MAST ACADEMY OUTREACH

ELEMENTARY SCHOOL PROGRAM

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

On-Site Packet

MAST Academy

Maritime and Science Technology High School

Miami-Dade County Public Schools

Miami, Florida

MAST ACADEMY OUTREACH

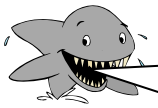
LAND SHARC ELEMENTARY SCHOOL

ON-SITE PACKAGE

TABLE OF CONTENTS

Wet Lab Docks

Computer Docks

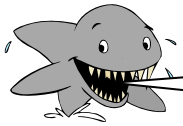


The "shark" symbol appears beside all directions, which are always enclosed within a callout. **READ ALL DIRECTIONS CAREFULLY.**

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

WET LAB DOCK
"UNDER PRESSURE" 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.

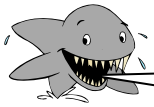


To observe the effect of depth on water pressure, follow the directions on the table and answer the questions.

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.** _____

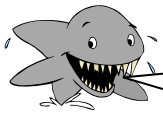
3. **If a fish that was not adapted to deep water were to swim down to a deep part of the ocean, they would die. What would the water pressure do to them that would kill them?** _____



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?** _____



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.	
The Gulper Eel is a distant relative of the river eel. It has tiny eyes and teeth and a large umbrella shaped mouth.	
The Hatchetfish has light, luminescent skin on the bottom and darker skin on top. It has large, bulging eyes and an upward-slanting mouth.	
The Viperfish has a long body and extremely large teeth, especially the front two on the bottom of its mouth.	
The Anglerfish lures prey with a long, slender lure between its eyes.	
Loose jaws lives in the murky depths of all oceans. There are three rows of green, luminescent (glowing) spots running along its body.	

5. What out of the ordinary body parts do you see on the fish that would help them to adapt to deep water? _____

(When finished, turn to page 2, the "Buoyancy: Sink or Swim" Dock.)

WET LAB DOCK

"BUOYANCY: SINK OR SWIM" **OCEAN ENGINEER**

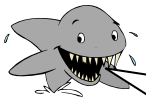
Introduction

An object will float as long as it weighs less than the water it pushes out of its way, or displaces. When an object floats, it is said to have positive buoyancy. An object can be made of materials that are heavier than water, but there must be air or space inside the object for it to float. The amount of air or space inside the object is also called volume. When the air inside an object is replaced by weight, the object will sink and is said to have negative buoyancy.

You will now do an experiment to find out how the amount of air or space (volume) in an object affects its buoyancy. On the table are four boats. Each boat weighs 10 grams. The experiment will involve finding out how much weight each boat will hold before it sinks. First, make two educated guesses or hypotheses about what you think will happen.

HYPOTHESIS 1: **The (circle one) white green red** or **blue boat will hold the greatest amount of weight before sinking.**

HYPOTHESIS 2: The (circle one) white green red or **blue boat will hold the least amount of weight before sinking.**



2. Carefully place the white boat in the container of water so that no water gets into the boat.
3. Carefully place washers (weights) one at a time in the center of the boat until it sinks.
4. In the data table below, record the number of washers it takes to make the boat sink.
5. Take the white boat and washers out of the water and place them back on the poster.
6. Repeat steps 1- 4 for the green, red, and blue boats.
7. Use information from the Introduction to answer the questions below.

DATA TABLE

Boats	Number of washers for boat to sink
White boat	
Green boat	
Red boat	
Blue boat	

1. The boats had negative buoyancy when they (circle one) **floated** or **sank.**
2. Which boat held the greatest number of washers before sinking? **white green red blue**
3. Why did this boat hold the greatest number of washers? _____
4. Which boat held the fewest number of washers before sinking? **white green red blue**
5. Why did this boat hold the least number of washers? _____
6. The inside of the boats are not really empty. They have air inside of them. Which boat has the greatest amount of air inside of it? (circle one) **white green red blue**

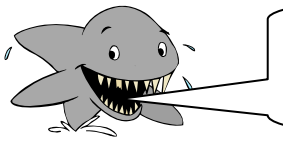
7. As the amount of air or space (volume) inside a floating object increases, the amount of weight the floating object can hold (circle one) **increases** or **decreases?**
8. Was your first hypothesis (circle one) **supported** or **not supported?** Why was your hypothesis supported or not supported? _____
9. Was your second hypothesis (circle one) **supported** or **not supported?** Why was your hypothesis supported or not supported? _____

10. If all the boats weigh the same, why do they hold different amounts of washers? _____
11. Cruise ships can float because they have large ballasts. What do you think is inside the ballasts? _____

(When finished, turn to page 3, the "Who's Who in the Ocean" Dock.)

