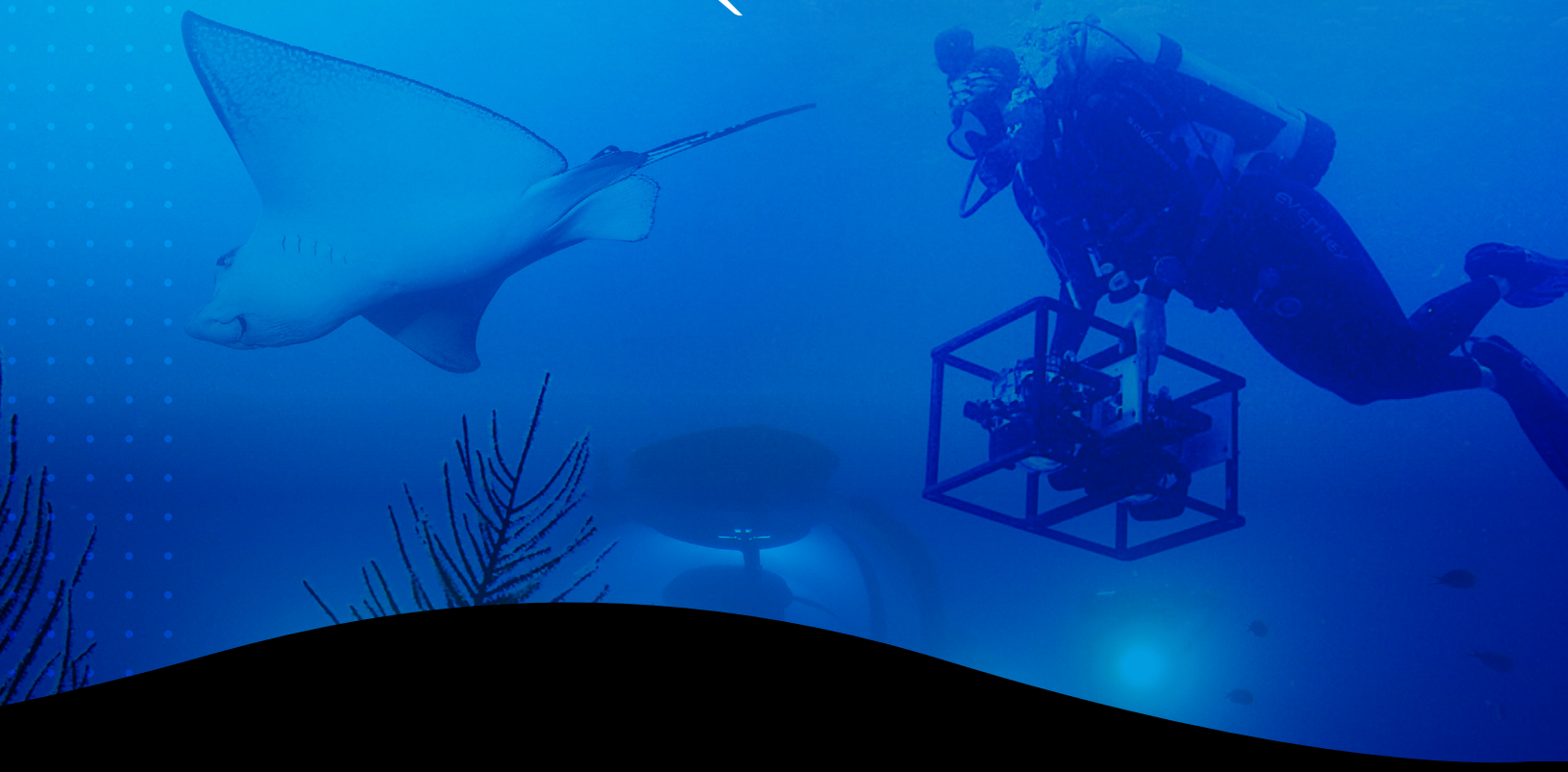
OCEANX

FLYING FISH

OCEANXPERIENCE



INSTRUCTIONAL SEQUENCE

OCEAN RESCUE 3-5 (PRE-VISIT)

Science

GRADE LEVEL: 3-5

ARIZONA SCIENCE CENTER

Never stop wondering.
Never stop imagining.™

Presented for Australian audience by:

WAM WESTERN AUSTRALIAN MUSEUM

PURPOSE

Elicit students' knowledge about ocean acidification and protecting coral reefs.

