



Watershed Warriors Oceans and Pollution Lesson Plan

Stage One: Desired Results

1. Essential Question(s):
 - What is the engineering design process and how can it be used to solve real-world problems?
 - How can humans impact the health of the ocean and marine animals, both negatively and positively?
 - What are common sources of ocean pollution?
 - How does pollution impact marine life?
 - What can we do to help prevent or clean up pollution?
2. Mastery Objective(s):
 - Students will use the engineering design process to solve a problem, including
 - a) Defining a problem
 - b) Understanding constraints
 - c) Brainstorming and choosing solutions in a group setting
 - d) Planning a solution
 - e) Building a solution
 - f) Testing a solution
 - g) Reflecting and making improvements
 - 5.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
 - j) models are constructed to clarify explanations, demonstrate relationships, and solve needs
 - 5.5: The student will investigate and understand that organisms are made of one or more cells and have distinguishing characteristics that play a vital role in the organism's ability to survive and thrive in its environment. Key concepts include
 - c) traits of organisms that allow them to survive in their environment
 - 5.6 The student will investigate and understand characteristics of the ocean environment. Key concepts include
 - a) geological characteristics
 - b) physical characteristics
 - c) ecological characteristics
 - 5.7 The student will investigate and understand how Earth's surface is constantly changing. Key concepts include
 - g) human impact.

Stage Two: Assessment Evidence

1. Summative Assessment:
 - A design challenge in which students will collaborate to determine how plastic/trash pollution affects their assigned marine organism and design a solution to remove that pollution.

Stage Three: Learning Plan

- Materials:
 - Clear bin
 - Scraps of trash (e.g. plastic bags, bottle caps, shredded wrappers)
 - Straws (2 per group)
 - Spoons (1 per group)
 - 4x4 inch peice of netting (such as from a clementine bag; 1 per group)
 - Rubber bands (2 per group)
 - Masking tape (1 ft per group)
 - Lab sheet
 - Organism fact card
 - *The material list for the design challenge is flexible and other materials can be used as long as each group is given equal amounts of each material.*
- Warm up/Discussion: (5 min)
 - Survey students' knowledge on oceans, including ocean topography, physical characteristics (light, pressure, currents), and marine life.
 - Ask essential question: How can humans impact the health of the ocean and marine animals, both negatively and positively?
- Activator Activity: Oceans Video (6 min)
<https://drive.google.com/file/d/0Bzig3Q4QPoEJNHZpV2Nsb3hyU28/view?usp=sharing>
 - Discuss what the students saw in the video by asking them to recall specific organisms and the impact trash has on those organisms. A good connection to make her is the great pacific garbage patch. Talk about the possible origins of the trash and how trash can migrant due to wind, tides, currents, and other methods.
- Design challenge: Can you Clean it? (30-45 min depending on length of class) The students use the engineering design process to build devices with the limited materials provided that can be used to remove trash from the "ocean".
 - Show the students the "ocean," a clear bin filled with polluted water (water with prepared trash particles added to it).
 - Have students break into groups of 4-5. Pass out one organism fact card to each group and lab sheets to each student.
 - Define the Problem: As a group, the students must determine what type(s) of trash affects their organism, how the organism is impacted, and where the trash comes from.
 - Brainstorm Solutions: Each group brainstorms three possible devices and/or methods for removing the trash affecting their organisms given the limited materials available to them.
 - Choose and Plan a Solution: Each group chooses a solution to build. They sketch their solution, write a quick description of how it works, and give it a name.
 - Build the Solution: Once the group has completed their plan, they may receive their materials and begin building.
 - Test the solution: Once they have completed their solution, groups may come up one by one to test it in the bin shown at the beginning of the challenge. While testing it, students should make observations about how

their solution performs. Students should record two things that went well and two things that didn't work on their lab sheets.

- o Reflection: Students return to their tables and discuss what went well and what they would change. Students talk about what they constraints could be in real life.
- o Extension: If time remains during the design challenge period, the students can revise their devices and repeat the steps of the engineering design process.
- Group discussion and summary (5 min)
 - o Have students share the problem each of their organisms face and the solutions that they came up with in their groups. Discuss the what went well when testing the solutions and how each solution could be improved. Discuss what each student can do in their daily lives to help their organism/reduce pollution.