

Healthy Water, Healthy Rio

An Educators Guide on Water, Health, Sanitation
and Disease Prevention

Rio de Janeiro



EDUCATORS GUIDE DEVELOPMENT PROCESS

Using a process developed over the course of 28 years in educational publishing, the Project WET Foundation conducts writing workshops globally to produce hands-on, interactive educational activities customized to meet local needs. The result is award-winning and highly effective educational materials used by teachers and children around the world.

In the development of *Healthy Water, Healthy Rio: An Educators Guide on Water, Health, Sanitation and Disease Prevention*, the Project WET Foundation convened local educators, experts, NGOs, community leaders and government officials in Rio de Janeiro to work together to determine areas of educational need and to generate ideas about how to engage children on those local topics. The cooperative efforts of these individuals, organizations and agencies helped to localize original Project WET activities for this educators guide that is customized for use in Rio de Janeiro.

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Why Project WET?

Learning to Succeed in the 21st Century

Global water problems continue to escalate and affect quality of life for billions of people—many of them children. Young people suffering from waterborne diseases—or walking miles daily to get clean water—lose precious days of education and childhood. Although there is no single solution to the worldwide water crisis, education must be an element of any sustainable solution. The Project WET Foundation develops hands-on water-education resources and trains teachers to use them, empowering students to understand the relationship between their health and water. Project WET materials and training workshops help educators, students and their families understand sustainable water resources management.

Project WET is currently active in more than 60 countries on five continents. Its materials have been translated into Arabic, Chinese, French, Japanese, Kiswahili, Portuguese, Spanish, and a number of other languages. Students, teachers and community members from diverse cultures and with different teaching styles can successfully use Project WET materials. Photographs taken around the world at Project WET events demonstrate that participants all have one thing in common, in addition to better knowledge about water—a smile.

Project WET materials motivate children and adults to learn by helping them find pleasure and joy in the process, which experts maintain is essential for effective learning. So what are the qualities that Project WET resources have to appeal to children's natural curiosity and support lifelong learning? Project WET's water education materials are:

- **Interactive.** Learners participating in Project WET activities are not passive observers. Engaging students through questioning and other inquiry-based strategies, educators become facilitators, involving students in hands-on lessons and encouraging them to take responsibility for their own learning. Students design investigations to seek answers to real-world problems, play games to explore scientific concepts, reflect, debate and share what they've learned by creating songs, stories, dramas and formal presentations.
- **Multi-sensory.** Activities engage as many of the learner's senses as possible. Research has shown that stimulation of multiple senses enhances learning.

- **Adaptable and active.** Although adaptable for any environment, many Project WET activities are ideal for outdoor settings and encourage children to be physically active.
- **Contemporary (21st-century skills).** In most activities, students work in small, collaborative groups; the activities engage students in higher-level thinking skills, requiring them to analyze, interpret, apply learned information (including problem-solving, decision-making and planning), evaluate and present. Project WET incorporates technology education into its activities and offers cross-cultural materials to prepare learners for participation in a global economy, in which an understanding of water resources will be critical.
- **Relevant.** Information is not delivered in isolation; educators are encouraged to localize activities to give them relevance.
- **Solutions-oriented.** Project WET believes in linking awareness and education to action and solutions. In this context, Project WET and local education and water partners seek to incorporate educational materials and training with on-the-ground action and solutions.
- **Measurable.** Project WET activities provide simple assessment tools to measure student learning.



Photo © 2014 by the Project WET Foundation.

How to use this Guide

All the activities in this guide are self-contained. Although the activities in this guide represent a unit, it is not necessary to teach them in order. Each activity has two levels—one appropriate for all learning levels and one for level Ensino Fundamental and higher.

Grade Level:

Suggests appropriate learning levels.

Subject Areas:

Project WET activities are designed to satisfy the goals of your educational program by complementing existing curricula. This section suggests subject areas in which you could teach this activity.

Duration:

The approximate time needed to complete each part of the activity.

Setting:

Suggested sites for conducting the activity.

Skills:

There are six skill levels in ascending order: gathering, organizing, analyzing and interpreting information; applying, evaluating and presenting learned information. Listed skills are applied in the activity.

Vocabulary:

Words defined in the activity that you may need to highlight for students.

Summary

A brief description of the activity concepts and students skills.

Objectives

The qualities or skills students should possess after participating in the activity.

Materials

Supplies needed to conduct the activity.

Making Connections

Describes the relevance of the activity to students.

Background

Information needed to understand activity concepts.

Procedure

Introduction

Prepares everyone for the main activity with step-by-step instructions and gives the educator an idea of students' current knowledge about the topic. This simple activity is appropriate for all levels and works well as a main activity for young children.

Activity

Provides step-by-step directions for conducting the activity. All, or some, of the parts may be used, depending upon instructional objectives.

Conclusion

Brings closure to the lesson and includes questions and activities to assess student learning.

Assessment

Presents diverse assessment strategies that relate to the objectives of the activity, noting the part of the activity during which each assessment occurs.

Extensions

Provides additional activities for continued investigation into concepts addressed in the activity. Extensions can be used for further assessment.

References

References from the Internet as well as books and other printed materials that enhance the Background section.

* A note about age and skill level for this guide: The activities in this guide will benefit learners of all ages and skill levels.

Watersheds and Pollution

What if your city water basin was a bunch of waterslides into the Guanabara Bay? How would water move down these slides?

