SCIENCE 3D

WEST COAST WHITE SHARK

In this packet, sample student answers are provided in red and notes to teachers are in blue.

In this **STEM Project**, students will explore careers in science, engineering, and communication that help teams like the Shark Lab study and solve environmental challenges. An additional (or alternative) project allows students to explore the physics of waves using technology designed by the Shark Lab.

ACTIVITY I: WHAT DO THEY DO?

Science and engineering are all about teamwork. Just like a good sports team, science teams need people with different skills to be successful. Let's explore some of the careers and backgrounds of people working with Shark Lab! Some people in Shark Lab, like Darnell and Chris, have more than one role!

Use online resources or books to complete the following table. If you don't have access to these resources, predict what kinds of things people in these careers do and how they might help the Shark Lab team.

Have students complete the table below to the best of their ability. Give certain careers to particular students or groups to share with the rest of the class or give students the information on all the careers. Have them think about how they help the Shark Lab team. Don't expect students to get all of the answers in terms of how the different careers help Shark Lab. The important part is for them to think about how each career helps make the work happen.

1. **Complete** Table 1.

Table 1. Different careers and roles in The Shark Lab team

Career	What they do	How they help Shark Lab
Marine Biologist	Studies marine life	Help study white sharks, their prey, and other organisms in their environment
Animal Behaviorist	Studies how animals behave and why they behave in the ways they do	Help study the behavior of white sharks and their prey
Geneticist	Studies genes and how they are inherited, turned on and off, function, and their role in health; develops ways to use genetics to understand populations	Help develop eDNA protocols
University Professor	Conducts research; teaches students; trains new scientists; finds resources (like money) to conduct research	Help study white sharks and their prey; train students working on the team; find funding
Oceanographer	Studies ocean processes like currents, waves, plate tectonics, and ocean life	Help study the white sharks' environment
Marine Engineer	Design, build, test and repair boats, ships and underwater vessels	Help build the Shark Lab autonomous submarine; make design improvements so it can do more
Electrical Engineer	Designs, develops, tests and solves problems with electrical systems	Integrate different sensors and abilities into the submarine or drone

Table 1 (Cont). Different careers and roles in The Shark Lab team

Career	What they do	How they help Shark Lab
Software Engineer	Use engineering principles and computer programing skills to develop software products, control systems for machines, video games, and digital networks	Design computer programs to run the autonomous submarine; help design software to analyze data from tags
Boat Captain	Safely drive boats of many sizes	Drive boats safely to get close to sharks and collect data
Statistician	Use math and statistics to design studies and analyze and interpret data	Help answer questions once the data are collected; help figure out how many sharks and places need to be studied to answer questions
Licensed Drone Pilot	Safely operate unpiloted aerial vehicles (drones) for many uses including collecting data and making videos	Fly the drone to collect information on white sharks
Lifeguard	Ensures the safety of people at the beach; watches for danger and makes rescues when needed	Help Shark Lab spot sharks; help tag sharks; make sure the public knows what Shark Lab is doing
Social Media Specialist	Plan and implement a social media campaign to spread information	Help inform the public about white sharks and what Shark Lab is learning
Marine Mechanic	Repairs boats and their engines	Fix the engines and keep them running
Graphic Designer	Create visual displays and products	Design posters and other products to inform the public about sharks
Education Researcher	Study ways to teach effectively; design ways to learn	Help create education programs from Shark Lab's research
Comic Book Writer/Illustrator	Create comic books to entertain and inform the public	Create a comic book to help teach people how to be safe around California ocean life

Extend the Lesson: Have students research the education each one of these careers requires. What subjects do they use most in their careers? What level of education do they need for certain jobs?

Extend the Lesson Further: Have students investigate careers that were important to cleaning up California's waters and helping restore populations of marine animals. Consider assigning students or groups different careers and have them create presentations or posters. Careers can include environmental chemist, ecotoxicologist, natural resources manager, wildlife veterinarian, chemical engineer, structural engineer, environmental engineer, environmental lawyer, science technician, environmental lobbyist, environmental communicator, environmental policy analyst, fisheries biologist, and marine mammologist.

ACTIVITY 2: BUILD YOUR TEAM

Imagine you are a scientist. You have been given the job of studying lions to figure out how to protect their populations. You need to learn where they are found. You need to learn about their behavior. You need to assess their health. You need to understand how humans might affect their populations. You need to figure out how to keep people's livestock safe from lions. Then, you need to communicate your findings to people who are affected by lions, those who can make decisions related to lions, and people that are interested.

Your job: Assemble a team to help you study lions and implement solutions to help protect them and their ecosystem.

1. List the technology and tools you will need to use or create for your project.

Accept reasonable and creative answers. Examples include: drone or airplane for survey, satellite tags or collars, computers, all-terrain vehicles, emergency beacons, cameras, etc…

2. List the careers and backgrounds of people that you would want on your team. Make sure you have a team of at least four people.

Accept reasonable answers. Examples include: pilot, GPS specialist, animal tracker, driver, photographer, statistician, etc…

3. Describe the role that each of these people would play on your team.

Accept reasonable answers. Examples include: flying the aircrafts, calibrating the satellite tags, creating maps, finding the animals, driving, taking photos and recording video, compiling data, etc…

Extend the Lesson: Have students create a presentation or a poster that shows how the team will work and the role of each team member. Consider giving students other scenarios or providing a set of scenarios that they can choose from. You could also have them choose to study animals of their choice. Then, have students compare and contrast the teams they created.

Extend the Lesson Further: Have students choose a career from the Shark Lab list or their scenario. Have them conduct a detailed investigation into what people in that career do, what education they need, and the subjects they need to know.

Alternative Project Idea: In the **Mission Reader** and **Mission Video**, the concept of waves is introduced in multiple contexts including radio waves, electromagnetic radiation (light waves), sound waves, and physical waves. Build on this mission by incorporating your typical lessons on waves and link them back to the white shark mission. Shark Lab has created a wonderful NGSS lesson on the physics of waves relative to the tags that are used in their study. It is available at:

https://nextgenscience.badgr.io/public/assertions/-xJjcS3ESfyX_tukldrxMA?v=1_1&identity__url=http:%2F%2Fwww.csulb.edu%2Fshark-lab&identity__email=http:%2F%2Fwww.csulb.edu%2Fshark-lab