

## Lesson 1.3 - Design a Habitat

### Overview

During this lesson, students will gain understanding of how living things require certain elements in order to thrive in an interdependent ecosystem. Students will integrate and exhibit learning by designing a sea turtle habitat which requires sunshine and seawater in order to function.

### Key Information

Level 1: (Ages 8-9) US Grades 2 or 3

Time: 45/90 minutes

<a href="#">Warm-Up</a>	5 minutes
<a href="#">Mini-lesson</a>	10 minutes
<a href="#">Worked Example</a>	7 minutes
<a href="#">Challenge 1</a>	7 minutes
<a href="#">Challenge 1 - Debug</a>	5 minutes
<a href="#">Challenge 2</a>	7 minutes
<a href="#">Tidy Up / Exit Ticket</a>	4 minutes

### Lesson Topics

- **Computing:**
  - Inputs, outputs, abstraction, debugging
- **Life Science:**
  - The requirements of plants for life and growth (light and water)
- **Scientific Thinking:**
  - Asking relevant questions and using different types of scientific enquiries to answer them
- **Art and Design:**
  - Explore and use mechanisms, devices and materials for imaginative activity that leads to original and creative outcomes
- **Design and Technology:**
  - Generate, develop, model and communicate ideas through talking, drawing and mock-ups
- **English Language Arts:**
  - Use information gained from illustrations and text to demonstrate understanding
  - Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area

### Learning Objectives

- **As a result of this lesson, students will be able to:**
  - Identify similarities and differences in the elements which enable animals to thrive
  - Explain why sea turtles need water and sunshine to thrive
  - Explain how sea turtles access the elements they need in an interdependent ecosystem
  - Design a SAM Habitat for sea turtles that systematically enables periodic sunshine and ocean current

### Materials

- Flip chart paper
- Markers

*Materials continue on Page 2*

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- Colored construction paper
- Gluesticks
- Shoebox for a diorama
- SAM Labs Kit
- SAM Labs Student Workbook

### Warm Up – ‘Odd One Out’

5 minutes

*What do living things need in order to thrive in their habitat?*

**Objective:** Conduct scientific inquiry about animal habitats to activate prior knowledge and prepare for the lesson.

**Procedures:** In small teams, students are set up to play ‘Odd One Out’, a game designed to encourage scientific discussion about the similarities and differences between things. In this case, we are exploring animals. *What do these living things need in order to thrive in their habitat?* Students could search the internet to help facilitate this activity. Students record findings in a comparative venn diagram in their workbooks. Students could share group findings to complete the warm-up.



**Sample photo ideas:** A sea turtle, a lion, a frog.

**Link forward:** The teacher identifies two requirements for animal survival elicited via the warm-up: sun and water. The teacher refocuses learning to sea turtles.

### Mini-lesson

10 minutes

*What do sea turtles need to survive in their habitat and why?*

**Objective:** Students learn about two elements sea turtles need to survive, sunshine and water.

**Procedures:** Focusing now on sea turtles, the teacher reiterates two requirements for animal survival, sunshine and seawater. Sea turtles need water and sunshine to thrive in their habitat (oceans, beaches and sand dunes). The teacher gives concrete examples of how sea turtles access and utilise sunshine and seawater in their habitat throughout their lifecycle. The teacher may decide to show a short clip of [‘Finding Nemo’](#) to support explanation and discussion (8 minutes).

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At the end of the mini-lesson, students can match or define keywords in their workbooks.  
(2 minutes)

### Keywords

- Class or classification (as in animals)
- Reptile
- Thrive
- Elements
- Need
- Lifecycle
- Habitat
- Survival
- Migration

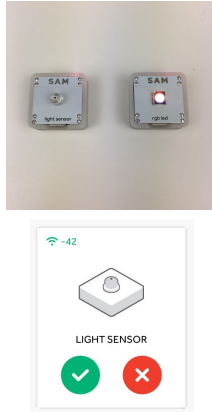
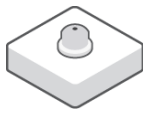

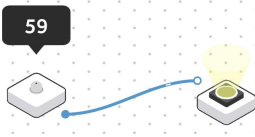
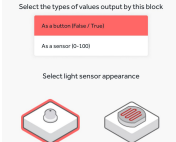
**Let's Discuss:** *Why do sea turtles need saltwater and sunshine? In your workbook or with a partner, record, discuss, or share an example of how sea turtles access and use these elements during their lifecycle.*

**Link forward:** The teacher prepares students to design a habitat for sea turtles using SAM blocks which replicate the sunshine and ocean water.

