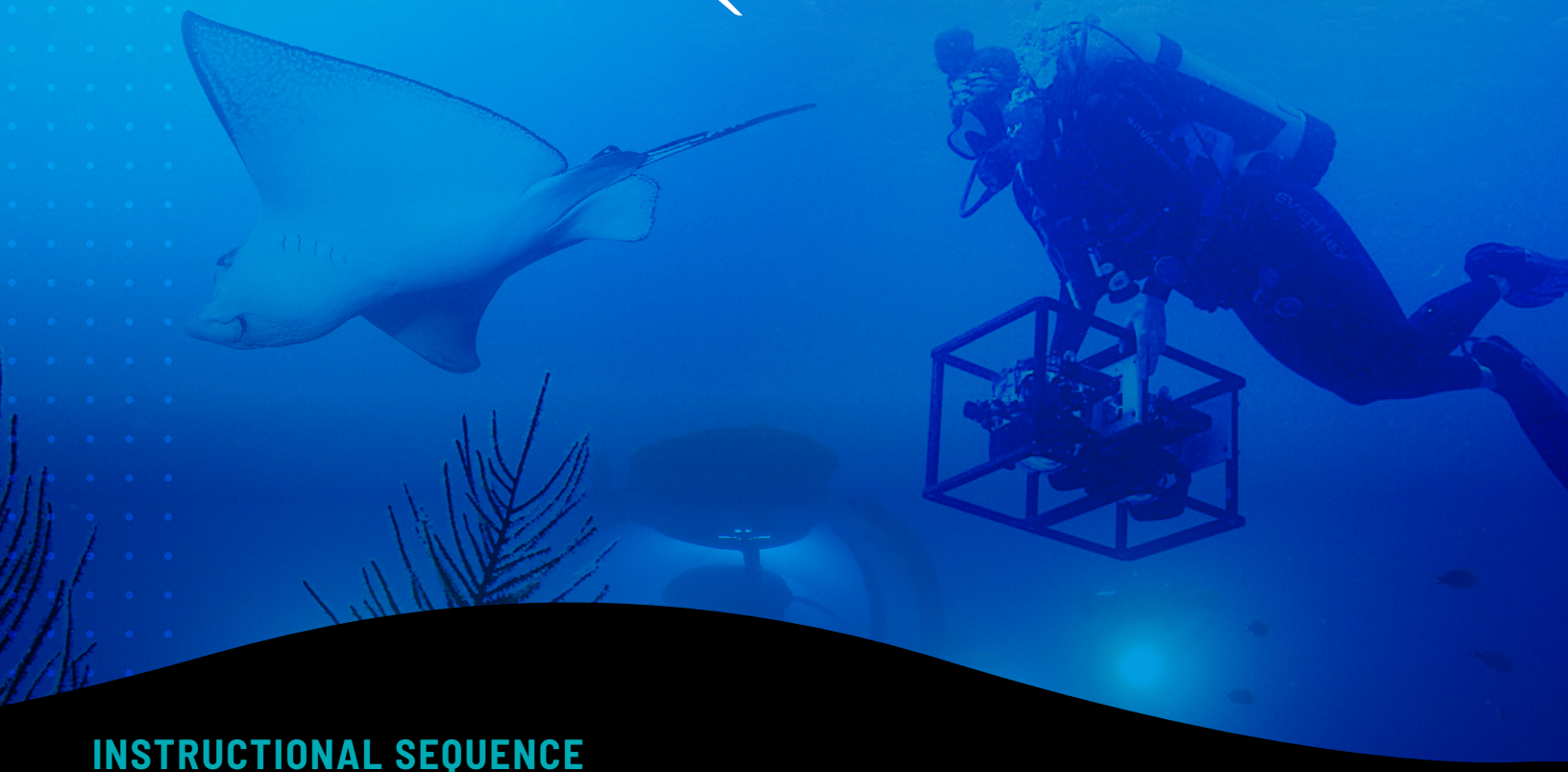
OCEANX

FLYING FISH

OCEANXPERIENCE



INSTRUCTIONAL SEQUENCE

OCEAN CLEAN-UP ENGINEERING CHALLENGE 3-5 (POST)

Science

GRADE LEVEL: 3-5

ARIZONA SCIENCE CENTER

Never stop wondering.
Never stop imagining.™

Presented for Australian audience by:

WESTERN AUSTRALIAN MUSEUM

PURPOSE

Elicit students' ideas about decreasing ocean pollution.