Grade Level:

Introduction: Ensino Infantil and higher
Activity: Ensino Fundamental I and higher

Subject Areas:

Earth Science, Environmental Science, Ecology

Duration:

Preparation: 5 minutes
Introduction: 20 minutes
Activity: 45 minutes
Conclusion: 10 minutes

Setting:

Classroom or large setting

Skills:

Analyzing information (comparing and contrasting); Interpreting (relating, summarizing); Applying (designing); Presenting (demonstrating)

Vocabulary:

water flow, water runoff, watershed, precipitation, rain water

Summary

Students investigate how the movement of water through a city and individual trash management decisions affect the health of water resources.

Objectives

Students will:

- demonstrate the movement of water through a Rio de Janeiro watershed.
- compare and contrast the amount of water flowing through a river and its watershed based on weather (precipitation).
- understand how water moves trash and debris through the watershed.

Materials

Activity

- Containers with beads, pea gravel, beans, marbles or similar objects (one for each hill or street, separated by color)
- Large bucket or other large container to collect beads or other objects
- Optional: signs on sticks with pictures representing sun, light rain and heavy rain
- Optional: four chairs

Making Connections

Children may observe how water flows downhill and how it often transports litter or sediment. Understanding water's movement across and through a city promotes student

understanding of the relationship between water quality, landscape and proper trash management.

Background

Often referred to as drainages, basins or catchments, watersheds are the gathering ground of a river system. A watershed is an area of land that drains water toward a common river. Within its boundaries, a watershed includes all of the land, air, soil, surface and ground water, plants and animals, mountains and deserts, cities and farms and people, culture, stories and traditions.

Beginning at the highest elevations of a watershed, water runoff from rain collects into small headwater streams. As these streams flow downhill, they gather more water and eventually run into the main stem of a river that flows to the sea.

In cities such as Rio de Janeiro, rain water may collect in gutters and flow downhill through streets. As the water moves downhill, it collects more water from other streets and gutters. The water may empty into a river or may flow all the way to the ocean or bay. In the dry season, less water flows into the rivers and through the streets. However, during the rainy season and heavy rain storms, rain water may carry large amounts of water through the city's watershed and into the ocean and Guanabara Bay.

A **watershed**, also called a basin, drainage or catchment, is an area of land drained by a river and its tributaries to a common outlet, which may be a closed basin, a larger stream, a lake, a wetland, an estuary or the ocean.

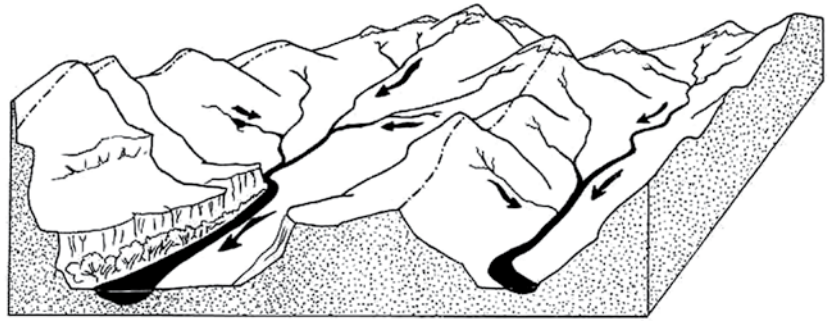


Diagram of a watershed.

Procedure

Introduction

This activity is suitable for all ages, including Ensino Infantil, Ensino Fundamental and adults.

1. **To begin, organize children into a circle or semi-circle around you.**
Explain to students that they will make a thunderstorm as a group.
2. **Tell students that when you make eye contact with or point to a student, he or she should imitate your motion. The student should continue making the motion until you make eye contact again and show a new motion. Start with a student and begin the first motion.**
3. **Continue the motion as you make eye contact with each student down**



the line. Return to the first student and start the second motion. This will create a crescendo as the sounds produced by these motions move from one end to the other. Using this strategy, lead students through the following series of motions:

- a. rub your hands together
- b. snap your fingers in an irregular cadence
- c. clap your hands together in an irregular cadence
- d. slap your hands on your legs (**Optional:** students may start to beat drums to symbolize thunder.)
- e. stomp your feet (or beat more drums)
- f. slap your hands on your legs and stomp your feet (represents height of the storm)

- g. stomp your feet (beginning to reduce the rainstorm)
 - h. slap your hands on your legs
 - i. clap your hands together in an irregular cadence
 - j. snap your fingers in an irregular cadence
 - k. rub your hands together
 - l. open palms (quiet)
4. **When all students are standing with open palms, have them remain silent for a minute to think about the exercise and to catch their breath. Discuss each motion and the effect it mimics. How much rainfall is there during each of these stages?**

Activity

This activity is suitable for use at levels Ensino Fundamental to adults.

1. **Assemble students in a branching formation to simulate various streets in a neighborhood. (See Teacher Resource Page— Streets of Grande Tijuca on page 8.)** Students at the top of the hill should stand on a chair (or arrange students on a slope) to simulate

the hills in the city. There should be four students at the top of different hills to represent different springs or streets. Give the springs or streets names if you want. (**Optional:** students can represent streams and a river that flows into the ocean or bay instead of streets in the city.)

- 2. Starting at the top of the hill, assemble four lines of students leading down slope to represent each of the four streets.** These students should touch fingertips and “run” toward

each other, but not connect as a whole yet.

- 3. Have the remaining students line up, fingertip to fingertip, connecting the streets to a main street that winds downhill.** It may be easier to draw the streets in chalk or tape and have students line up along those marks. Tell the students that they represent the flow of water downhill. Have everyone touch fingertips.
- 4. At the top of each hill, place a bucket of colored beads to represent rain**

drops. At the bottom of the main stem, place an empty large bucket or other container to receive the beads. This empty bucket represents the Guanabara Bay.

