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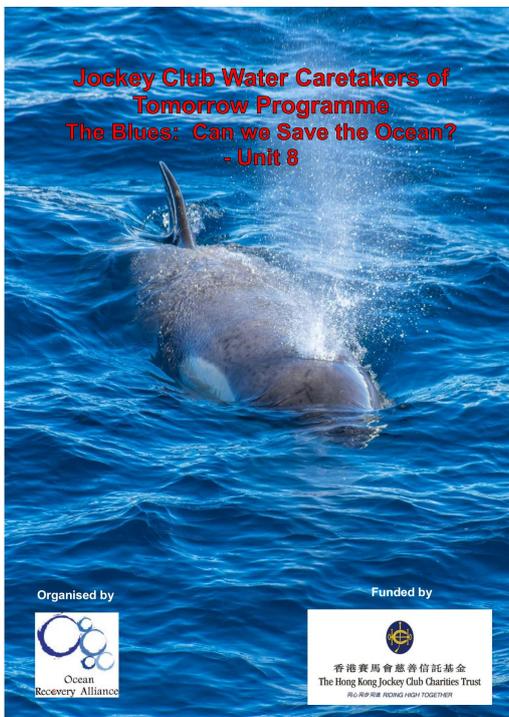
香港賽馬會慈善信託基金
The Hong Kong Jockey Club Charities Trust
同心同步同進 RIDING HIGH TOGETHER

Teacher Notes for Unit 8: The Blues - Can We Save the Ocean?

About the Jockey Club Water Caretakers of Tomorrow Programme:

The Jockey Club Water Caretakers of Tomorrow Programme is a collaboration funded by The Hong Kong Jockey Club Charities Trust and developed by Ocean Recovery Alliance, Ltd. It is an educational curriculum programme designed for students in Form 1-3 early secondary school in Hong Kong. Through a combination of both inquiry-based and project-based learning, students develop understanding and appreciation for our water systems and functions, at both the local and global levels. They learn how to assess threats such as pollution and habitat destruction, while also developing ways to mitigate them. This understanding will empower our youth to take an active role as caretakers of our water resources of the future, and to share their commitment with their families and communities.

Using the Lessons in the Classroom



The Jockey Club Water Caretakers of Tomorrow Programme consists of eight units. The units have been developed to allow for using as many as your time and your curriculum will allow. Each unit can stand alone, although it is strongly recommended that Unit 1: *Miraculous Water*, be implemented first as it lays the groundwork for the other units. Please note that there is repetition in some of the topics covered in each of the units. This is intentional. As it is likely that most teachers will not be able to complete all of the eight units, the curriculum has been designed to contain as many of the important concepts as possible, within each unit. Teachers are encouraged to pick and choose from the range of topics and activities in each unit, such that unnecessary repetition is avoided.

Teacher Notes and Student Notes

Each unit consists of Teacher Notes and Student Notes. The Teacher Notes include information about skills accessed, materials needed, recommended assessments, suggested extensions, cross-curricular links and other information that could help determine how the Unit and the individual lessons might fit into a teacher's curriculum. In addition to this, Teacher Notes will contain links to websites with background material that can deepen the teacher's understanding on the topics covered in the unit.

The Student Notes can be printed out for the students to use throughout the unit. It includes background information, instructions for all the activities, as well as space to record their learning. The students should also have access to the Student Notes online as many of the activities and additional information are linked to websites on the internet.

It is also recommended that students keep their own "learning log" or journal to record their progress in understanding the issues as well as the actions they might take.

Extensions

All the lessons contain "Extensions" which provide additional rigor or challenges for students. These suggestions for enrichment can help to streamline the lessons to the grade level, curricular or differentiation needs of your own students. Some of the extensions utilize case studies or contain more photographic material or recommended websites, all of which might be suited to students with different learning styles.

Safety in the Classroom and in the Field

Teachers will go over their school's rules for safe and responsible behaviour both inside and outside the classroom, before doing all of the activities in the units. The Teacher Notes will, however, identify particular safety concerns to be aware of in specific activities.