WET LAB DOCK

"WHO'S WHO IN THE OCEAN" **MARINE BIOLOGIST**



Choose any of the marine organisms (living things) and complete a marine data card for each. Questions are on the posters under the name of each marine organism.

MARINE DATA CARD	**MARINE DATA CARD**
Name of Organism_____ Draw the organism here. Write your answer to the question here. (Question is on the poster under the organism name.)	Name of Organism_____ Draw the organism here. Write your answer to the question here. (Question is on the poster under the organism name.)
MARINE DATA CARD	**MARINE DATA CARD**
Name of Organism_____ Draw the organism here. Write your answer to the question here. (Question is on the poster under the organism name.)	Name of Organism_____ Draw the organism here. Write your answer to the question here. (Question is on the poster under the organism name.)

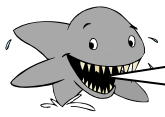
1. Marine biologists like to study interesting things about marine organisms. Pretend you are a marine biologist. Choose one of the organisms above. What would you like to find out about this organism? _____

_____

Put organisms back above their names when finished.

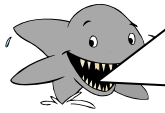
(When finished, turn to page 4, the "Sharks and their Relatives" Dock.)

Shark teeth can be triangular in shape with serrated (rough) edges or pointed in shape with smooth edges. The function of the tooth is determined by its shape.



Look through one of the plastic magnifiers on the table by holding it away from you and looking through the top until the teeth are in focus. Draw each one in the table below.

Triangular serrated tooth	**Pointed smooth tooth**



Using the shark jaw on the table, count the teeth in the first row of the upper jaw from left to right. Do the same for the lower jaw. Write these numbers in the first row of the table below.

Put your finger on one tooth in the front row of the upper jaw. How many teeth are lined up behind that front tooth? Do the same for the lower jaw and write these numbers in the second row.

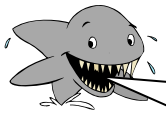
Multiply the number of teeth from left to right by the number of teeth from front to back to calculate an estimate of the total.

	Upper jaw answers are approximations	**Lower jaw answers are approximations**
Number of teeth from left to right		
Number of teeth from front to back	**X**	**X**
Total number of teeth in each jaw		

1. **To calculate an estimate of the total number of teeth on both jaws, what math computation do you have to do?** _____

2. **What is the estimated total number of teeth on the jaw?** _____

The skate and the stingray are related to sharks because they have skeletons made of cartilage but their body shapes are different from a shark's body shape.



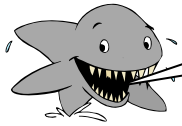
Marine biologists study how organisms are related to each other. Look at the models of a stingray and skate and answer the questions to find out how they are related to each other and to sharks.

3. **Name two ways the ray and the skate are similar.** _____

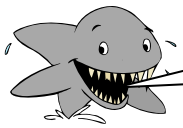
4. **In what two ways are the ray and the skate different from sharks.** _____

(When finished, turn to page 5, the "Sands of Time" Dock.)

Not all sand is created equal! Sand from South Florida has shell pieces and sand grains in it while sand from other places may have only sand grains in it.



1. Look at the sand in Dish A under the stereoscope and draw what you see in the space below.

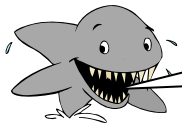


2. Look at the sand in Dish B under the stereoscope and draw what you see in the space below.

3. Which sand do you think is from South Florida? _____

4. Give a reason for your answer to question 3. _____

Calcium carbonate (chemical formula $CaCO_3$) is found in living things such as clams and snails. Hydrochloric acid (chemical formula HCl) is used as a test for $CaCO_3$. If hydrochloric acid is added to a substance with calcium carbonate in it, bubbles of carbon dioxide (chemical formula CO_2) will form. You are going to test two sand samples to see if calcium carbonate is present. One is from South Florida with many shell pieces in it. The other sample is quartz sand with no shell pieces in it.



Follow the directions on the table for the hydrochloric acid test and answer the questions. **PUT ON GOGGLES FOR SAFETY!**

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

6. Which sand has $CaCO_3$ in it? _____

7. Where does the $CaCO_3$ in South Florida come from? _____

_____

(When finished, turn to page 6, the "Every Picture Tells a Story" Dock.)

