MAST ACADEMY OUTREACH

MIDDLE SCHOOL PROGRAM

Adventures Aboard
The
Land SHARC
(Science Hands-On And Related Careers)

Teacher Instructions/Answer Keys

MAST Academy

Maritime and Science Technology High School

Miami-Dade County Public Schools

Miami, Florida

MAST ACADEMY OUTREACH

LAND SHARC

MIDDLE SCHOOL TEACHER'S INSTRUCTIONS/ANSWER KEY

TABLE OF CONTENTS

The "thinking" symbol appears beside all critical thinking questions. Teamwork will be required to answer these questions.

Land SHARC On-Site Package
Teacher Instructions

If you have not already done so, show the Land SHARC Pre-site DVD to your students. Make a copy of the on-site package for each of your students. Distribute one package to each student the day of the Weather on Wheels visit. They will also need pencils or pens. Pencils will be provided only in an emergency.

Since there are ten lessons, divide the class into ten teams of equal size, and assign each team a number from 1-10. IF ESOL, ESE or other inclusion students are assigned to your class, make sure they are grouped with at least one student at grade-level reading ability. This grade-level student should be designated the team leader.

To save your student's photographs from lesson 6, you will need to provide **one** flash drive (USB drive).

Students are not to carry books, book bags, etc. to the Land SHARC. These will get in the way. Clipboards will be provided for all students.

When your students arrive at Land SHARC, a brief introduction will be given. Each team will then begin at the lesson with their assigned number. **THE TEACHER MUST HELP SUPERVISE STUDENTS WORKING AT THE STATIONS SET UP OUTSIDE WEATHER ON WHEELS.**

After the Land SHARC visit, grade the on-site activities, using the answer key provided in this packet. Total the points. This grade will be used to award certificates to students who score 80% or higher. A Certificate of Achievement Request Form, along with a Program Evaluation Form, will be sent to you following the Land SHARC visit.

Discuss the correct answers with your students. All questions that address "critical thinking skills" are preceded by the icon to the left.

WET LAB DOCK

"UNDER PRESSURE" 10 points – 1 for each answer **MARINE BIOLOGIST**

Pressure affects creatures that live in the deepest parts of the ocean by pressing against their bodies. The pressure of water changes with depth. To observe the effect of depth on water pressure, follow the directions on the poster on the table and answer the following questions.

1. **From which hole does the water come out the farthest? a. top hole b. bottom hole**

2. **Is the water pressure greater at the top of the pitcher or the bottom of the pitcher? Explain your answer. At the bottom because the weight of the water is greater at the bottom.**

3. **If a fish that was not adapted to deep water were to swim down to a deep part of the ocean, they would die. What would the water pressure do to them that would kill them? The water pressure would crush the fish.**

Read the following information and then answer the questions that follow.

Fish in the deepest parts of the ocean live in total darkness and give off light (bioluminescence.) Bioluminescence helps them attract prey. However, these fish may also attract predators. Therefore, bioluminescence is an advantage when attracting prey and a disadvantage when attracting predators.

4. **What two things can be attracted to a fish that is bioluminescent? Prey and predators**

Marine biologists must make careful observations of animals when they study them in the ocean. Pretend you are a marine biologist. Look at the plastic models of deep-water fish in the aquarium. They are labeled A – F. Read the following descriptions and write the letter of the fish that matches the description in the table below.

