing a Sales Pitch</b></p> <p>You must have seen people try to sell various products in advertisements on television.</p> <ul style="list-style-type: none"> <li>- Do you think these advertisements make people want to buy the products?</li> <li>- How would you convince someone to buy your solar water heater?</li> </ul> <p>To sell our solar heaters well, we need to plan how to give a selling talk or a sales pitch!</p> <ul style="list-style-type: none"> <li>- A sales pitch is like a special way of talking to someone about a product to convince them to buy it. It's somewhat like trying to persuade your friends to play a game!</li> <li>- In a sales pitch, you would talk about             <ul style="list-style-type: none"> <li>- all the great things about your solar water heater,</li> <li>- why people would love it, and</li> <li>- how it can help them.</li> </ul> </li> </ul>

	<p>You can use this format to plan your sales pitch:</p> <ol style="list-style-type: none"> <li>1. Introduction: <ul style="list-style-type: none"> <li>- Say "Hello" or "Hi" to your readers and tell them what you're going to talk about. For example, "Hi, friends! Today, I want to tell you about something really cool!"</li> </ul> </li> <li>2. Describe your Solar Water Heater: <ul style="list-style-type: none"> <li>- Explain what the product or idea is in simple words. Make sure it's easy to understand.</li> <li>- Share why it's special and how it can make life more fun, easier, or better.</li> </ul> </li> <li>3. Demonstrate: <ul style="list-style-type: none"> <li>- Do a demonstration of how your solar water heater works.</li> </ul> </li> <li>4. Explain Why It's Special: <ul style="list-style-type: none"> <li>- Talk about what makes your solar water heater unique from others.</li> <li>- Share the best things about it and why people should be excited to have it.</li> </ul> </li> <li>5. Listen to Concerns: <ul style="list-style-type: none"> <li>- Ask peers to share any worries or questions they might have and answer them.</li> <li>- Let them know that you understand their concerns and explain why they don't need to worry.</li> </ul> </li> <li>6. Call to Action: <ul style="list-style-type: none"> <li>- Encourage them to try it out and have fun with it. You can say something like, "You don't want to miss out on all the fun!"</li> </ul> </li> <li>7. Closing: <ul style="list-style-type: none"> <li>- Say "Thank you" for reading and leave them with a positive message. For instance, "Thanks for listening! I hope you enjoy it as much as I do!"</li> </ul> </li> </ol> <p>You should not</p> <ul style="list-style-type: none"> <li>- tell incorrect or fake stories,</li> <li>- give wrong data from experiments,</li> <li>- say bad things about other solar water heaters, or</li> <li>- fool your customers in any other way.</li> </ul> <p><b>Note:</b> Ask learners to prepare their own sales pitches.</p>
15 minutes	<p><b>Activity: Delivering the Sales Pitch</b>  Present your sales pitches to your friends/family.</p> <p>After the presentation, ask your friends/family to share:</p> <ul style="list-style-type: none"> <li>- whether or not they were convinced to buy the product,</li> <li>- what they liked about the product, and</li> <li>- what they think can be improved in its design.</li> </ul>

<b>Additional enrichment activities:</b>	Learners can test the variations in the heating capacity of their models by making changes such as: <ul style="list-style-type: none"> <li>- using a smaller/ larger insulating bottle</li> </ul>
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	<ul style="list-style-type: none"> <li>- using a smaller/ larger water container</li> <li>- using a water container of a different shape</li> <li>- using different kinds of reflectors, such as curved mirrors</li> </ul> <p>At the end of this exercise, learners can recommend a model design for most efficient heating.</p>
<b>Modifications for simplification</b>	Learners can use only the concepts of the effect of colour on heat absorption and insulation to create their models.

## ASSESSMENT CRITERIA

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A majority of my learners were able to:

- Demonstrate the use of colours to increase absorption of heat.
- Demonstrate the use of insulators to disallow transfer of heat.
- Measure temperature correctly using a thermometer.
- Design and create a solar water heater.

## APPENDIX 1

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[Video](#) on making and using a thermometer (Day 1).

- Instead of food colouring, learners can add turmeric to water.
- Instead of playdough, learners can use tape to seal the thermometers shut.

## APPENDIX 2

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[Video](#) on testing whether a given object is made up of a conductor or insulator of heat (Day 3).