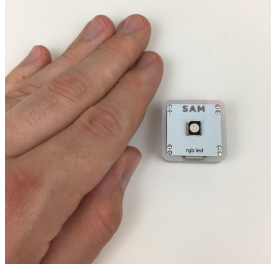
### Worked Example

**7 minutes**

*Design a SAM Habitat for sea turtles that includes one requirement for them to thrive, periodic sunshine.*

Instructions	Workspace	Notes for Teachers
<b>Step 1.</b> Turn on and pair: <ul style="list-style-type: none"> <li>• 1 Light Sensor block</li> <li>• 1 RGB LED block</li> </ul>		<p>Teacher says, "We are going to do the first example together as a class and then I'm going to set you up to work independently/in small groups. One of the things we learned is that sea turtles require sunshine. The RGB LED is going to act as our sunshine in our habitat. The Light Sensor will allow us to turn the sunshine on or off".</p>
<b>Step 2.</b> Drag the Light Sensor block onto the canvas.	<p><b>Light Sensor</b></p> 	<p>Teacher says, "Notice the number above the Light Sensor. This is the value of the light in the room. The Light Sensor spans 1-100. Do you see the small filled in circle to the bottom right of the Light Sensor? This means it's an input".</p>
<b>Step 3.</b> Drag the RGB LED block onto the canvas.	<p><b>Light</b></p> 	<p>Teacher says, "Do you see the open circle to the top left of the RGB LED block? This means it's an output".</p>
<b>Step 4.</b> Connect the Light Sensor and RGB LED blocks.		<p>Teacher says, "The Light Sensor is in input and the RGB LED is an output. When these blocks are connected (blue line) in a system, the Light Sensor collects information that the RGB LED conveys".</p>
<b>Step 5.</b> Open the Settings icon of the Light Sensor. Turn the Light Sensor into a button.		<p>Teacher says, "Turning the Light Sensor into a button means it will register one of two values: true or false. What happens if we change the Light Sensor to a button? (Try it)".</p>

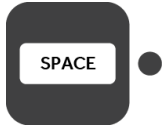
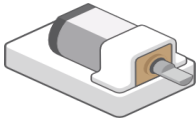
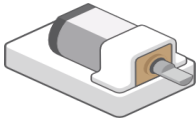
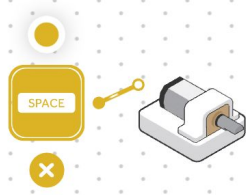
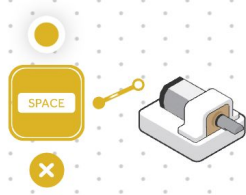
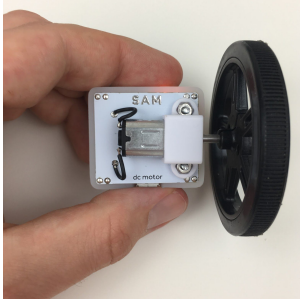
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<p><b>Step 6.</b> Test it! Put your entire palm over the Light Sensor. This should turn the RGB LED off.</p>		<p>Teachers says, “True (hand over the light) will turn the light on as if it’s dark outside. False (remove hand) will turn the light off as if it’s light outside. Do you see how this is like a smart house? How can we automate it further for our turtle habitat?”.</p>
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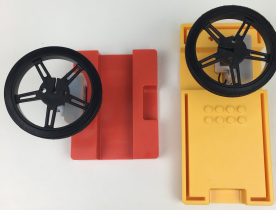

### Challenge 1

7 minutes

Design a SAM Habitat for sea turtles that includes another requirement of their habitat, ocean water.

Instructions	Workspace	Notes for Teachers
<p><b>Step 1.</b> Drag a Key Press onto the workspace.</p>		<p>Teachers says, “The Key Press is an input function. Can you find any other functions which can act as an input to ‘start’ the system?”</p>
<p><b>Step 2.</b> Turn on and pair:</p> <ul style="list-style-type: none"> <li>(2) DC Motors</li> </ul>	<p>DC Motor</p> 	<p>Teacher says, “DC motors are outputs. Our motors are going to act as the backdrop of our habitat and replicate the ocean current”.</p>
<p><b>Step 3.</b> Drag the DC Motors onto the canvas.</p>		<p>Teacher says, “Is there a clue on the canvas which tells us why DC Motors are outputs? (Hint: the open circles indicate the block is an output). Can outputs connect to one another? Why or why not?”.</p>
<p><b>Step 4.</b> Connect the Key Press to the DC Motors.</p>		<p>Teacher says, “When you connect the Key Press to the DC Motors, they are a system. How can you tell? (Hint: the colors synchronize)”.</p>
<p><b>Step 5.</b> Test it! Press the Key Press. This should turn the motors on.</p>		<p>Teacher says, “Let’s press the button to turn the system on”.</p>
<p><b>Step 6.</b> Put wheels on the motors. Be sure to match the flat part of the wheel with the flat part of the axel.</p>		<p>Teacher says, “The wheels will create a current for our habitat’s ocean water. Sea turtles need the ocean’s current to move from place to place and migrate. They also need salt water to drink”.</p>

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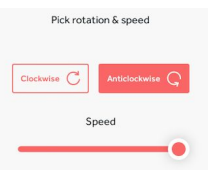
<p><b>Step 7.</b> Put the 1st motor in the chassis. Put the 2nd motor in the control block. <i>This may require some pressure.</i></p>		<p>Teacher says, “How do we ensure our “current” is moving in the same direction? (Many students will miss that the motors need to be moving in opposite directions to create a current. This is a good opportunity to debug)”</p>
<p><b>Step 8.</b> Cut out a strip of paper and draw blue waves on it. Place it around the two wheels. <i>This will be the backdrop to your habitat.</i></p>		

**Checks for understanding:** What is one reason sea turtles require sunlight? What is one reason sea turtles require sea water?

