Innovation Project Presentation \/

1. **Lydia**

Hi, my name is Lydia and this is Madeleine, Kyle, Jackson, Wesley, and Katherine We are the “Shark-Kidettes”

1. **Wesley**

To begin our season, we first played headbands with different ocean explorers like a marine veterinarian, marine archaeologist, fisherman, and marine biologist. We did research about some of them and learned lots of cool things like veterinarians can catch diseases from their patients, Jeff Bezos was a marine archaeologist, and it is very loud underwater! We also brainstormed some possible problems explorers might encounter, like invasive green crabs. We talked to three experts; Dr. Fishell, a marine roboticist, Dr. Large, a fisheries manager, and Dr. Mangel, a marine biologist who studies sea turtles. We asked two of our experts about invasive green crabs and learned that they’re not really a problem anymore because they’ve been around since the 1800s.

1. **Lydia**

A few of the problems our experts talked about encountering in their work were finding cold stunned turtles and working around air turbines in the water. We brainstormed many possible solutions to finding cold-stunned turtles like RC cars, RC boats, RC drones, and pretty much RC anything but we decided these were pretty impractical and some might have even been illegal!

We also talked about ways that the National Oceanic and Atmospheric Administration (NOAA) might be able to continue to collect data about ocean life in places where wind turbines are now being installed without the use of nets. They can’t use boats and nets anymore, something they’ve done for over 150 years because they aren’t allowed around the turbines. Dr. Large, one of our experts, specifically asked that we help solve this problem he had been working on and hadn’t come up with a solution for yet. One of our teammates thought about installing data collection devices directly onto the turbine bases, an idea we really liked. We brainstormed lots of cool ways that data could be collected without nets like Garmin fish finders which use sonar, hydrophones (underwater microphones), cameras, and EDNA sampling and analysis (environmental DNA).

1. **Kyle**

We then worked as a team to design our device, including all of these sensors to create a passive continuous data collection system. An electrical engineer helped us to make a block diagram of all the components we needed to make our device work and how they all go together. Working as a team, we researched each of the parts so we knew what they were, what they looked like, what they do, and approximately how much they cost. For instance, on our chart, you can see that a piezoelectric crystal, when hit by a sound wave, vibrates and creates energy. They cost $20-$30.

As a team, we chose to build the hydrophone part of our device. A hydrophone is an underwater microphone that can detect sounds underwater from things like fish. The sound data would then be analyzed by a computer program used to determine what caused each of the sounds. Computer learning would be used to help create the program code. Dr. Feischell told us that Python is the most used programming language to analyze this kind of data.

1. **Katherine**

Here’s the hydrophone we built! To make it, we first soldered our piezoelectric crystal to our circuit board with two wires. We then soldered three wires to the circuit board, one ground signal and two audio signals which were attached to an XLR cable to connect to our amplifier to put the sound into the speaker system. We made two part epoxy, added some color, and very quickly poured it out into the mold so it wouldn’t set in our measuring cup. A week later, we tested it out! We put it into water, and dropped some chalk, and… we could hear it sizzling as it disintegrated! We also blew bubbles like a fish would, and that worked too.

1. **Madeleine**

Brief Hydrophone Demo

1. **Jackson**

If we had more time, money, and expertise, NOAA could help us build the rest of our device and support the completion of the machine learning program to help analyze the data. By using our innovative design, NOAA could continue collecting data in their fisheries while still following the rules of the wind farms.