WET LAB DOCK
COMMUNICATIONS SPECIALIST
"EVERY PICTURE TELLS A 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_____

_____

_____

_____

_____

_____

SECOND PHOTOGRAPH

This is a photograph of _____

_____

_____

_____

_____

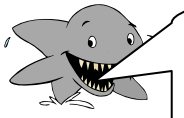
_____

(When finished, turn to page 7, the "Coral Reefs: Living Communities" Dock.)

COMPUTER DOCK
MARINE BIOLOGIST

"CORAL REEFS: LIVING COMMUNITIES"

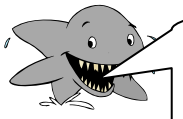
Before you is the command deck of your coral reef exploring submarine.



1. Turn on and put on headphones before you begin.
2. Click on the 5th lab icon from the left in the middle of the screen, called "Adaptations." 
3. Click on the seahorse in the aquarium on the left to see the video "Camouflage," then answer the following question.

Question 1 – Marine organisms use camouflage in order to (Circle the correct answer.)

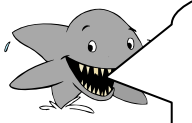
a. become energy efficient
b. avoid becoming dinner
c. produce more offspring
d. all of the above answers



4. In the lower right corner of the screen, click on the black arrow to go to "Becoming Invisible: Find the Creature."
5. Starting with the photo at the upper left, click on each photo.
6. Follow the directions on the screen and complete the matching questions for each photo.

Question 2 – Match each sea creature in the first column with its way of camouflaging by placing the appropriate number next to its name.

_____A. scorpion fish	**1. Looks like a sea whip**
_____B. lionfish	**2. Looks like a piece of debris**
_____C. trumpetfish	**3. Attaches other creatures to its shell**
_____D. seahorse	**4. Looks like a sunlight striped reef**
_____E. octopus	**5. Burrows in the sand**
_____F. decorator crab	**6. Looks like algae-covered coral**
_____G. crab	**7. Changes skin texture, color and shape**



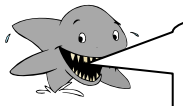
7. In the lower left corner of the screen, click on the icon called "Adaptations." 
8. In the lower left corner of the screen, click on the submarine icon. 
9. Click on the 3rd icon from the left called "Living Communities." 
10. Click on the top right aquarium called "Underwater Wonderland."
11. **Do not watch the video.** At the bottom right side, click on the black arrow.
12. Move the mouse around the picture to see names of each marine creature shown.
13. Find 3 marine creatures you learned about in question 2. Write their names below.

Question 3

Creature 1 _____

Creature 2 _____

Creature 3 _____

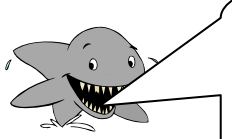


14. Click on the icon at the bottom left of the screen, called "Living Communities." 
15. At the lower left of the screen, click on the sub icon. 
16. Turn off the headphones. Return them to the pegs on the wall.

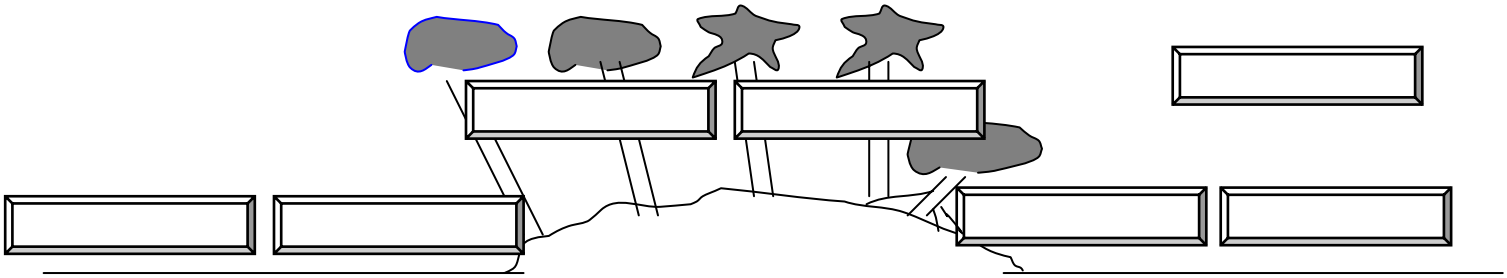
(When finished, turn to page 8, the "The Everglades Story" Dock.)