Description	Letter
The Dragonfish has a long scaleless body, strong jaws and needle-like teeth. The female has a long, slender, sensory barbel on her chin.	**B**
The Gulper Eel is a distant relative of the river eel. It has tiny eyes and teeth and a large umbrella shaped mouth.	**A**
The Hatchetfish has light, luminescent skin on the bottom and darker skin on top. It has large, bulging eyes and an upward-slanting mouth.	**D**
The Viperfish has a long body and extremely large teeth, especially the front two on the bottom of its mouth.	**C**
The Anglerfish lures prey with a long, slender lure between its eyes.	**E**
Loose jaws lives in the murky depths of all oceans. There are three rows of green, luminescent (glowing) spots running along its body.	**F**

5. What unusual body parts do you see on the fish that would help them to adapt to deep water?
Lures, barbells, bioluminescent skin and/or spots, large eyes and mouth, large teeth

WET LAB DOCK
MARINE BIOLOGIST

"PLANKTON" 7 points – ½ for questions 1 – 7; 1 ½ for drawing; 2 for explanation

Introduction: Phytoplankton are tiny plants that must float to remain near the ocean's surface for sunlight. Phytoplankton can have spines and bristles to keep them afloat. Having a round shape or being a long chain also helps them float because it increases surface area. Zooplankton do not have to stay near the surface so they have appendages (arms or legs) to help them swim. At night, they search for food in the light zone when they are less likely to be seen by predators. During the day, they swim to darker, deeper zones to escape from predators.

Look at the plankton models on the table. You are going to do an experiment to find out which plankton models sink or float and, if they sink, which one sinks the fastest. First, state your hypothesis by completing the sentence below.

My hypothesis is that (circle one) Plankton A, Plankton B, Plankton C or Plankton D will sink the fastest.

1. Place Plankton A in the graduated cylinder. Use the stopwatch to time how long it takes to sink and record (in seconds) in the data table below. If it does not sink, record 0 seconds.
2. If it does not sink, reach in and remove it before testing the next model. If it does sink, pour the water from the graduated cylinder into the pitcher and remove the model. Then pour the water back into the graduated cylinder to test the next model.
3. Repeat steps 1 and 2 for Plankton B, Plankton C, and Plankton D.
4. When you have completed steps 1 - 3, empty the water into the pitcher and remove the plankton model from the graduated cylinder. Pour the water from the pitcher back into the graduated cylinder for the next team.

Plankton	Time it takes to sink (seconds)
A	0 (floats)
B	0 (floats)
C	Answers will vary.
D	Answers will vary.

My hypothesis was (circle one) supported or not supported by the experiment.

Questions

1. Did any of the plankton models float? (circle all that apply) **A B C D**
2. Do you think these models represent (circle one) **phytoplankton or zooplankton**?
3. Explain your answer to #2 by using information from the ~~Introduction~~.
   They are phytoplankton because they float. One is round and the other is in a long chain.
4. Which plankton models sank ? (circle all that apply) **A B C D**
5. Do you think these plankton model represent (circle one) **phytoplankton or zooplankton**?
6. Explain your answer to #5 by using information from the Introduction.
   They are zooplankton because they sank to the bottom to escape predators. They have appendages.
7. Which plankton model is best equipped for escaping prey? Explain why. (Hint: Look at "Time it takes to sink.")
   Model D because it sank the fastest.

Look at the laptop computer screen. There is a large circle showing different types of plankton. To the lower right there is a box with a small red circle. Click on the red circle to move to another area of the large circle to see more plankton types. Select one plankton and find it on the poster that is on the table. If it is there, draw it in the box below and identify it as phytoplankton or zooplankton. If it is not on the poster, keep selecting plankton from the circle until you find one that is also on the poster.

Answers will vary.

Circle one: **Phytoplankton or Zooplankton**

Explain your answer. Phytoplankton has bristles or spines or it is round or in chains. Zooplankton has appendages.

WET LAB DOCK
MARINE BIOLOGIST

"SPONGES" 12 points – 2 for each question

Sponges have needle-like spicules throughout their bodies that are composed of hard substances like calcium carbonate or silica. Different types of sponges have different types of spicules. Observe the sponge spicules using the compound microscope. Compare what you see to the spicule drawings below.

1. Circle the drawing that is similar to the spicules you see in the microscope.

a. 

b. 

c. 

d. 