- 5. To help students understand what will happen during this activity, instruct students at the top of the streets to pick up just one bead and hand it to the person below them.** Have students continue to pass the one bead “downhill” until it travels down to the main stem and is deposited in the bucket, representing the Guanabara Bay, at the bottom. **PLEASE INSTRUCT STUDENTS TO ONLY PICK UP ONE BEAD AT A TIME. GRABBING A FISTFUL OF BEADS WILL STOP THE SIMULATION AND CORRUPT THE DATA.**
- 6. Explain to students that they will now simulate the flow of water through an area of the city during a rain storm. Tell students you will announce various scenarios and they will pass beads accordingly: light rain (pass one bead at a time), heavy rain (pass several beads at a time), sun (stop passing beads).**
- 7. Begin the scenarios below.** Allow each scenario to last 30 seconds to one minute. (**Optional:** Make large signs with symbols for sun, light rain and heavy rain. Attach these signs to sticks and hold these signs up to indicate each



Photo © 2014 by Suzam Christiaans.

When water moves downhill, it carries trash and debris with it that can pollute water sources.

scenario. This is especially helpful for large groups.)

- a. light rain (pass one bead at a time)
- b. sun (stop passing beads)
- c. light rain (pass one bead at a time)
- d. heavy rain (pass three beads at a time)
- e. sun (stop passing beads)

8. All students must stop passing beads. Students may hold onto the beads in their hands and use in the next simulation.

9. Have students look at the bucket representing the Guanabara Bay. What do they notice? They should answer that the water from all the different streets ends up there.

10. Now ask students to imagine what would happen if there were trash in the streets.

Where do they think the trash will go? (The bay!)

11. Add items representing trash such as paper, wrappers, crayons, or plastic tops into ONLY TWO of the starting buckets.

12. Repeat step 7 but tell students they should also pass the trash items in addition to the beads.

13. Have students look at the bucket representing the Guanabara Bay again. What do they notice? Is there trash in the bay? (Yes.) Ask students if all the streets had trash on them. (They should say no.) Even though only two of the streets had trash on them, trash from any part of the community or cities

can end up polluting the water.

Conclusion

Have students inventory their school grounds or community, looking for land areas that compare to those demonstrated in the activity. During a rainfall, students can observe the water runoff and the amount of trash carried by water.

Assessment

Have students:

- reflect on the amount of water entering the watershed during a rain storm.
- assess how water moves trash into water sources.
- understand how to prevent trash from moving into water sources.

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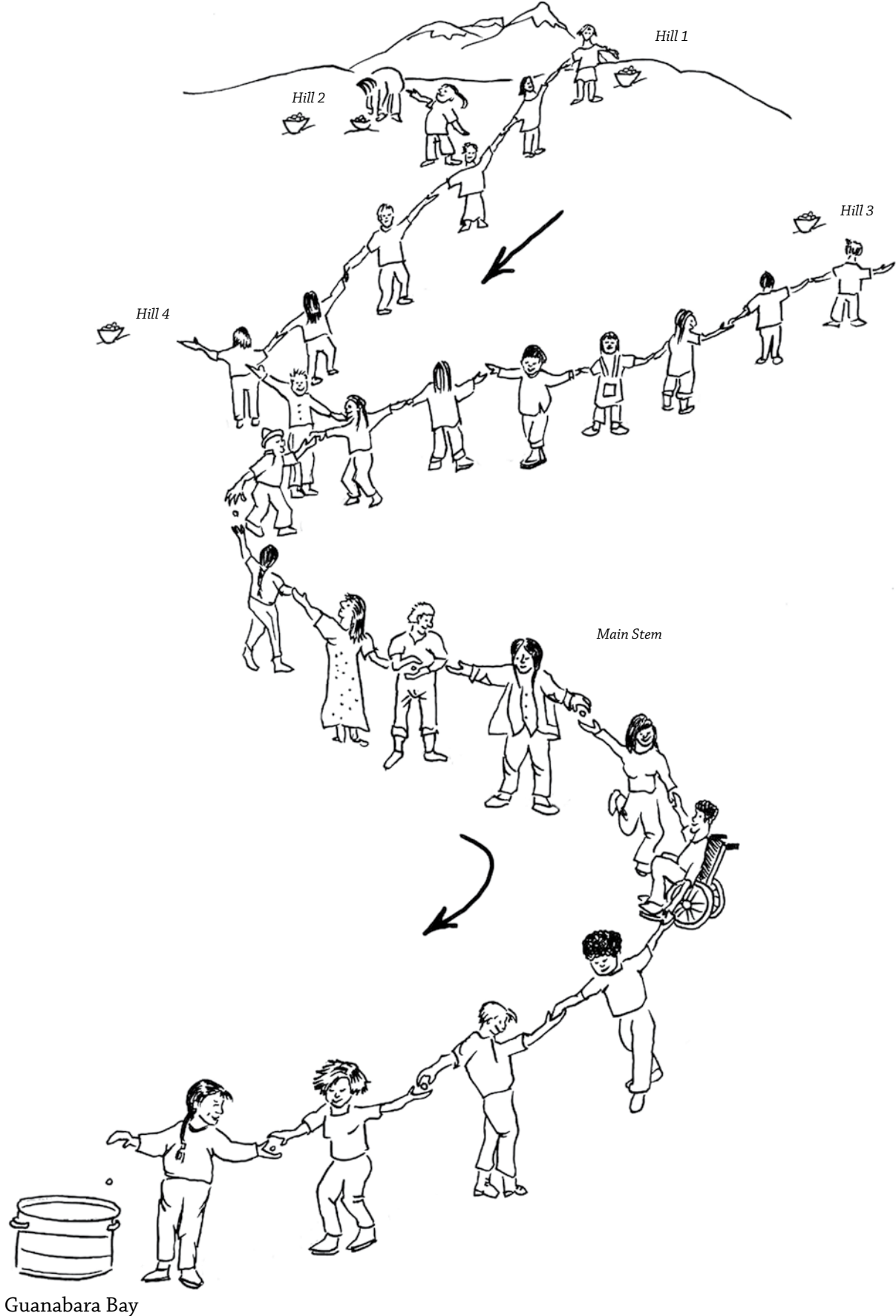
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Trash from a nearby community pollutes the Guanabara Bay.