EXHIBITION LEARNING GOAL

Students will be able to understand pollution factors that are impacting our oceans.

Students will be able to 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 3 - CONTINUED

DESIGN AND TECHNOLOGIES

Contexts - Materials & Technologies Specialisations:
WA3TDECMT1 – Properties of materials, suitability and safe practice using given technologies to create a product to achieve a purpose.

Design thinking skills – Investigating and defining:
WA3TDEDTID1 - Define ideas and design opportunities for individual and/or local needs.

Design thinking skills – Designing:
WA3TDEDTD1 - Design solutions through use of labelled drawings, technical terms and/or a sequence of steps.

Design thinking skills – Producing and implementing:
WA3TDEDTPI1 - Use appropriate technologies and components with given equipment and follow agreed protocols to produce a designed solution.

Design thinking skills – Evaluating:
WA3TDEDTE1 - Use given criteria to evaluate diagrams, technologies and the components used for the designed solution.

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 4 - CONTINUED

DESIGN AND TECHNOLOGIES

Contexts - Materials & Technologies Specialisations:
WA4TDECMT1 - Properties of materials and components for a range of purposes affect suitability and function in a system.

Design thinking skills – Investigating and defining:
WA4TDEDTID1 - Define the features of a design brief and the requirements of a design task for a community need.

WA4TDEDTID2 - Investigate and select resources based on properties for the given task.

Design thinking skills – Designing:
WA4TDEDTD1 - Design solutions through use of labelled drawings, technical terms, decision-making and/or a sequence of steps.

Design thinking skills – Producing and implementing:
WA4TDEDTPI1 - Use appropriate technologies, components and/or equipment and follow agreed protocols to produce a designed solution.

Design thinking skills – Evaluating:
WA4TDEDTE1 - Use given criteria to evaluate design features, selected resources, decision-making processes and the designed solution.

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 5 - CONTINUED

DESIGN AND TECHNOLOGIES

Contexts - Materials & Technologies Specialisations:
WA5TDECMT1 - Properties for a range of materials, related components and use of given technologies to achieve a purpose.

Design thinking skills – Investigating and defining:
WA5TDEDTID1 - Break down a design brief to define the purpose and requirements for a given task.

WA5TDEDTID2 - Investigate and select resources based on properties and functions for the given task.

Design thinking skills – Designing:
WA5TDEDTD1 - Design solutions considering competing factors, with annotated diagrams, storyboards and/or a sequence of steps, using technical terms and an iterative process.

Design thinking skills – Producing and implementing:
WA5TDEDTPI1 - Use technologies, components and/or equipment to implement agreed protocols to produce a designed solution.

Design thinking skills – Evaluating:
WA5TDEDTE1 - Use given criteria to evaluate design features, with consideration of competing factors, processes and the designed solution.

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.

YEAR 6 - CONTINUED

DESIGN AND TECHNOLOGIES

Contexts - Materials & Technologies Specialisations:
WA6TDECMT1 - Properties of selected materials, technologies, and production systems affect suitability and functionality in a product.

Design thinking skills – Technologies and society:
WA6TDETS1 - People in design and technologies occupations address competing considerations, including sustainable factors in the design of products, services and environments.

Design thinking skills – Investigating and defining:
WA6TDEDTID1 - Break down a design brief to define the purpose, requirements and constraints for a given task.

WA6TDEDTID2 - Investigate and select resources considering constraints, properties and functions appropriate for the given task.

Design thinking skills – Designing:
WA6TDEDTD1 - Design alternative solutions achieved through an iterative process, including critical thinking, graphical representations, use of a range of technologies, techniques, technical terms and/or a sequence of steps.

Design thinking skills – Producing and implementing:
WA6TDEDTPI1 - Use a range of technologies, components and/or equipment to implement agreed protocols to produce a designed solution.

