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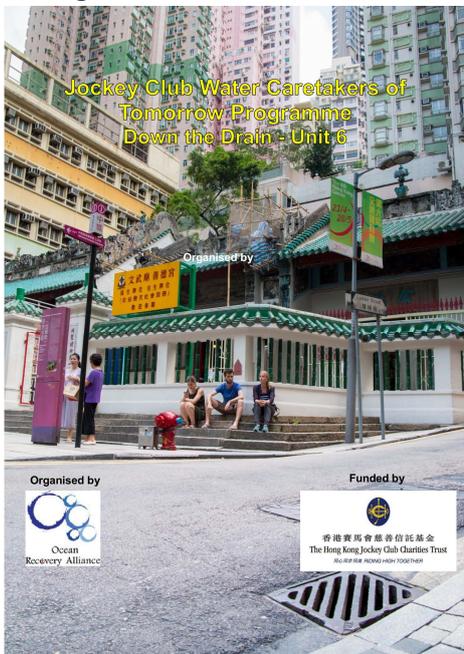
香港賽馬會慈善信託基金
The Hong Kong Jockey Club Charities Trust
同心同步同進 RIDING HIGH TOGETHER

Teacher Notes for Unit 6: Down the Drain

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 6: Down the Drain

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

- Understand how to find and identify the location of sewage and drainage systems in their neighborhood
- Explain the purpose of drainage and sewage systems

- Design a field work activity to gather data that answers questions about stormwater pollution
- Identify issues related to drainage and sewage
- Identify ways to reduce water pollution related to drainage
- Develop a communication project that educates a section of my community about reducing the community's impact on water pollution.

Student skills table:

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								

Cross-curricular Links:

Lesson 1: *Physical Science* permeability(, looking at graphs), *Physical Geography* (maps, climate change), *History* (changes in watersheds), *Language Arts* (reading for understanding and summarizing)

Lesson 2: *Language Arts* (using sensory imagery for descriptions and reading for understanding) *Science* (data collection and analysis), *Mathematics* (calculating percentages, transforming data)

Lesson 3: *History* (sewage contamination through the ages), *Science* (reading graphs, Scientific Method)

Unit Vocabulary - refer to Student Notes

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

Materials and Technology Needed

Activity				
Lesson	1	2	3	4
1			Camera in mobile phone or tablet	Camera in mobile phone or tablet Bucket, water
2		Camera in mobile phone or tablet, Clip board, pencil, recording sheet, calculator	Small plastic bags, large glass jar with lid or small aquarium, garbage from student lunches	
3	Access to internet	Access to internet	4 jars with water toilet paper, tissue paper, baby wipe, cotton bud	Access to internet dependent on type of public information campaign chosen

Unit Introduction:

- 1- Go over the Student Aims and the Vocabulary with the students
- 2- Students look at the diagram and do the reading. The teacher can ask about some of the different types of surfaces near the school.

Lesson 1: All Washed Out

Objectives: In this lesson, students will understand:

- Difference between stormwater and sewage
- How characteristics and features in the watershed affect volume and quality of stormwater
- Impact of different surface permeability on water flow

Activity 1: Where does the rain go?

Students can compare and contrast the surfaces depicted in these photos. Some of the surfaces are much more permeable than others. They read a short description about how cities handle removal of rainwater and wastewater.

Activity 2: Stormwater and sewage system

The round pipe indicates the sewage pipe that collects all the grey- and blackwater in the home. The square pipe indicates the stormwater pipe which connects water from the roof and down the gutters and the storm drains.

Activity 3: Where are the drains?

Students follow the prompts, finding evidence of stormwater draining off the landscape in their neighborhood.

Activity 4: What happens to water when it hits the ground?

Follow the instructions in Student Notes for this activity. It is advisable that prior to this activity, the teacher scouts out areas on or near the school property that offer some diversity in surface permeability and slope.

Extension:

Students increase their understanding of the importance of having permeable surfaces, by identifying areas of different permeability and suggesting ways to increase permeability in urban areas.

Activity 5: Where do the stormwater and sewage end up?

Students make a list of sources of wastewater in their homes and their community. Identify which pipeline in the map, their wastewater connects to.

Activity 6: Potential impact of climate change

Students are asked to consider the effects of climate change on stormwater and sewage systems. The extension deals with examples of past floods caused by heavy rain, etc.

Lesson 2: It Stinks!

Objectives: In this lesson, students will understand:

- The effects of stormwater flow in an urban environment
- The sources of stormwater pollution
- How to quantify and classify different types of litter and pollution
- Differences between the effects of organic and inorganic waste

Activity 1: It stinks

- 1- This brief reading and writing activity gives the students a chance to use Language Arts skills and to access misconceptions they might have about rain “cleaning” the environment.
- 2- Students read about the different sources of water pollution. They might provide personal examples of what they have seen that falls into these categories.

Activity 2: Litter and pollution survey

- 1- Students follow the instructions in Student Notes.
- 2- For the data analysis, it might be necessary to review how to calculate percentages of pieces of litter. This cross-curricular link with Maths might be worth raising with the students’ math teacher prior to the lesson.

Activity 3: How water pollution works

- 1- Make sure that every student puts a few small small items of their waste from student lunch into a bag given to them, **prior to the class**.
- 2- Follow the prompts. Students should be able to see a difference in the effects on water, from the inorganic versus organic waste.

Lesson 3: The Dark Mystery

Objectives: In this lesson, students will understand:

- The connection between waterborne diseases and improper handling of sewage
- The historical connection between life expectancy and level of sewage treatment
- Effects of sewage on wildlife

The lesson begins by accessing students’ prior knowledge about what the purposes of sewage treatment are.

Activity 1: Staying alive

Apart from the short graph reading exercise, most of this activity involves the students using the internet to research the effects of sewage contamination. The Student Notes contains suggested websites for this purpose.

Activity 2: How to treat sewage

Students follow the prompts to learn more about sewage. Access to the internet is needed. If books are available from the library, these can also be used.

Activity 3: Only the right kind of crap

Students follow the instructions for this experiment. It requires that you leave the materials undisturbed for a day and then resume the experiment on the following day.

Note that the point must be made at the conclusion of the experiment that solid, non-degradable materials that go into the system cause the sewage treatment system to malfunction. The students should try to figure out which steps in the treatment would be compromised by this. The same is true for the hazardous chemicals or overload of non-solid substances that might enter the system. They should be able to understand that it disrupts the biological action of digestion, etc. which are involved in breaking down the sewage.

For teacher to share:

The cleanliness fanaticism in HK leads many people to use Chlorine based bleaches and other harsh chemicals for cleaning the household that end up in our drains and require a huge amount of energy to filter every year .

A shift towards softer biodegradable soaps, detergents, disinfectants in the community would lessen the need for energy intensive water treatment before greywater is discharged back into the sea

<https://www.youtube.com/watch?v=jG1VNSCsP5Q> (first 2 minutes)

https://www.youtube.com/watch?v=Fw_qGOkJO5A

Activity 4: Looking forward

Students develop a public information campaign to address contamination of waterways via drainage systems in Hong Kong. They pick which message and medium they will use for this project.