◈ SeaPerch Design Folio and Build Overview ◈

Grade Level: 7th-12th

Length of Lesson: 2 days – 1 week

Goals:

- Students will learn about ROVs and where they are used
- Students will learn about the SeaPerch design challenge
- Students will design their SeaPerch ROVs, build them, and test them

National Science Standards:

- ETS1.A: Defining and Delimiting an Engineering Problem
- ETS1.B: Developing Possible Solutions
- ETS1.C: Optimizing the Design Solution

Materials:

- SeaPerch Design Folio (located below)
- PowerPoint 1: SeaPerch Overview and Design Challenge
- SeaPerch kits (1 for each group of 2-5 students)

Background:

Explain to students what the SeaPerch challenge is about. Students will construct remotely-operated vehicles (ROVs) that are able to maneuver underwater. Students will be expected to create several potential designs and then pick the best one to complete. Their ROVs will need to be able to move through an obstacle course, as well as follow through with the year's current challenge.

Lesson: LAUNCH

Show students this short coverage of a robot helping to clean up the Gulf Oil Spill:

http://www.youtube.com/watch?v=Y5-sVKnio4w

Discuss with the students how robots can be used in different ways underwater, including helping to clean up or even avert disasters.

Lesson: INVESTIGATE

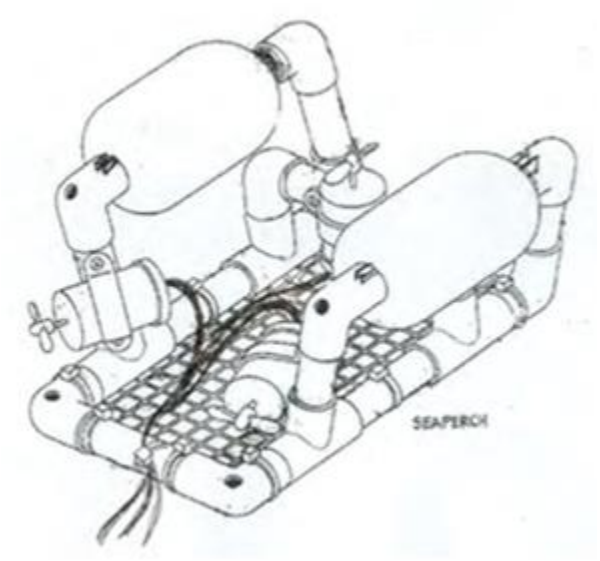
Show and discuss the **SeaPerch Overview and Design Challenge PowerPoint.** Next, give the students the **SeaPerch Design Folio** and help them to begin designing their SeaPerch ROVs. Once students have decided upon a final design, allow them to continue to the next step: building the ROVs.

Lesson: PRACTICE

Students should use their final designs to construct their SeaPerch ROVs. Depending on your classroom time frame, this could take anywhere from one day to a week.

SeaPerch Design Folio

Name:	
Period:	
Teacher:	
Date Started:	
Date Due:	



DEFINING: Write a brief description of the challenge you are to solve: _____

_____

_____

BRAINSTORMING: What do you already know about ROVs? _____

_____

_____

List any initial ideas you have for the design of your SeaPerch: _____

_____

_____

_____

_____

RESEARCH & GENERATING:

A remotely operated vehicle (ROV) is a remotely-operated underwater robot. They are common in deepwater industries such as offshore hydrocarbon extraction. An ROV may sometimes be called a remotely operated underwater vehicle to distinguish it from remote control vehicles operating on land or in the air. ROVs are unoccupied, highly maneuverable and operated by a person aboard a vessel. They are often linked to the ship by a tether, a group of cables that carry electrical power, video and data signals back and forth between the operator and the vehicle. High power applications will often use hydraulics in addition to electrical cabling. Most ROVs are equipped with at least a video camera and lights. Additional equipment is commonly added to expand the vehicle's capabilities. These may include magnetometers, a still camera, a manipulator or cutting arm, water samplers, and instruments that measure water clarity, light penetration and temperature.

IDENTIFYING CRITERIA & SPECIFYING CONSTRAINTS:

List the things your product must do to solve the problem.