Streets of Grande Tijuca—Resource Page



Conserving Water

Imagine you have just bought a bag of nuts and have six friends who want some. How are you going to divide it up?

Grade Level:

Introduction: Ensino Infantil and higher
Activity: Ensino Fundamental I and higher.

Subject Areas:

Earth Science, Environmental Science, Ecology, Mathematics

Duration:

Preparation: 2 minutes
Introduction: 20 minutes
Activity: 45 minutes
Conclusion: 10 minutes

Setting:

Classroom

Skills:

Organizing information; Analyzing (formulating questions); Applying (problem solving)

Vocabulary:

conserve, water supply, potable water, water use

Summary

By rationing a limited water supply, students learn how their water use affects others in their community.

Objectives

Students will:

- assess which daily activities require water.
- ration a limited water supply with their peers.
- create and perform a song to teach others about the importance of conserving water.

Materials

Introduction

- Paper or plastic cups (1 per student plus extras)
- Water jug

Activity

- Musical instruments
- Optional: CD player and popular music songs

Making Connections

Everyone uses water every day for drinking, cleaning and cooking. However, the amount of fresh water available is limited. By reflecting on their own water use and rationing water consumption, students can create a culture of water conservation that benefits the entire community.

Background

Water is a limited resource, even though the earth is 71 percent water. The reason for this is that the majority of water is

contained in oceans or frozen in glaciers and ice caps and is not available for human consumption. The amount of accessible fresh water available for use is actually less than one percent of all of the water on earth (only 0.003 percent is fresh surface water). Fortunately, this fresh water is recharged regularly through the water cycle.

There are seven billion people on the planet and each person needs water daily for drinking, cooking and cleaning. In order to ensure there is enough water for everyone's basic needs, people need to learn to use water wisely by turning off faucets between uses, using water-saving appliances and not taking more water than is necessary for the task at hand.

Within a community, water may be even more limited. Water recharge (the amount of water flowing back into a system) can be dependent on rain, city water supply and the size of water tanks. People must learn to use water in a manner that allows all members of a community to have enough water for basic daily needs.

Procedure

Introduction

This activity is suitable for all ages including Ensino Infantil, Ensino Fundamental and adults.

- 1. Have students sit in a circle, and give each student a cup.** Tell students they may not drink until everyone has water.

Conservation Actions:

- Turn off the faucet after use.
- Turn of the faucet while brushing your teeth—only turn it on while rinsing.
- Fix any leaks in water tanks or faucets.
- Use rain water instead of tap water for cleaning.
- Install low-flush toilets in new bathrooms
- Use a receptacle or fill the sink to wash dishes instead of letting the water run.
- Take short showers.



2. **Ask students to reflect on how they use water.** Students should name daily actions that require clean water.
3. **Tell students the water in the pitcher represents the available water in the community. Have the first student pour out as much water as he or she needs from a water**

jug and pass the jug to the next student in line.

The first student may be decided by closest birthday or at random. (For young students, the teacher may need to pour the water into cups and ask students to say when to stop.)

4. **Because of the limited amount of water in the jug, there might not be**

enough to go around. Ask students (those who received water and those who did not) how they feel. Tell them that sometimes there is not enough water available to meet everyone's needs.

5. **Ask students what they could do to make sure everyone gets water.** Have them think of what they would do differently the next time.
6. **Pour the water back into the jug. Have them repeat the activity and put their ideas into action.**

Continuation of Introduction for Ensino Fundamental

This activity is suitable for use at levels Ensino Fundamental to adults.

7. **Divide students into groups of six people per group. Tell students to keep their cups.**
8. **Assign each person in the group one of the following roles:**
 - a. brushing teeth
 - b. washing hands
 - c. washing dishes
 - d. showering
 - e. flushing the toilet
 - f. drinking water
9. **Give each group a jug of water. Each student should take as much water as they want for the activity they have been assigned.** Was there enough water for everyone in the group?
10. **Ask students how they can conserve water during their activities to ensure there is enough water for all of their activities**



Photo © 2014 by Bruno Maia.

Everyone can conserve water by turning off faucets after use.

and for everyone in the community. Make a list of actions to conserve water for each activity on the board.

Activity

This activity is suitable for use at levels Ensino Fundamental to adults.

- Using the list of conservation actions from the Introduction, have students write a song about conserving water.**
- Tell students they must include the actions in the list.** Students may write songs in groups or as a class. (**Optional:** students may use a popular song and change the lyrics to talk about conservation of water.)
- Perform this song at the next school or community event.**

Conclusion

- Have students summarize the importance of sharing water and other resources.
- Ask student to list the ways they can conserve water.

Assessment

Have students:

- List the ways they use water in their daily lives.

- Ration a limited water supply so that everyone has water.
- Create a song about water conservation.

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Fixing leaky faucets and toilets helps to conserve water.

Photo © 2014 by KConstantine - Shutterstock Photo.

Trash and Recycling

The good news is that you've inherited valuable beachfront property. The bad news is that the beach is polluted! Where did all this stuff come from?