Design thinking skills – Evaluating:
WA6TDEDTE1 - Develop negotiated criteria to evaluate design features, graphics, selected technologies, processes and functionality with consideration of constraints for the designed solution.

VOCABULARY

OCEAN ACIDIFICATION
A change in the properties of ocean water that can be harmful for plants and animals

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

IMPACT
Have a strong effect or influence on a situation or person

OCEANOGRAPHER
Someone that studies the ocean

POLLUTION
When the environment is contaminated by waste, chemicals, and other harmful substances

LITERARY CONNECTIONS

Thank You, Earth by April Pulley Sayre

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

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

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

Polar Bear, Why Is Your World Melting? by Robert E. Wells

MATERIALS

ALL MATERIALS USED ARE COMPLETELY OPTIONAL AND ARE NOT NECESSARY IN ORDER TO ANSWER QUESTIONS.

CLEAR BIN
WATER
CRAFT STICKS
SPOONS
STRING
PIPE CLEANERS
PAPERCLIPS
RUBBER BANDS
STRAWS
ROCKS
OCEAN ANIMAL FIGURINES

ONLINE RESOURCES

THE MAJESTIC PLASTIC BAG - A MOCKUMENTARY

WILL SEABINS SAVE OUR OCEANS? THE SEABIN PROJECT

THE OCEAN CLEANUP SYSTEM 001 EXPLAINED | | CLEANING OCEANS

ENGAGE

DISCUSSION:

Discuss with the class.

- What is pollution?
- What types of pollution are there?
- Have you ever experienced pollution in your community?
- Have you been anywhere that suffers from pollution?
- What types of things end up in the ocean due to pollution?

WATCH

- The Majestic Plastic Bag - A Mockumentary
- The Most Famous Straw in the World (Save the Turtles)

EXPLORE

DISCOVER:

Have students research and uncover the types of pollution humans create each year that directly effects the oceans.

EXAMPLES

- Number of straws used in a year
- Amount of trash in the sea
- Number of animals that eat plastic trash
- Number of plastic shopping bags used each year
- Number of plastic water bottles used each year
- How much oil is used to create all those water bottles?

Optional: Research can be done independently, in groups or with the whole class.

EXPLAIN

ENGINEERING DESIGN PROCESS

Now that students have discovered that pollution is a problem in the oceans, let's see if students can come up with some solutions.

Tell the students they are now going to be oceanography and sustainability engineers whos focus is on creating a clean-up tool that can remove trash from the sea. They will be working in groups.

The goal of the challenge is to engineer a way to remove trash from the ocean without disturbing the ocean floor (rocks) and the ocean wildlife (ocean animal figurines).

EXPLAIN

ENGINEERING DESIGN PROCESS

Optional: Create budget cards and explain that each material has a price.

Instruct students to discuss with their groups how they want to build their tools. Students should be instructed to make a drawing of their design following the engineering design challenge process.

- Identify the problem
- Imagine ideas for a solution
- Select a solution
- Build your design
- Test your creation
- Improve upon your design
- Share and present your ideas

Send one person from each group to gather materials.

Begin building!

Optional: Have students keep track of their own budget. Have a worksheet they need to bring that works as their checkbook or budget sheet.

EXTEND

READ:

"One Turtle's Last Straw: The Real-Life Rescue that Sparked a Sea Change" by Elsa boxer

Changing Habits:

- Discuss how your class can make changes to reduce its single-use plastic consumption.
- Search for other ocean clean-up ideas.
  - Seabin: https://youtu.be/ySp7HKD7jaw
  - Ocean Clean-up: https://youtu.be/01EAeNdTFHU

(Classroom Challenge) Can the class commit to zero waste?

(School Challenge) Students pick up one piece of trash a day.

(Home Sustainability Challenge) The students can pick a way to help the environment at home... i.e., use less water, recycle, don't use single-use plastic. Optional: At the end of the week, or after the weekend, they can discuss how it went. Was it hard? Easy? Did they feel like it made a difference? Will they keep doing it?

EVALUATE

SHARE & PRESENT IDEAS:

Students will share their designs:

- Respond to audience questions
- What worked well and what did not work well?
- Would you make any changes to your design and why?

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