The solution must: _____

_____

_____

_____

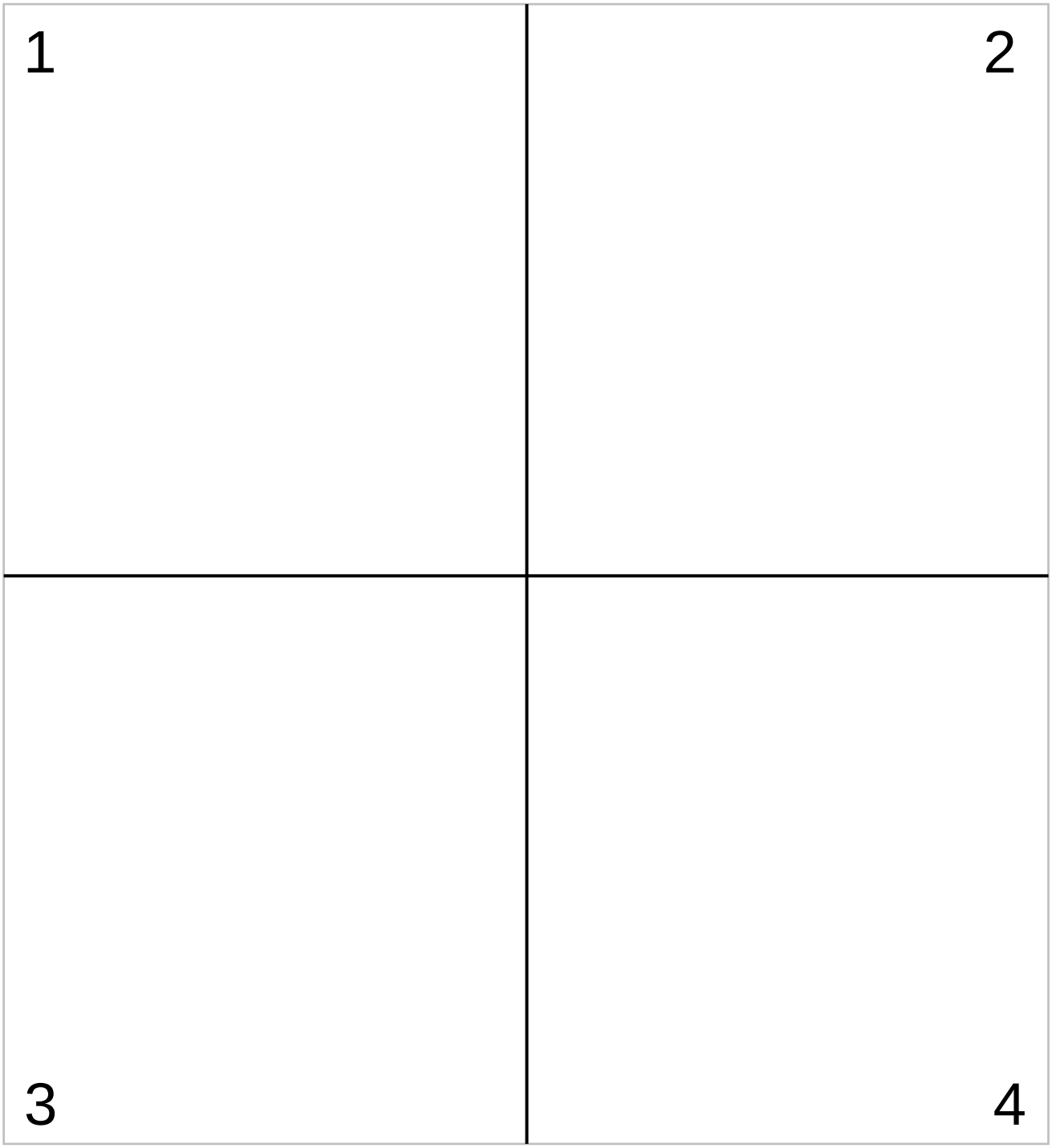
_____

_____

_____

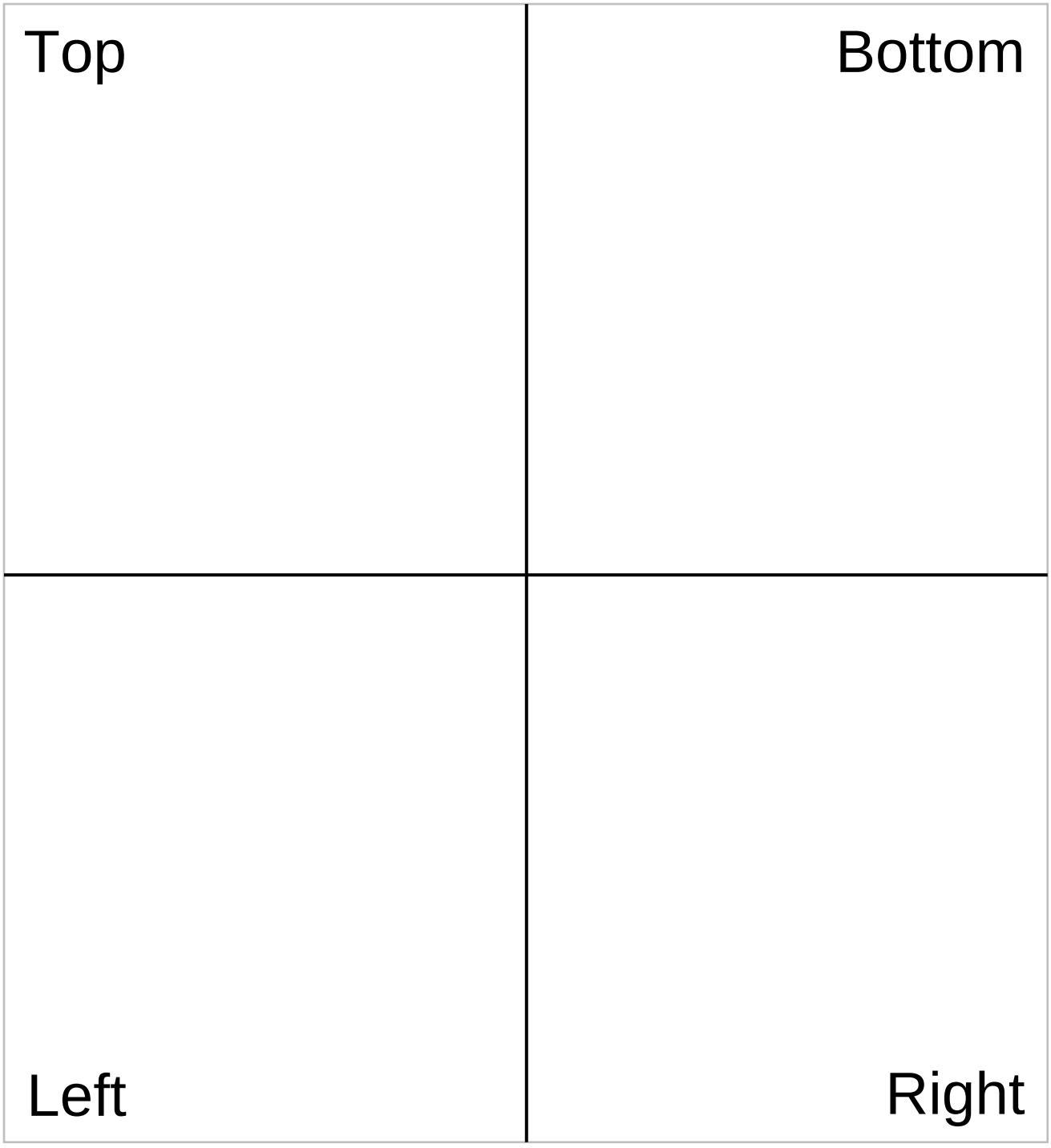
EXPLORING POSSIBILITIES:

Sketch out 4 possible designs for your SeaPerch ROV. Each sketch should be shown from side view. Include body shape, location of motors, location of floats, & location of wires. Each box in the grid should represent a consistent distance. Sketches should be drawn to scale.



SELECT A DESIGN SOLUTION:

Select a final design. Sketch out your final design below. This is a four-view sketch - front view, side view, top view, and bottom view. You should be sure to include locations of the motors. The SeaPerch should be drawn to scale.



REASONING: The design chosen is most suitable because: _____

_____

DEVELOP A DESIGN PROPOSAL: Technology Resources needed to produce prototype:

- Additional information needed: _____

  _____
- Energy required:_____
- People required:_____
- Capital (money) required;_____
- Estimated time required:_____
- List the materials you will use to produce your prototype:_____

  _____

  _____

  _____
- List the tools and/or machines you will use:_____

  _____

  _____
- List the processes you will use to produce your prototype:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

MAKE A MODEL/ PROTOTYPE:

Using supplied capital resources, build your prototype. Document the challenges you face during the build: _____

_____

_____

Document any changes made to the original design:_____

_____

_____

TESTING & EVALUATING THE SOLUTION:

Test your product in the testing tank. Document any problems that occur during testing: _____

_____

_____

REFINING THE DESIGN:

Use available capital resources to adjust or refine your prototype. Document the changes you made: _____

_____

_____

_____

CREATING OR MAKING IT:

When your final product is complete, present it for judging and/or grading.

Reflect on the process you just completed, and the final product you created. Answer the following questions:

COMMUNICATING PROCESS & RESULTS:

1. List what worked well/was a success in your design:_____

_____

_____

2. List what was satisfactory in your design, but could be improved:_____

_____

_____

3. List what did *not* work well or was unsatisfactory in your design:_____

_____

_____

4. How could you improve your overall design? _____

_____

_____

5. What did you learn while working on this challenge? _____

_____

_____