Student Action and Social Responsibility

The aim of every unit in this project is to build student understanding of water resource issues. Through that understanding, it is hoped that they will be motivated to work toward positive change individually, locally and globally. It is, however, important that their teachers communicate the importance of their being sensitive to the complexities of cultural norms and political processes.

Objectives of Unit 8: The Blues - Can We Save the Ocean?

At the end of the lessons in this unit, students will be able to:

- Illustrate a basic ocean ecosystem
- Connect ocean habitats with natural and non-natural events on land

- Explain how the oceans are being managed and exploited
- Identify the reasons why clean oceans are necessary
- Extrapolate from current knowledge to potential future issues for the oceans
- Implement simple strategies to reduce our impact on oceans

Student Skills

Lesson	Critical thinking	Supporting Opinions with evidence	Applying scientific principles	Data collection	Graphing and Data Analysis	Reading for Understanding	Using technologies for mapping	Research and/or Presentation
1								
2								
3								
4								
5								

Cross-curricular Links:

Lesson 1: *Biology/Ecology* (organisms in oceans, food webs) *Geography* (fisheries, proposing research)

Lesson 2: *Biology* (biographies of sea animals), *Ecology* (fisheries impacts), *Human Geography* (effects of trawling, tragedy of the Commons)

Lesson 3: *Physical Geography* (ocean circulation, meteorology, oceans as heat sinks), *Physical Science* (heat capacity)

Lesson 4: *Ecology* (herring population, life cycle), *Mathematics* (graph reading), *Human Geography* (impacts of oil spills)

Lesson 5: *Human Geography* (effects of shipping with respect to shipping), *Biology/Ecology* (microplastics in the food chain), *Humanities/Human Geography* (water bottle use, ship breaking), *Chemistry/Biology* (ocean acidification),

Unit Vocabulary - refer to Student Notes

Student Notes includes all the vocabulary and definitions that the students should know in order to understand the topics covered.

Materials and Technology Needed

Activity						
Lesson	1	2	3	4	5	6
1	Access to internet			Permanent markers, different color plastic packaging	Printed sheet of ocean life, Scissors Paste/glue Marker Sheet of paper to stick animals to	
2	Access to internet	Access to internet	Access to internet, M & Ms, Google presentation, straws, paper strips, blue trays, tissues, tally sheets	Access to internet	Access to internet	
3	Access to internet	Access to internet	Access to internet, download materials provided in notes	Access to internet	Access to internet	Access to internet
4	Access to internet		Access to internet			
5	Access to internet		Access to internet	Access to internet	Access to internet	

Unit Introduction:

- 1- Go over the Student Aims and the Vocabulary with the students.
- 2- Students access prior learning by responding to the potential effects of litter on the oceans.
- 3- Listen to a Beatles song and then describe their experiences of the ocean and seaside.

Lesson 1: Ocean Habitats and Ecosystems

Objectives: In this lesson, students will understand:

- The effects that people have on the ocean
- Examples of animals that use the ocean

Activity 1: Big ocean, big impact

Students watch a video about man's impacts on the ocean.

Activity 2: Life on top of the ocean

Students look at a cross-section of ocean surface biota to gain an appreciation of the importance of the ocean for different organisms.

Activity 3: Life underneath

- 1- Students are introduced to an ocean food chain.
- 2- They gain an appreciation for the different adaptations for a life in the ocean.

Activity 4: Filtering and fading light

- 1- Students learn about how light changes as one moves into greater depths in the ocean.
- 2- They follow the prompts to experience the changes in appearance as one moves below the ocean.

Activity 5: Ocean food web

Students learn that food associations are not only linear. They are introduced to a food web and they assemble their own food web with photographs provided. They also answer questions after this, to check for understanding.

Lesson 2: Ocean Productivity

Objectives: In this lesson, students will understand:

- The ocean is a resource
- The Tragedy of the Commons as a model of our current use of the ocean
- The negative implications of some of our uses of the ocean
- How our activities directly affect specific animals that live in the ocean

Activity 1: It's all about nutrients and sustainable fishing

- 1- Students learn that ocean currents are conveyors of nutrients and thereby the foundation of life in the oceans.
- 2- They learn about how sustainable fishing requires different strategies for different species.
- 3- They have the opportunity to gain an appreciation for local seafood by researching the fish found in their local markets.