OBJECTIVE

Students will "deep dive" into our oceans to understand pollution factors that are impacting our environment.

Students will create and present ways to help decrease pollution in the oceans.

YEAR 3

SCIENCE

Science Inquiry Skills - Questioning and predicting:
WA3SSIQ1 - Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed.

Science Inquiry Skills - Planning and conducting:
WA3SSIPL1 - Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks.

WA3SSIPL2 - Make and record observations, including formal measurements using familiar scaled instruments.

Science Inquiry Skills – Evaluating:
WA3SSIE1 - Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation.

Science Inquiry Skills – Communicating:
WA3SSICM1 - Communicate ideas using scientific vocabulary.

Science Inquiry Skills – Collaborating and applying:
WA3SSICL1 - Use science knowledge to propose explanations for observed phenomena and solutions to problems.

YEAR 4

SCIENCE

Science Inquiry Skills - Questioning and predicting:
WA4SSIQ1 - Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed.

Science Inquiry Skills - Planning and conducting:
WA4SSIPL1 - Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks.

WA4SSIPL2 - Make and record observations, including formal measurements using familiar scaled instruments.

Science Inquiry Skills – Evaluating:
WA4SSIE1 - Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation.

Science Inquiry Skills – Communicating:
WA4SSICM1 - Communicate ideas using scientific vocabulary.

Science Inquiry Skills – Collaborating and applying:
WA4SSICL1 - Use science knowledge to propose explanations for observed phenomena and solutions to problems.

YEAR 5

SCIENCE

Science Inquiry Skills - Questioning and predicting:
WA5SSIQ1 - Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions.

Science Inquiry Skills - Planning and conducting:
WA5SSIPL1 - Use equipment to observe, measure and record data.

Science Inquiry Skills – Evaluating:
WA5SSIE1 - Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation.

Science Inquiry Skills – Communicating:
WA5SSICM1 - Communicate ideas in a variety of ways, including scientific reports with appropriate language features.

Science Inquiry Skills – Collaborating and applying:
WA5SSICL1 - Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research.

YEAR 6

SCIENCE

Science Understanding – Chemical sciences:
WA6SSUC1 - Materials can undergo reversible changes and irreversible changes.

Science Inquiry Skills - Questioning and predicting:
WA6SSIQ1 - Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions.

Science Inquiry Skills - Planning and conducting:
WA6SSIPL1 - Plan and conduct fair, safe and repeatable investigations.

WA6SSIPL2 - Use equipment to observe, measure and record data.

Science Inquiry Skills – Evaluating:
WA6SSIE1 - Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation.

Science Inquiry Skills – Collaborating and applying:
WA6SSICL1 - Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research.

VOCABULARY

OCEAN ACIDIFICATION
A change in the ocean water that can be harmful to plants and animals

WATER QUALITY
Condition of the water

NEUTRALIZE
Ineffective or harmless

PH
Measure of acidity in water/solution

ECOSYSTEM
A community or group of living organisms that live in and interact with each other in a specific environment

IMPACT
To have a strong effect on

OCEANOGRAPHER
Studies the ocean

MATERIALS

PH DEMONSTRATION

7 CLEAR PLASTIC CUPS OR BEAKERS
PITCHER
WATER
ALKA SELTZER TABLETS
BLEACH
LEMON JUICE
BAKING SODA
BORAX
VINEGAR
UNIVERSAL INDICATOR (OR CABBAGE JUICE, OR BLUEBERRY JUICE)
POPSICLE STICKS OR STIRRING RODS
*EXTENSION
- WELL TRAYS
- PAINT BRUSHES
- CARDSTOCK
- BLOW DRYER
- CUPS, ENOUGH FOR STUDENTS TO WORK IN PAIRS
- STRAWS (WRAPPED, OR FRESH OUT OF THE BOX)