Grade Level:

Introduction: Ensino Infantil and higher
Activity: Ensino Fundamental I and higher

Subject Areas:

Earth Science, Environmental Science, Ecology, Physical Fitness

Duration:

Preparation: 15 minutes
Introduction: 30 minutes
Activity: 45 minutes
Conclusion: 10 minutes

Setting:

Classroom or large setting

Skills:

Analyzing information (comparing and contrasting); Interpreting (relating, summarizing); Applying (designing)

Vocabulary:

nonpoint source
pollution, watershed

Summary

Students demonstrate how everyone contributes to the pollution of a river as it flows through a watershed and they recognize that, through individual and group action, the amount of pollution can be reduced.

Objectives

Students will:

- separate recyclable materials versus waste.
- recognize that everyone contributes to and is responsible for their water quality.
- identify ways to reduce pollution and waste.

Materials

Introduction

- *trash and recycling items—enough for one item per person*
- *bins or boxes to separate trash and recycling (at least four, equal to two per team)*

Activity

- *large pieces of paper such as flip chart paper (minimum six)—write numbers on back corners and draw coastline as shown in the diagram on page 14.*
- *trash and recycling items*

Making Connections

Most students have attended a large gathering such as a concert or sporting event and

may have been amazed at the amount of garbage left behind. Each person in attendance probably did not leave much on the ground, but with hundreds of people (or more!) doing the same, the total amount was large. Taking a closer look at how students can positively or negatively contribute to water quality helps them appreciate their role in water quality management.

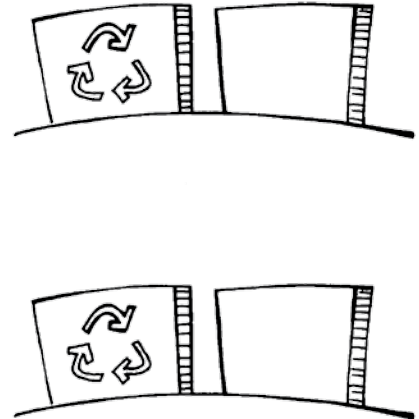
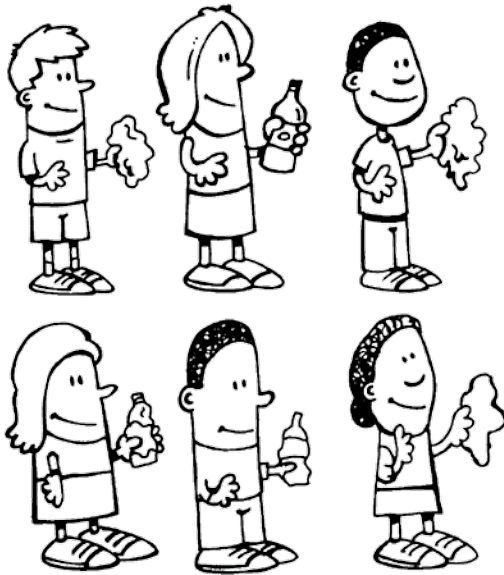
Background

The quality of water in a river or lake is, to a large extent, a reflection of land uses and natural factors found in its watershed. If soil near a river or lake naturally erodes, chances are the river has sediment and turbidity problems. If the land has a lot of plants, erosion is kept in check. When humans settle and develop land, water quality can be affected. Cutting forests, building cities, mining and other ways that we use the land can have an impact on water quality.

A watershed is an area of land drained by a river and its tributaries to a common outlet, which may be a closed basin, a larger stream, a lake, a wetland, an estuary, a bay or the ocean. If trash and pollutants are plentiful, these pollutants will flow into the water outlet and contaminate it. Ensuring trash is properly disposed of in closed trash bins can help keep water sources clean.

Everyone bears responsibility for the health of a watershed and the water systems (rivers,

Recycling Relays



lakes, wetlands, etc.) within a drainage basin. Individual actions, both negative and positive, add up. Understanding a river, lake or bay's water quality involves understanding the contributing watershed. If the watershed is polluted, sections of the river and the bay will likely be polluted.

Procedure Introduction

This activity is suitable for all ages, including Ensino Infantil, Ensino Fundamental and adults.

Preparation: Assemble a pile of trash with recyclable and non-recyclable materials. This can include candy wrappers, plastic bottles, paper, newspaper, pencils, toys, cans, cardboard, etc. Place containers for recycling and trash

DID YOU KNOW?

More than 80% of the pollution in the oceans begins on land!

What is Recycling?

Processing materials in order to put them back in reuse.



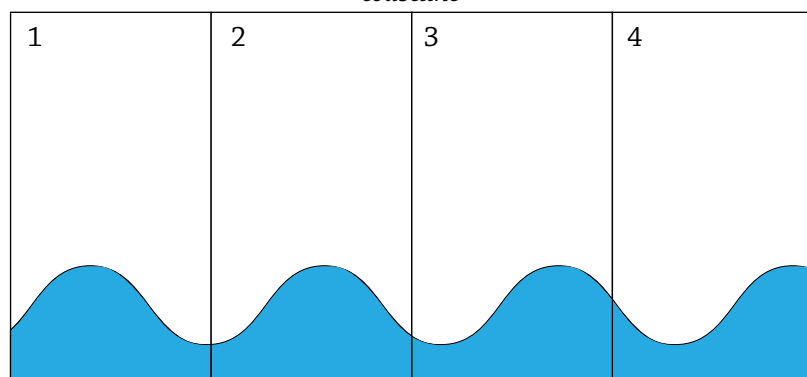
(one each for each group) at one end of the room or play area.