COMPUTER DOCK
"THE EVERGLADES STORY" **MARINE BIOLOGIST**

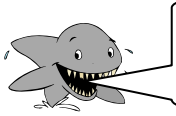
In this lesson you will learn about Everglades habitats and food chains. First, you will play two environmental games.



1. On the left side of the screen, click on the top icon that looks like this. ()
2. Follow the directions on the screen.
3. **Do not watch the video until you have tried to complete the game.**
4. Remember to click on Report Card to check your answers.
5. If you cannot get the correct answers, click on the video icon () to watch the video.
6. Try the game again. When your answers are correct, write the names of the creatures in the boxes below.

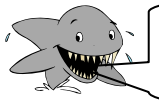


Freshwater Marsh **Hardwood Hammock/Pinelands** **Florida Bay**



7. Click on the middle icon that looks like this:  Follow the directions on the screen.
8. When the food chain is correct, write the names of the creatures in the spaces below.

The alligator _____ **which** _____ **which** _____ **which** _____ **which** _____
eats the **eats the** **eats the** **eats the** **eats the**



9. If you have already watched the video, then answer the questions below.
10. If you have not watched the video yet, click on the video icon (). Answer the questions.

1. Interdependence, the major idea of this video, means that
   a) the life of one organism depends on all the other organisms b) all life is related
   c) food webs connect all organisms d) all of these answers

2. The pig frog and periphyton are related because they both live in the
   a) hardwood hammock b) pinelands c) freshwater marsh d) Florida Bay

3. Without periphyton, there would be no fish available to be eaten by the
   a) egret b) mosquito larva c) deer d) tree snail

4. The deer and the tree snail are related because they both live in the
   a) hardwood hammock b) air c) freshwater marsh d) Florida Bay

5. The mosquito fish is food for largemouth bass and the Florida gar. These fish are food for
   a) raccoons b) otters c) alligators d) a, b and c

Click on the "Happy Face" at the bottom of the screen to return to the beginning of the lesson.

(When finished, turn to page 9, the "Sink the Reef" Dock.)

WET LAB DOCK

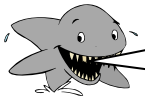
"SINK THE REEF" **MARINE BIOLOGIST**

Artificial or man-made reefs are made by placing materials on the ocean bottom. In this lesson you will experiment with different artificial reef designs using concrete blocks. Their rough surface encourages the growth of corals, algae and barnacles which are food for many kinds of fish. Your objective is to see which design is the most effective for attracting fish.

1. Click on the word "Height" and choose 1 meter.
2. Click on the word "holes" and choose none.
3. Click on "spacing" and choose 5 meters.
4. Click on "done" to determine the fish catch for this reef design.
5. Record the height and the fish catch in the table below.
6. Click on the word "height" and choose 2 meters.
7. Click on "done" to find out how this changed the fish catch. Record the height and the fish catch below.
8. Change the height and choose 3 meters.
9. Click on "done" and record the height and the fish catch below.

Height	Holes	Spacing	Depth	Fish Catch
	None	5 Meters	12 Meters	
	None	5 Meters	12 Meters	
	None	5 Meters	12 Meters	

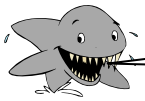
1. How did increasing the height affect the fish catch?_____



10. Click on "holes" and choose small.
11. Click on "done" and record the catch.
12. Do the same for "large" holes and for "combination."

Height	Holes	Spacing	Depth	Fish Catch
3 Meter		5 Meters	12 Meters	
3 Meter		5 Meters	12 Meters	
3 Meter		5 Meters	12 Meters	

2. How did adding small holes affect the fish catch?_____
3. How did increasing the size of the holes affect the fish catch?_____
4. How did adding a combination of holes affect the fish catch?_____



13. Click on "spacing" and find the catch for 5, 10, and 20 meters.
14. Record the catch.

Height	Holes	Spacing	Depth	Fish Catch
3 Meter	Combination		12 Meters	
3 Meter	Combination		12 Meters	
3 Meter	Combination		12 Meters	

5. How did increasing the spacing affect the fish catch?_____

6. Now that you know how changing height, holes and spacing affects fish catch, how would you design an artificial reef so that it attracts the most fish?