### Challenge 1 - Debug it

5 minutes

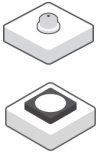
Enable students to identify, work through and overcome difficulties and misconceptions.

Instructions	Workspace	Notes for Teachers
<p><b>Step 1.</b> Open the Settings icon of both DC Motors and lower the speed.</p>		<p>Teacher says, “To replicate the ocean current near a shoreline, we need to lower the speed of the motor. Does anyone know how the ocean current relates to sea turtle migration?”</p>
<p><b>Step 2.</b> Open the Settings icon of one of the DC Motors. Change the direction to anticlockwise.</p>		<p>Teacher says, “To ensure our ocean current is moving in one direction. Depending on how your chassis is oriented, you may need to make one motor move anticlockwise, whilst the other continues to move clockwise”</p>

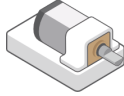
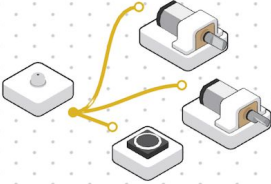




### Challenge 2

7 minutes

Design a SAM habitat for your sea turtle that works in a system to fulfil two requirements of their Ecosystem, periodic sunshine and ocean water. This challenge combines learning from the Worked Example and Challenge 1.

Instructions	Workspace	Notes for Teachers
<p><b>Step 1.</b> Turn on and pair:</p> <ul style="list-style-type: none"> <li>1 Light Sensor block</li> <li>1 RGB LED block</li> <li>2 DC Motors</li> </ul>	 <p>Light Sensor</p> <p>Light</p>	<p>Teacher says “Did you know we can identify our blocks by proximity? What symbol or value indicates proximity on this screen?”</p>

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<p><b>Step 2.</b> Drag the Light Sensor block, RGB LED block and (2) DC Motors onto the canvas.</p>	 <p>DC Motor</p>	<p>Teacher says, "Zoom in and zoom out of the canvas quickly. Do you notice, when you zoom out that the canvas goes striped? This allows you to view all the blocks on the stage, but it doesn't allow you to edit them. Now, zoom back in"</p>
<p><b>Step 3.</b> Connect the Light sensor block to (2) DC Motors and the RGB LED block. This will turn the system on.</p>		<p>Teacher says, "Now we've turned the system on. But, we want the habitat to mimic the sea turtle's real ecosystem. How can we ensure the water has a current when the turtle decides to swim? How can we make a smart light that turns on when it's dark to regulate the amount of sunshine available?"</p>
<p><b>Step 4.</b> Select each connection and click "X" to disconnect the system.</p>		<p>Teacher says, "To make a smart habitat, we need to add a few more things. Let's deconstruct the current system and consider what we need. First, we need a way to turn the system on and off. Right now, the system is always on. Second, we need a way to regulate the system so that just the right amount of light or darkness turns the system on. Right now, the system is not sensitive to the environment"</p>
<p><b>Step 5.</b> Locate the Inverse function and add it to the system.</p>	<p>Inverse</p> 	<p>Teacher says, "Let's add the Inverse function to our system. The Inverse function allows the opposite to happen. So, right now any value the Light Sensor displays turns the system on. This will do the opposite. Any value the Light Sensor displays will turn the system off. Now, how can we regulate the system turning it off and on?"</p>
<p><b>Step 6.</b> Locate the Threshold function and add it to the system. Select the Settings icon and change the Threshold value to 51.</p>	 <p>THRESHOLD</p> 	<p>Teacher says, "Let's add the Threshold function. Threshold means we can set a range of values that will turn the light on or off. Let's set the Threshold value to 51. This means that any value the Light Sensor detects under 51 will turn the system on. Any value over will keep it off"</p>
<p><b>Extension Ideas:</b></p> <ul style="list-style-type: none"> <li>• Can you find another way to regulate the system so that just the right amount of light or darkness turns the system on?</li> <li>• Set a Time Trigger or an Alarm function to prompt the turtle to wake up and take a swim</li> <li>• Mimic the sunrise with your RGB LED block, enabling it to increase brightness over time</li> <li>• Use the Proximity Sensor to turn on the water current when the turtle gets near to it</li> </ul>		

**Checks for understanding:** Which output/s replicate the sunshine in our habitat? Which inputs help replicate the seawater in our habitat?

### Tidy Up / Exit Ticket

4 minutes

Reinforcing the learning objectives of the lesson, students can reflect on key takeaways by completing and submitting an exit ticket.