CORAL OBSERVATIONS

IMAGE CARDS (SEASHELLS AND CORAL REEFS)
10 CLEAR PLASTIC CUPS
VINEGAR
SEASHELLS (NONTREATED)
CHALK (ALTERNATIVE TO SEASHELLS)
*EXTENSION:
- CARDSTOCK
- SPONGES, CUT INTO SMALLER PIECES
- PAINT

INSTRUCTOR NOTES/PROGRAM REQUIREMENTS

NEED ACCESS TO SINK OR WATER
NEED AN INSTRUCTOR TABLE

ONLINE RESOURCES

VIDEOS:

SAVING AMERICA'S GREAT BARRIER REEF

OTHER VIDEOS:

DARK SIDE OF THE REEF: DIVING TO THE MESOPHOTIC ZONE

RISING OCEAN TEMPERATURES ARE "COOKING" CORAL REEFS

GREAT BARRIER REEF EXPLORING OCEANS

CORAL REELS 101

HOW OCEANX SCIENTISTS ARE FIGHTING FLORIDA CORAL REEF LOSS | NOWTHIS

WILL THESE CORALS HELP US SAVE THE WORLD'S REEFS?

THE SPECTACULAR UNDERWATER WORLD OF CORAL REEFS

NETFLIX DOCUMENTARY:

NETFLIX: OUR PLANET (COASTAL SEAS)

CODE.ORG:

THE OPEN AQUATIC WORLD AWAITS YOU. BUILD A CORAL REEF!
HTTPS://STUDIO.CODE.ORG/S/AQUATIC/LESSONS/1/LEVELS/12

OCEAN ACIDIFICATION:

HTTPS://WWW.NOAA.GOV/EDUCATION/RESOURCE-COLLECTIONS/OCEAN-COASTS/OCEAN-ACIDIFICATION

LITERARY CONNECTIONS

Thank You, Earth: A Love Letter to Our Planet: A Springtime Book for Kids by April Pulley Sayre

Sydney & Simon Go Green! by Paul A. Reynolds and art by Peter H. Reynolds

We Are Water Protectors, Carole Lindstrom and illustrated by Michaela Goade

Saving American Beach, Heidi Tyline King and illustrated by Ekua Holmes

Dive in: Swim with Sea Creatures at Their Actual Size by Roxie Munro

Coral by Molly Idle

Alba and the Ocean Cleanup by Lara Hawthorne

The Brilliant Deep: Rebuilding the World's Coral Reefs by Kate Messner & illustrated by Matthew Forsythe

Explore My World: Coral Reefs by Jill Esbaum

ENGAGE

IMAGES

Provide ocean images to students in groups.

Ask students what they already know about the ocean. They can formulate ideas in their small groups and then share out when they are done brainstorming.

EXPLORE #1

You all seem to know a lot about our oceans! They are an important part of our environment that can be affected by our actions; positively or negatively. Dive into our oceans to understand pollution factors that are impacting our environment. We will learn about oceanography as well as create and present ways to help decrease pollution in the oceans.

- Ask students what some dangers to the ocean might be. What makes the ocean dirty? What causes harm to the ocean? Have them formulate ideas in small groups and share out when they are done brainstorming.
- Explain to the students that there are many ways we can harm the ocean like the ones you talked about with your teams and with the class. Today we are going to focus on one big thing: water quality.
- Explain what water quality is and that there are many ways to change the water quality of the ocean. Today, we will be focusing on two ways that water quality can be changed: acidification and pollution.

WATCH:

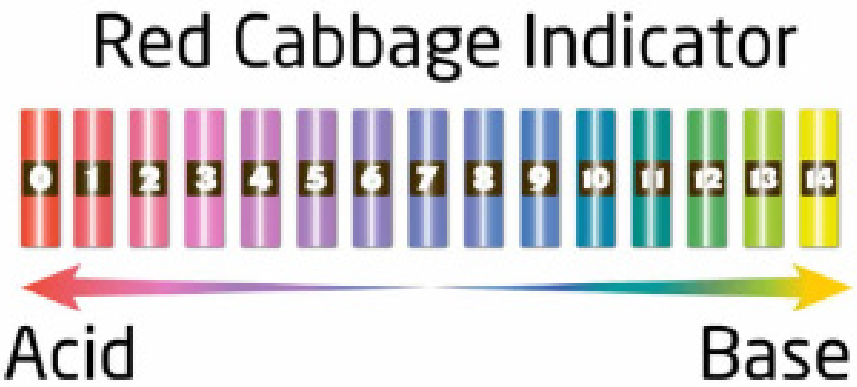
- **Saving America's Great Barrier Reef**
- **How OceanX Scientists Are Fighting Florida Coral Reef Loss | NowThis**