_____

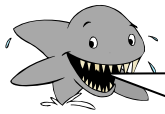
_____

_____

When finished, turn to page 10, the "Ask the Experts about Whales" Dock.

COMPUTER DOCK
MARINE MAMMAL SCIENTIST

"ASK THE EXPERTS ABOUT WHALES"

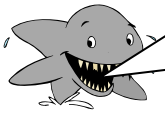


1. Turn on and put on headphones before you begin.
2. Click on "Whales in Motion."
3. Click on the top right photo of a whale to see the video "The Songs of Humpbacks" and answer the following questions.

Question 1–Why do humpbacks sing? (Circle your answer.)
a. to attract females b. to attract food c. to challenge rival males d. both a & c

Question 2–Humpbacks in the Pacific Ocean sing the same song as humpbacks in the Atlantic.
True False

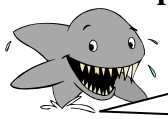
Question 3- The song of the humpback is similar to
a. a poem b. a rock and roll song c. a rap song d. a story



4. Click on Main Menu.
5. Click on "Ask the Experts."
6. Click on the question, "Why do humpback whales sing?"
7. Listen to all four experts and use a line to connect each expert with the opinion that best matches their response to the question.

Dr. Roger Payne	**to communicate**
Dr. James Mead	**males sing to attract females and deter other males**
Dr. Aleta Hohn	**to drive males away and to attract females**
Dr. Chris Clark	**to drive males away and to advertise their presence**

Question 4-From listening to the video and the experts, what seems to be the main reason why humpbacks sing?_____

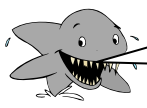


8. Click on the question, "What do you feel is the most important issue about whales and their environment?" Listen to all four experts. Use a line to connect each expert with the opinion that best matches their response to the question.

Dr. Roger Payne	**fishing nets and destruction of habitat**
Dr. James Mead	**noise, pollutants, overfishing, overharvesting**
Dr. Aleta Hohn	**mainly pollution**
Dr. Chris Clark	**human beings damaging the environment**

Question 5- What can you do to help save whales? _____

_____



9. Turn off the headphones. Return them to the pegs on the wall. Click on the arrow at the bottom right of the screen to return to the main screen.

(When finished, turn to page 1, the "Under Pressure" Dock.)

The School Board of Miami-Dade County, Florida, adheres to a policy of nondiscrimination in employment and educational programs/activities and strives affirmatively to provide equal opportunity for all as required by:

Title VI of the Civil Rights Act of 1964 - prohibits discrimination on the basis of race, color, religion, or national origin.

Title VII of the Civil Rights Act of 1964, as amended - prohibits discrimination in employment on the basis of race, color, religion, gender, or national origin.

Title IX of the Education Amendments of 1972 - prohibits discrimination on the basis of gender.

Age Discrimination in Employment Act of 1967 (ADEA), as amended - prohibits discrimination on the basis of age with respect to individuals who are at least 40.

The Equal Pay Act of 1963, as amended - prohibits sex discrimination in payment of wages to women and men performing substantially equal work in the same establishment.

Section 504 of the Rehabilitation Act of 1973 - prohibits discrimination against the disabled.

Americans with Disabilities Act of 1990 (ADA) - prohibits discrimination against individuals with disabilities in employment, public service, public accommodations, and telecommunications.

The Family and Medical Leave Act of 1993 (FMLA) - requires covered employers to provide up to 12 weeks of unpaid, job-protected leave to "eligible" employees for certain family and medical reasons.

The Pregnancy Discrimination Act of 1978 - prohibits discrimination in employment on the basis of pregnancy, childbirth, or related medical conditions.

Florida Educational Equity Act (FEEA) - prohibits discrimination on the basis of race, gender, national origin, marital status, or handicap against a student or employee.

Florida Civil Rights Act of 1992 - secures for all individuals within the state freedom from discrimination because of race, color, religion, sex, national origin, age, handicap, or marital status.

School Board Rules 6Gx13- 4A-1.01, 6Gx13- 4A-1.32, and 6Gx13- 5D-1.10 - prohibit harassment and/or discrimination against a student or employee on the basis of gender, race, color, religion, ethnic or national origin, political beliefs, marital status, age, sexual orientation, social and family background, linguistic preference, pregnancy, or disability.

Veterans are provided re-employment rights in accordance with P.L. 93-508 (Federal Law) and Section 295.07 (Florida Statutes), which stipulate categorical preferences for employment.

REVISED 8/1/01