2. Spicules help to provide support for the sponge. How would the weight of the water affect the shape of the sponge if the sponge had no spicules? The sponge would collapse.

Sponges are in the phylum called Porifera. This is because they all have pores that create a lot of empty space inside. This allows sponges to hold large amounts of water in comparison to their size. Follow the directions to find out just how much water a sponge can hold.

3. Place a small piece of dry sponge on the scoop that is on the scale and find its weight. Directions for using the scale are on the laminated poster on the table.

How many grams does it weigh? Answers will vary.

4. Place the piece of sponge in the beaker of water. Remove the wet sponge from the beaker and squeeze out extra water. Place the wet sponge on the scale and find its weight.

What does the wet sponge weigh? Answers will vary.

5. Subtract the weight of the wet sponge from the weight of the dry sponge to find out the weight of the water inside the sponge.

Weight of wet sponge	**Answers will vary.**
Weight of dry sponge	**Answers will vary.**
Weight of water	**Answers will vary.**

6. To find the percentage of water the sponge is holding in comparison to its weight, divide the weight of the water by the weight of the dry sponge**.** **(Answers below will vary.)**

weight of water (divided by) **=** _____ **(multiply by 100) =** _____%
weight of dry sponge

WET LAB DOCK
MARINE BIOLOGIST

"TURTLE GRASS COMMUNITY"

11 points – 1 for each drawing, 1 for each Phylum, 1 for each reason, 1 for each question

Choose any 3 of the marine organisms (living things) and complete the chart below. Refer to the information on the poster to answer the questions in the last 2 columns.

Drawing of Organism	**What phylum is it in?**	**What does your organism have in common with other organisms in the same phylum?**
Turtlegrass	Tracheophyta	It's a plant.
Fiddler crab	Arthropoda	It has jointed legs and/or a hard, external skeleton
Pencil urchin	Echinodermata	It has spiny skin and/or radial symmetry.
Barnacle	Arthropoda	It has a hard, external skeleton.
Hermit crab	Arthropoda	It has jointed legs and/or a hard, external skeleton
Brittlestar	Echinodermata	It has external plates and/or radial symmetry.
Sea biscuit	Echinodermata	It has external plates and/or radial symmetry.
Horseshoe crab	Arthropoda	It has jointed legs and/or a hard, external skeleton
Sponge	Porifera	It has pores.
Starfish	Echinodermata	It has spiny skin and/or radial symmetry.

Refer to the poster on seagrasses to answer the following questions.

1. Turtle grass (and other sea grasses) provide many things for the organisms that live in their community. Name two (2) reasons that sea grasses are so important and should be protected.
They maintain water clarity. Their roots stabilize the bottom. They provide a habitat for other organisms. They are food for other organisms. They are a nursery for young organisms.

2. Name two reasons why Florida's valuable sea grasses are disappearing at an alarming rate.
Dredge and fill projects and decrease of water quality due to the stress of urbanization have caused a decline in seagrass populations.

WET LAB DOCK
CHEMICAL OCEANOGRAPHER
"WATERY WANDERINGS" 12 points – 2 for questions 1-3; 3 for questions 4 and 5

Refractometer: The normal salinity of sea water ranges from 30 - 35 0/00 (30 - 35 grams of dissolved substances in 1000 grams of water.) Brackish water is a mixture of freshwater and seawater and tends to have a much lower salinity. Pure water has a salinity of zero.

Follow the directions on the table to use the refractometer to measure the salinity of the water in the beaker and then answer the following questions**.**

1. What is the salinity of the water you tested? **32- 35 0/00 (parts per thousand)**

2. Is the water you tested seawater, brackish water, or pure water?

Hydrochloric Acid Test: Read the information about calcium carbonate before doing the next test. Calcium carbonate is found in many living things or parts of once living things such as shells from snails, clams, etc. It has the chemical formula $CaCO_3$. **Hydrochloric acid is used as a test for $CaCO_3$.** The chemical formula for hydrochloric acid is HCl. **If hydrochloric acid is put on a substance with calcium carbonate in it, you will see bubbling**. You are going to test two samples of sand to see if calcium carbonate is present. One sample is from South Florida which has many shell pieces in it. The other sample is quartz sand and has no shell pieces in it.

