**Description**

**Phenomenon:** Some areas of the California Coast have been protected. These underwater parks are called Marine Protected Areas.

**Guiding Question:** What is a Marine Protected Area and why are they important?

**Program Goals:** Help students discover their connection with the Monterey Bay National Marine Sanctuary and the system of California Marine Protected Areas, build healthy eco-identities, and become environmental stewards of our coasts and ocean habitats. To provide students access to experiencing what Marine Protected Areas look like underneath the water’s surface, a vantage point they may not otherwise be able to see.

**Overview:** Through a virtual reality experience, students explore our system of Marine Protected Areas along the coast of California, and our Monterey Bay National Marine Sanctuary. After engaging with the virtual reality, students learn about the different types of Marine Protected Areas and the regulations that govern each type through individual readings and class discussion. Lastly, students put their newfound knowledge of Marine Protected Areas into a “Take Care of Our MPA’s” art poster that can be converted into public educational signs.

**Standards**

This lesson sequence supports the following Next Generation Science Standards (NGSS) three dimensions of science learning.

NGSS Science and Engineering Practices (SEPs):

* Engaging in Argument from Evidence - Evaluate competing design solutions based on jointly developed and agreed-upon design criteria

NGSS Crosscutting Concepts (CCCs):

* Stability & Change
* Cause & Effect
* Influence of Science, Engineering, and Technology on Society and the Natural World
* Science Addresses Questions about the Natural and Material World

NGSS Disciplinary Core Ideas (DCIs):

* *LS2.C: Ecosystem Dynamics, Functioning, and Resilience -* Biodiversity describes the variety of species found in Earth’s terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem’s biodiversity is often used as a measure of its health.
* *LS4.D: Biodiversity and Humans -* Changes in biodiversity can influence humans’ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on - for example, water purification and recycling.
* *ESS3.C: Human Impacts on Earth Systems -* Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.

**Materials Needed:**

* Oculus headsets or 360 video link
* MPA readings/definitions
* MPA Maps - central & south coast overviews, and up-close view of MPA’s used in the VR
* Post-lesson worksheets
* Internet access necessary for 2D remote learning version

**Engage**

1. Introduce yourself and Save Our Shores to the class through the SOS mission statement.
2. Ask students whether or not they think the Monterey Bay is protected? Introduce the Monterey Bay National Marine Sanctuary and the concept that there are areas of the sanctuary that are called Marine Protected Areas (MPAs).
3. Assess student’s prior knowledge by creating a brain map as a class of what they think an MPA is. What does ‘Marine Protected Area’ remind them of? What comes to mind when you hear ‘Marine Protected Area’?

**Explore**

1. Let students know we will be exploring some of these MPA’s through a Virtual Reality experience. Provide instructions on how to use the oculus headsets safely.
2. MPA VR (~10-12 min): Students are lead through a Virtual Reality experience by an animated sea lion character. They travel in a submarine to multiple Marine Protected areas where they complete mini scavenger hunts looking for various species that live in each location. Students will explore the biodiversity of California’s system of MPA’s and will become familiar with the meaning of the term. They will be introduced to the impacts of human disturbance on marine ecosystems, and how Marine Protected Areas work to mitigate those impacts and protect marine organisms and habitats.

**Explain**

1. After the VR experience, provide students with readings about the different types of MPA’s - each student gets one type (SMR, SMCA, SMRMA). Allow students a few minutes to read about their type of MPA and then have them discuss the different types with their table group.
2. Display slides that briefly explain what an MPA is, and what the rules/regulations are for each type of MPA.
3. Display an MPA map and provide students with paper maps showing all the MPA’s we have here on our central coast. Explain how the maps are color coded for each type of MPA. Ask students to provide an example of each type of MPA by having them find one on the map and sharing with the class. Has anyone been to any of the MPA’s we have seen on the map (virtually or in person)?
4. Questions to discuss as a class: What are the benefits of MPAs? How do they support the entire surrounding ecosystem? Do the benefits remain only within the boundaries of the MPA (describe spillover effect)?

**Elaborate**

1. Have students create a “Take Care of our MPA’s” poster that includes animal and plant species found in an MPA of their choosing (species known will depend on what species were seen in the VR). Their posters should also include what is not allowed (restricted activities) and why MPA’s are important.
2. Take photos of students' posters and send them to Save Our Shores at [krista@saveourshores.org](mailto:krista@saveourshores.org).

**Evaluate - as a post-survey worksheet, teachers will implement this either in class or as a take home assignment after the VR lesson is complete and will return completed work to Save Our Shores.**

1. Students will complete a post lesson worksheet with the following questions and writing prompts:
   1. Have you ever utilized Virtual Reality technology before? (Yes/No)
   2. How much did you enjoy this VR experience? (scale 1-5)
   3. How likely are you to tell your friends and family about this VR experience? (scale 1-5)
   4. What is a Marine Protected Area? (Short answer)
   5. List 5 species (plants or animals) that live in Marine Protected Areas that you saw in the Virtual Reality experience.
   6. List the three types of Marine Protected Areas we discussed.
   7. What is one thing that is not allowed in any of the three types of Marine Protected Areas?
   8. Paragraph writing prompt: Choose one type of Marine Protected Area (SMR, SMRMA, SMCA) that you believe is the most effective at protecting biodiversity. Write a paragraph using evidence from the Virtual Reality experience, the readings, and the class discussion to support your argument. In your argument, you should address the following:
      1. How do the restrictions in this type of MPA help restore the ecosystem?
      2. How do the restrictions in this type of MPA increase populations of individual species (for example, giant kelp) and overall biodiversity? Recall that **biodiversity** is the *total number of different species* in an ecosystem.
      3. How do the restrictions in this type of MPA support human needs, such as fishing?