TEACHER SET UP:

Set the seven beakers up on the instructor's table, filling each 1/3 of the way with water. Starting from your left add one of these ingredients to each cup:

- Alka seltzer tablets
- Bleach
- Lemon juice
- Baking soda
- Borax
- Vinegar
- Universal indicator (or cabbage juice, or blueberry juice)

Introduce students to a pH indicator scale.
Discuss that the colors tell us how acidic or not something is.



PH DEMO:

Explain to the students that the ocean water needs to stay at a healthy water quality level for everything to work the way it is supposed to. Sometimes, when we put things in the water, it changes the water quality.

Briefly explain the topic of pH: water should be at pH 7 (neutral) to be considered good quality.

Ask the students to make observations about your seven cups; what do you think is in them? What color is the stuff in them?

EXPLAIN #1

Starting from your right and going to your left, add a little universal indicator (or cabbage juice, or blueberry juice) to each of the cups, one at a time, asking the students what they observe when you add the indicator. What happens? What did it do? Did it change? How?

Ask the students what colors are present; does it look familiar? (At this point, you should have some semblance of a rainbow in the cups)

Anthocyanin is the pigment in the cabbage that acts as a natural indicator. When the pigment comes into contact with the substance, it changes color depending on the pH of the environment.

Ask students to refer back to the video and ask "what organisms were changed due to human impact? (answer: coral)

Discuss why the coral began to die.

EXPLORE #2

CORAL OBSERVATIONS:

Now that we saw that coral was being harmed and we have learned how the pH of water is important, let's observe how pH affects coral through an investigation.

- Give each group some seashells
- Optional: Pictures of seashells and coral reefs
- Give each group a clear plastic cup and a piece of shell (Optional: A piece of chalk, you can use ¼ of a stick per group)
- Fill the cup about ⅓-½ full of vinegar
- Instruct the students to make observations about the vinegar and shell (Optional: chalk)
- Then, have the students predict what would happen if they dropped the "shell or chalk" into the vinegar. When they are done, they can test their predictions by dropping the shell or chalk into the vinegar. It should begin to bubble and fizz.
- Optional: You can have the students draw pictures of what is happening before and after adding the chalk to the vinegar

EXPLAIN #2

Explain to the students that some coral is made of the same thing chalk is, calcium carbonate. Calcium carbonate is a base.

Refer back to the pH demo and explain that vinegar is an acid. When we mix an acid and a base, they neutralize. When this happens, we see the chalk fizz and bubble.

Explain that this same process is happening in the ocean, but at a slower rate. How do you think this affects coral? Can coral survive these acidic environments? What are some things we can do to help coral in the ocean? I wonder what can cause the changes in PH levels in the ocean that could have an effect on the coral. Let's read to find out.

READ: How to Choose & Use Sunscreen (for Parents) - Nemours KidsHealth
READ: Sunscreen, clothing, and other coral reef-safe ways to protect your skin

EXTEND

Have students test/compare different sunscreens and share their thoughts.

MORE EXTENSION RESOURCES:
Minecraft: Voyage Aquatic - Code.org
Minecraft: Voyage Aquatic #12 - Code.org
Why Are Coral Reefs Hotspots of Life in the Ocean? · Frontiers for Young Minds
Coral Reef Livestream: Tropical Reef Camera powered by EXPLORE.org

EVALUATE

OCEAN RESCUE: CONCLUSIONS

Write a summary explaining:
In what ways are humans affecting the pH of oceans and what does this do to organisms living in the ocean?

OCEANXPERIENCE

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