- 1. Divide the class into two (or more) groups and tell the groups they will participate in a relay race.**
- 2. Ask students what the definition of recycling is.** (Processing materials to put them back into reuse and to avoid the extraction of new materials from nature. For young children, recycling can be defined as reusing materials in order to protect the environment.)
- 3. Ask students to identify which materials can be recycled and which cannot by forming separate piles.** Make sure students understand that plastic bottles, newspaper,

cardboard and aluminum can be recycled, while wrappers, toys and other miscellaneous waste usually cannot. Tell students that not all items in front of them are trash—some are valuable materials that can be reused or recycled.

- 4. Line up groups at the beginning of the playing field as shown above in the diagram *Recycling Relays*.** Explain the rules of the relay race:
 - a. Each person will grab one item from the pile and run it to the other side of the playing field.
 - b. The person must deposit the item in the correct bin—recycling or trash—

coastline



Example of how papers fit together.

- before running back to their team.
- c. Runners then tag the next person, who will repeat this process.
 - d. Only one runner at a time can run for a team. All participants must run once. (If the groups are uneven, designate one person from the smaller group to run twice.)
5. **Ask each team to measure how much “trash” they have in their pile.** Students can measure by volume or pieces of trash. Record the initial amount of waste from each team.
 6. **Have students run the relay.** If a student misses the bins or deposits the item incorrectly, make sure they properly place the item in the correct bin before running back to their group.
 7. **Ask students to measure trash in their trash bins after the relay race. Students should only count trash in the trash bin and not the recycling bin.** Do they have less trash than at the beginning? (Yes!)
 8. **Which team had less trash at the end of the activity? Can the students**

think of more ways to reduce waste? (Buy recycled materials, reuse old materials, buy fruits and vegetables that are not in packaging, use their own bag while shopping to reduce plastic bags.)

9. **Have children wash their hands after the activity.**

Activity

This activity is suitable for use at levels Ensino Fundamental to adults.

Preparation: Assemble a pile of trash with recyclable and non-recyclable materials. This can include candy wrappers, plastic bottles, paper, newspaper, pencils, toys, cans, cardboard, etc. Write numbers on the backs of the large papers and draw the coastline at the bottom of all sheets. (See example above.)

1. **Inform students that they have just inherited a piece of beachfront property and a million reais. Have them think of ways they could use the land and the money.**
2. **Divide the class into groups. Pass out large pieces of paper—one for each group—that represent their property and drawing pens and**

pencils. Explain that the blue is water and the blank space is land they own. Each group has one million reais to develop their land as they wish. They can farm or ranch; build resorts, homes, factories or parks; log, mine or plant forests— whatever they like.

3. **When students have completed their drawings, ask them to look on the back of their property for a number. Explain that each piece is actually a part of a puzzle. Have students assemble their pieces starting with number one.** They will construct the beach line pathway and adjacent land area in proper order.
4. **Have students describe how they developed their land. They should identify any of their actions that polluted or added trash to the waterway. Have students choose items from the pile of trash to represent each of their contributions to the pollution of the watershed.**
5. **Tell students to take their item(s) and line up in the same order as their pieces of beachfront property. They are going to pass their pollution pieces down the current of the water. Have them announce what kind of pollutant they are holding before they pass it on.** The ones will pass their item(s) to the twos; the twos will pass everything to the threes and so on, until the last students are holding all the items. Be sure everyone looks closely at the pile of trash. You may want to measure the trash volume in a bag.

6. Have each group take their trash items back and divide the recyclable materials from the non-recyclable materials.

You may need to have a discussion on what types of materials are recyclable (e.g., cans and plastic bottles).

7. Repeat the process of passing trash downstream except that this time only pass non-recyclable materials down the beach. Put the recyclable items aside.

Examine the volume of trash again. It should be smaller. How can recycling materials help reduce the amount of trash in water ways?

8. Ask students why recycling is important.

List answers on the board or on flip chart paper. Be sure to cover all of the following points:

- Recycling reduces trash in the environment.
- Recycling decreases the amount of resources harvested from nature.
- Recycling creates jobs.
- Recycling protects both humans and wildlife by reducing trash in water sources.

Conclusion

Have students inventory their school grounds or community. How does the school contribute



Photo © 2014 by the Project WET Foundation

Many schools have recycling containers. Start a recycling program at your school today.

to the pollution of the water shed? How does their community contribute to the pollution of the watershed? Make a list of what students can do to help promote a healthier environment in the community.

Assessment

Have students:

- identify recyclable versus non-recyclable items.
- describe how land uses can create trash and affect water sources.
- analyze how recycling can decrease the amount of trash in water sources.
- understand how recycling can create jobs and decrease the amount of exploitation of new resources from nature.

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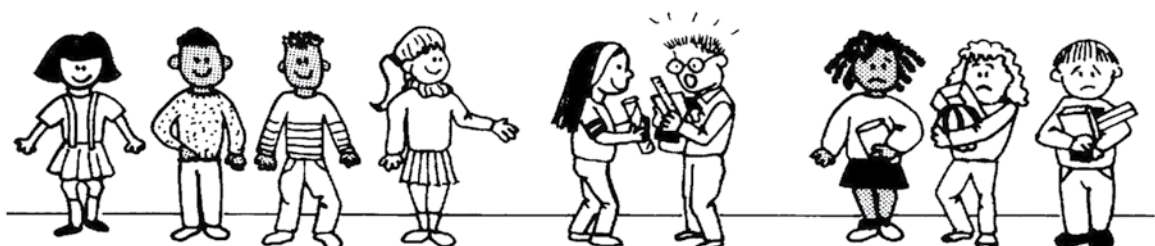
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Upstream

Downstream



Understanding Germs

How can healthy habits make for healthy interactions?