Follow the directions for the hydrochloric acid test and answer the following questions.

PUT ON GOGGLES FOR SAFETY!

3. In which test tube do you see bubbling? (Circle your answer.)
(A) quartz sand OR (B) South Florida sand

4.Which sand has $CaCO_3$ in it? (Reread the paragraph above about the Hydrochloric Acid Test.)

B. South Florida sand

5. Where does the $CaCO_3$ in South Florida sand come from?

It comes from the shells left from snails, clams, etc. that were once living.

WET LAB DOCK
COMMUNICATIONS SPECIALIST

"EVERY PICTURE TELLS A STORY" 6 points – 3 for each story

1. You will document your experience aboard the Land SHARC by using the digital camera to take two photos of any of the Land SHARC docks.
2. Look around and find something you want to photograph.
3. Write a story about each photograph. Use complete sentences in your story. Think about who or what is in your picture. If a person is in your photograph, what is he or she doing? If a computer is in your photograph, what is on the screen? If a piece of equipment or an instrument is in your photograph, what is it used for?

FIRST PHOTOGRAPH

This is a photograph of Stories will vary.

SECOND PHOTOGRAPH

This is a photograph of Stories will vary.

COMPUTER DOCK
MARINE BIOLOGIST

"CORAL REEFS: LIVING COMMUNITIES" 10 points – 1 for each question

Before you is the command deck of your coral reef exploring submarine. Here will learn about the environmental conditions needed for coral reefs to survive.

1. Turn on the headphones and place them on your head.
2. Click on "Living Communities," the third icon from the left in the middle of the screen.
3. Click on the globe at the upper left-hand side of the screen to see a video about coral reefs. Answer the following question.

   Question 1 – There are few seasonal changes in water around coral reefs. **(True)** **False**

   Question 2 - Water around coral reefs must be clear for sunlight to penetrate. **(True)** **False**

   Queston 3 - There is little species diversity in a coral reef. **True** **(False)**

4. After viewing the video, click twice on the black arrow in the bottom right-hand side of the screen.
5. You will see a map with shaded areas representing locations of coral reefs around the world. Answer the following questions.

   Question 4 – Coral reefs are primarily located between what 2 latitude lines? **Tropic of Cancer and Tropic of Capricorn**

   Question 5 – Locate and name the state in the continental U.S. where coral reefs are found. **Florida**

6. Click on "Temperature" at the top of the screen.

   Question 6 – Most coral reefs need temperatures above 22 ^{0}C or 71.6 ^{0}F in order to survive.

7. Click on "Salinity."

   Question 7 – Which two salinity ranges do most coral reefs fall within? 34-35ppt, 35-36ppt

8. Click "Living Communities," in the lower left corner of the screen to go back to the lab.

9. Click on the sub icon at the lower left of the screen to go back to the sub.

10. Click on "Change and Evolution," the 6th icon from the left.
11. Click on the aquarium at the top left of the screen to view a video about coral reefs. Answer the following questions.

    Question 8 – Where are most stressed reefs located? close to human activity

    Question 9 - Name one natural phenomena that causes coral stress. rising temperatures

    Question 10 – Name one human produced stress of corals. nutrient enrichment

12. When you are finished, click on "Change and Evolution," the icon at the lower left of the screen to go back to the lab.
13. Click on the sub icon at the lower left of the screen to go back to the sub.
14. Turn off headphones and return them to the pegs.

COMPUTER DOCK
SHARK BIOLOGIST

"SHARKS!!" 12 points – 1 for each question

1. Click on Video Gallary
1. You are going to view a movie called, "Jaws: Then and Now." Click on the shark picture at the bottom center of the screen to see the video. Answer the following questions.