Activity 2: Trawling - what is it?

- 1- Students learn about what trawling entails.
- 2- They contextualize this information in the example of the Hong Kong trawler fishing ban.
- 3- Students contrast industrial methods with traditional methods
- 4- Students learn about ghost nets

Activity 3: The Tragedy of Commons

Students follow the prompts to learn about the concept that common resources become over-exploited unless we temper our desire for short term gains for the long term good of all.

Activity 4: Researching our oceans

Students follow the prompts for developing their own research project about a research topic of their choice about Pacific Ocean issues.

Activity 5: Biography

Students pick an animal from the list, research it and make a biography about the animal.

Lesson 3:

Objectives: In this lesson students will understand:

- How ocean circulation and atmosphere are connected, and are major drivers for our climate
- That oceans are responsible for major weather events
- The causes of coral bleaching

Activity 1: Weather from satellite and radar

Students look at information from the Hong Kong Observatory and learn about how radar and satellite images provide us with weather information. The Extension requires students to learn about the Beaufort scale of wind speed.

Activity 2: Ocean circulation

Students watch a video about ocean currents and consider how litter might be transported to faraway places due to ocean circulation.

Activity 3: Rubber Ducky Science

1- Download this Discovery Science worksheet which teaches about the paths of ocean currents by following the paths of rubber duckies that fell off a container ship:

[Earth Science: Oceans](#)

Activity 4: El Nino and El Nina

Students do an activity to learn about El Nino and El Nina -- they watch 2 short videos and annotate a diagram.

Activity 5: Are the oceans the biggest heat sink?

Students follow the prompts to learn about how the oceans behave as a heat sink and then compare graphs about ocean temperature and sea levels.

Activity 6: Ocean heat sink - looking for trouble

Students learn about potential consequences of sea level rise and weighing arguments about these consequences. They also learn about the causes of coral bleaching.

Lesson 4: Ocean Resources

Objectives: In this lesson, students will understand:

- Need for sustainable fishing
- Case study of the herring as an example of a fish we have been catching for centuries
- The transportation of fish at sea
- How oil spills are cleaned at sea

Activity 1: Fishing - When do we say, "No thank you"?

Students learn about the Atlantic Herring and answer some questions about fishing in general.

Activity 2: Oceans for Transport

1-Students gain an appreciation for how the ocean is used to transport goods economically.

2- They look at some of the negative consequences of this method and clean-up solutions.

Extension: Students can make a trip to the Maritime Museum to explore a topic of their choice.

Activity 3: Oil drilling - big risks when things go wrong

Students watch a case study video about the Deep Water Horizon oil spill and discuss the issues as a class.

Lesson 5: Ocean Pollution

Objectives: In this lesson, students will understand:

- Pollution at sea begins on land
- How large ships regulate and manage their waste onboard
- The effects of plastics and microplastics in the ocean
- The effects of decommissioning large ships
- The effects of global warming and acidification of oceans' effects on coral reefs

Activity 1: Land-based pollution - was it you?

Students watch some videos about plastic pollution and marine debris. Then they consider what they can do to reduce this type of pollution.

Extension: Research alternatives to plastics or clean-up techniques.

Activity 2: Pollution at sea - no one's looking

Students learn about the importance of managing waste materials on board ships.

Activity 3: Small but deadly: it's double trouble

1- Students learn about the sources and dangers associated with microplastics. They learn about the consequences of microplastics on the food web.

2- They create a news report on the issue and consider the effects of using non-reusable water bottles.

Activity 4: Ship-breaking in Bangladesh - deadliest jobs for people and the sea

Students use online resources to learn about the hazards of ship-breaking

Activity 5: Acidification - destroying the ocean's chemistry

1- Students explore the causes of coral bleaching through ocean acidification.

2- They make a cartoon that explains the major processes involved in the above.

Activity 6: Looking forward

Students are given a choice of different projects that each cover some facet of ocean protection. These include a social media project, a sustainable fish app, writing music or a music list, following a research program, etc.