Grade Level:

Introduction: Ensino Infantil and higher
Activity: Ensino Fundamental I and higher

Subject Areas:

Science, Health

Duration:

Preparation: 2 minutes
Introduction: 20 minutes
Activity: 45 minutes
Conclusion: 10 minutes

Setting:

Classroom

Skills:

Gathering information (observing, listening); Analyzing (identifying components and relationships among components, identifying patterns); Applying (planning, designing, problem solving, developing and implementing investigations and action plans); Interpreting (relating, making models, identifying cause and effect); Presenting (demonstrating, describing)

Vocabulary:

nonpoint source exposure, fecal-oral, germs, direct contact, indirect contact, transmission

Summary

Students learn about germs and the prevention of their spread by using healthy habits.

Objectives

Students will:

- develop awareness about the frequency with which they come in contact with everyday objects and other people.
- describe how germs may be spread through touch.
- demonstrate how, through both indirect and direct contact, one person can expose many others to germs.
- identify ways to prevent spreading germs.

Materials

Introduction

- Glitter

Activity

- Markers, crayons or colored pens or pencils
- Disease diagram, copied onto the board

Making Connections

Each person touches many things and other people throughout a day. Each time we do, whatever is on our hands may be left on these things or people. We are not able to see the germs we leave behind or pick up from the surfaces we touch. Understanding that

germs may be spread through this kind of simple contact can encourage healthy habits, such as frequent hand washing.

Background

Germs are infectious agents that can make you sick. You can find them anywhere in the world. Types of germs include: bacteria (tiny single-celled organisms), fungi, viruses and parasites (protozoa and worms). Some of these can be harmful to humans, while others are beneficial. For example, some bacteria help our body's immune system fight diseases.

Diarrheal diseases are among the most common diseases in the world. Most diarrheal diseases occur through fecal-oral (feces to mouth) transmission. Fecal-oral transmission occurs when germs enter the body from human or animal feces that have contaminated food, water or hands. These germs, also called microorganisms, multiply in the digestive system and are shed from the body in human and animal feces.

Proper sanitation and hygiene, along with healthy habits, can keep both animal and human feces out of water supplies.

Many steps can be taken to prevent diseases from spreading through fecal-oral transmission while also conserving existing water resources. These include the following healthy habits:

- Frequently wash your hands with soap and clean water, turning off all faucets after

each use. (Hand washing is one of the most effective ways to stop the spread of disease.)

- If possible, use a clean paper towel to turn off faucets so as not to re-contaminate hands.
 - Properly construct sewer systems so that human waste does not enter the water system.
 - Purify drinking water. (This can kill many germs from fecal and other types of contamination.)
 - Get vaccinated. (This can boost natural immune defenses against many diseases, including some fecal-oral diseases, such as Hepatitis A.)
 - Keep trash in bins and away from water sources so that it does not contaminate water.
 - Wash fruits and vegetables with clean water to clean the food of any germs or bacteria from previous handlers or contaminated soil.
- direct physical contact: touching an infected person or infected bodily fluids.
 - indirect contact: touching a contaminated surface.
 - airborne transmission: breathing in contaminated dust particles or airborne germs that can remain alive in the air for long periods of time.
 - fecal-oral transmission: consuming contaminated food or water, and contact that spreads germs from feces.
- covering the mouth with an arm instead of a hand when sneezing, coughing or yawning.
 - cleaning surfaces that people frequently touch.
 - not sharing eating utensils, food or drinks.
 - keeping hands away from the mouth, nose and eyes.
 - avoiding close contact with sick people.

Procedure

Introduction

This activity is suitable for all ages including Ensino Infantil, Ensino Fundamental and adults.

1. **Ask for two volunteers. Take the volunteers aside so that other students cannot see them or hear you.** Put a small amount of glitter in the hand of each volunteer. Tell the volunteers to keep the glitter a secret. Tell them the glitter represents germs. Assign the role of “sneezing into their hand” to one person and the role of “not washing hands after using the bathroom” to other. Tell the volunteers they should be sure to

Some germs, including many that cause sanitation and hygiene-related diseases, can survive on everyday objects for a long time. Frequently touched surfaces, such as money and door handles, are among the most likely places for spreading germs through indirect contact. Emphasize that students should not be afraid to touch what others have touched or to come in contact with other people. Rather, students can use simple methods to stay healthy and prevent spreading illness from germs. These include:

- frequently washing hands with soap and water.

When disease-causing germs invade your body and your immune system can't fight them, they multiply and gain strength. Germs take nutrients and energy from your body and can produce toxins (chemicals that damage cells). Your body reacts to the toxins, creating symptoms (evidence or signs) of illness.

In order to prevent getting infected by a disease, we must first understand how it is spread. Common ways diseases are spread include:

- droplet contact: inhaling or having contact with droplets coughed or sneezed by an infected person.