Question 1 – What effect did the movie "Jaws" have on the hunting and slaughtering of sharks?
a. It increased. **b. It decreased** **c. It stayed the same.**

Question 2 – From what TV show did the Land SHARC get its name?
a. Flipper **b. Gilligan's Island** **c. Saturday Night Live**

Question 3 – What effect did the book "White Shark" have on shark populations?
a. shark protection increased **b. shark protection decreased** **c. no effect**

2. After watching the video, click on "Main Menu."
3. Click on "Ask the Experts."
4. Click on the question, "What's our biggest misconception of sharks?"
5. Click on each scientist and listen to his/her comments. Use a line to connect each expert with the misconception that best matches their response to the question.

Question 4.	**Dr. Samuel Gruber**	**a. Going in shark infested water is more dangerous than crossing the street.**
Question 5.	**Dr. Jose Castro**	**b. Sharks eat everything they come in contact with.**
Question 6.	**Dr. Eugenia Clark**	**c. Sharks make their living eating people.**
Question 7.	**Dr. Charles Manire**	**d. Sharks have many variations in size, shape, behavior, etc.**

6. Click on the question, "What's most fascinating about sharks?"
7. Listen to each scientist and match each expert with his/her answer.

Question 8.	**Dr. Samuel Gruber**	**a. Sharks can learn and remember months later.**
Question 9.	**Dr. Jose Castro**	**b. We know very little about shark behavior and physiology.**
Question 10.	**Dr. Eugenia Clark**	**c. Sharks have the ability to "home."**
Question 11.	**Dr. Charles Manire**	**d. The myth of the shark's being a mindless eating machine is wild.**

Question 12 – How has the information presented in this lesson changed your opinion of sharks?

Answers will vary but should state that sharks may not be as dangerous to humsns as previously believed.

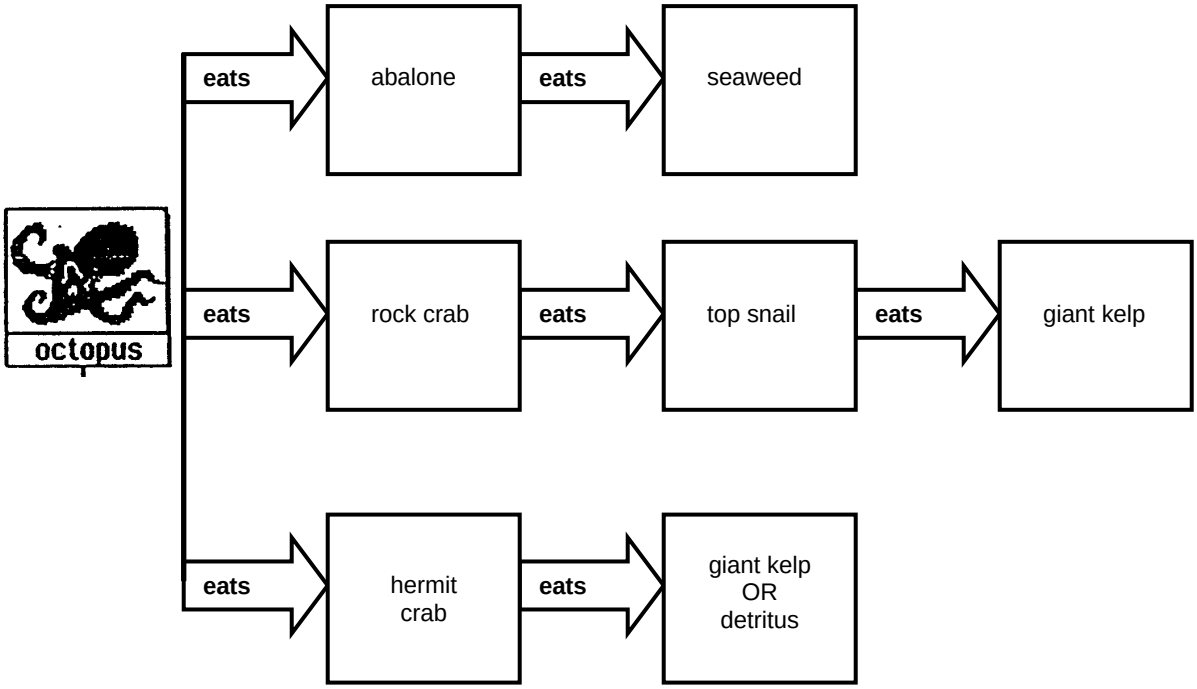
Click on "Back" to return to the main screen.

COMPUTER DOCK
MARINE BIOLOGIST

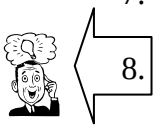
"MARINE FOOD CHAINS" 9 points – 1 for each organism in food chains, 2 for question

The red octopus has a varied diet. Thus, there are several different food chains that begin with the red octopus. In this lesson, you will create three food chains for the red octopus.

1. Use the mouse to click on the words "Food Chain" at the top of the screen.
2. Select red octopus. Follow the directions in the lower right hand corner of the screen to create the first food chain.
3. When the food chain is complete, click once to see a diagram of it.
4. Using page 11 of your packet, cut out the pictures of the marine organisms in the food chain and paste them in the appropriate places in the diagram below using the glue sticks. If the first food chain consists of two organisms plus the octopus, paste them in the first row. If the first food chain consists of three organisms plus the octopus, paste them in the second row.



5. Click on the red octopus to create a second food chain beginning with the red octopus and repeat steps 3 – 4.
6. Click again on the red octopus to create a third food chain beginning with red octopus and repeat steps 3 – 4.
7. Return scissors and glue sticks to the small basket and dispose of scrap paper in the waste basket.



8. What organisms in the food chain would be affected if the topsnail became extinct? How would they be afftected? The rock crab population would decrease due to lack of food. Then the octopus' diet would be less varied and they would eat more abalone and hermit crabs and these populations would decrease, etc.

Click on the small picture in the lower left hand corner to return to the beginning.

COMPUTER DOCK
MARINE MAMMAL SCIENTIST

"WHERE CAN YOU SEE WHALES?" 11 points – 1 for each month in table, 1 for each question

In this lesson you will learn about where you can see whales during different months of the year.

1. Turn on the headphones and place them on your head. Click on the picture of the boat.
2. Click on R-RUN to watch the movie and answer the questions below.

Question 1 - What is the best time to watch whales in Baja? <u>During winter (Jan. – March)</u>

Question 2- What type of whale can you see here? <u>gray whales</u>

4. Click on the movie when it stops. Turn off the headphones and return them to the pegs on the wall.
5. Click on the map under the movie to enlarge it.
6. Click on the words, "Key to Whale Species" in the lower right corner of the screen.
7. When you click on a month in the lower left side of the screen, pictures of whales appear on the map in the locations In North America where they are seen during that month. Use the "Key to Whale Species" to identify the whales. Complete the following table by clicking on the appropriate months and checking off the types of whales sighted in North America during each month.

Month	Gray	Right	Bowhead	Beluga	Blue	Humpback	Minke	Fin	Pilot	Sperm	Killer
January	X										
March	X				X	X		X	X		
May	X	X	X	X		X	X	X			X
June		X	X	X	X	X	X	X			X
September		X		X	X	X	X	X			X

Answer the following questions.

Question 5 – What 2 months would you go whale watching to see sperm whales? (Hint: Look at the months not in the chart above.) <u>July and August</u>

Question 6 – Where would you go to see sperm whales? <u>off the southwest coast of North America</u>

When finished, click on the map to return to the main screen.

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