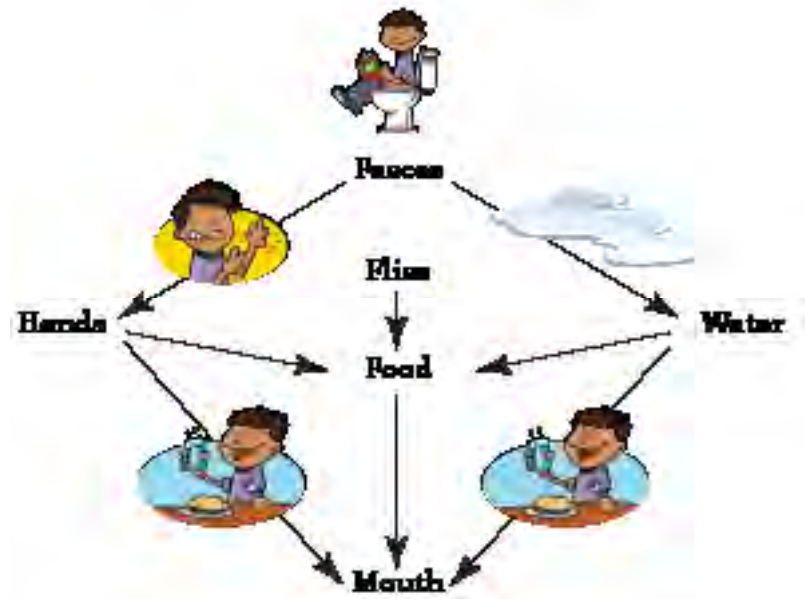


Piles of open trash are home to many germs.

touch their classmates and spread the glitter during the activity.

2. **Have the volunteers shake hands with classmates or hand out classwork.** While they do this they should high-five or shake hands with classmates, thereby transferring the glitter. (Another option is to play a game that requires touching.)
3. **Tell the volunteers to reveal their secret. Discuss the fact that the glitter represents germs.**
4. **Have all students with glitter on their hands stand on one side of the room and students without glitter stand on the opposite side.** Compare the number of students with glitter on their hands at the start (two) to the number now. What if illness-causing germs had been on the volunteers' hands? How many students would have been exposed to potential illness?
5. **Explain to the class that being exposed to germs does not necessarily mean a person will become ill.** A person's immune system can keep the body healthy by preventing many types of illness-causing germs from invading and multiplying in the body.
6. **Have students look at their clothes and body to see if "germs" (glitter) transmitted to their body without their knowledge.** What should students do to prevent the spread of germs? (Wash their hands; sneeze, cough and yawn into their elbow or handkerchief and not into their hands.)

Disease Diagram



This diagram illustrates possible scenarios for fecal-oral disease transmission.

7. **Ask students how else germs can spread from one person to another.** Is it possible to transfer germs from someone's hand or a door to a different person's hands? (Yes, this is called indirect contact.)

Activity

This activity is suitable for use at levels Ensino Fundamental to adults.

Before beginning the activity, copy the *Disease Diagram* (above) onto a board or paper. Discuss with students each transmission pathway on the *Disease Diagram*. Ask students how each transmission path occurs (e.g., How do feces get from the bathroom to hands and from hands to mouth?)

1. **Have students copy the fecal-oral disease diagram on the board into a notebook or onto a piece of paper three times.**
2. **Divide students into groups of two to three students.** Give each group

of students different colors of crayons, pens or markers.

3. **Tell students you are going to read three short stories, and as you read the stories, students should look at the disease diagram and determine the pathway of fecal-oral transmission (the pathway of germs from feces to humans).** Tell them to trace the pathway of transmission on one of the diagrams in their notebooks, using one diagram per story. Ask them to think about where and how they could stop the disease transmission in each story.
4. **Read Story 1 on page 20.** Have students trace the fecal-oral germ pathway on one of their diagrams in their notebooks. Tell them to write down one healthy habit that would prevent the germ transmission.
5. **Repeat this with the next two stories on page 20.**
6. **Read each story again.** After each story, call on one group

to explain the transmission route using the diagram on the board and have students tell the class the healthy habit they recommend for preventing the transmission of germs. Have the group draw an “X” on or erase the line(s) in the diagram that the healthy habit breaks. Ask the class if there are groups with different answers (such as different transmission pathways or other healthy habits to prevent the spread of germs). Discuss any different answers.

7. Keep a list on the board of all the healthy habits students recommend for breaking the chains of disease transmission.

Review the healthy habits after all the stories are read. Treating water before drinking, frequent hand washing with soap, washing fruits and vegetables and keeping trash contained in garbage bins are some of the most effective ways to stop the transmission of diseases. Be sure all of these healthy habits are on the list.

Conclusion

- Ask students to explain the difference between direct and indirect contact.
- Do students think items they touched today are likely locations for spreading germs through indirect contact? Why or why not?
- Discuss habits that can help the class stay healthy.
- Ask students to suggest other ways to prevent spreading germs.

Assessment

Have students:

- describe how germs can be spread through physical contact.
- differentiate between direct and indirect contact.
- identify ways to prevent spreading germs through contact.
- diagram how disease-causing germs can spread from feces to people.
- identify healthy habits that can stop the spread of germs and disease.

Extensions

Have students put glitter on their hands at home and shake hands with family members and friends. What was their reaction to the transfer of the fake germs?

Have students put glitter on their hands at a community event and then shake hands with community members. Students can then teach their community about how to avoid spreading germs by washing their hands with soap and water.

Assign a student in the class to monitor the care of hygiene and water for the class. Duties would include ensuring that soap is present in the classroom or bathroom and that water is available at school to wash hands (see page 22 How Can Our School Maintain Soap at All Times?) and encouraging students to wash their hands after using the bathroom.

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Stories

Story 1

Paolo and Claudia are siblings. They walk home from school together every day. As they arrive home one day, Paolo notices a pile of trash on the corner near their house. The trash has been torn open, and there are flies all around it. They can see old diapers in the trash. It smells terrible! Paolo and Claudia go inside to say hi to their mother before going back outside to play. As they are leaving, a fly enters the house and remains there while their mother cooks. Unfortunately, nobody notices the fly until it lands on the freshly cooked fish. A few days later, both Paolo and Claudia have to stay home from school because they are sick with diarrhea and vomiting.

Disease transmission: FECES to FLIES to FOOD to MOUTH

Healthy Habits: Keep trash in bins until collection; cover food with a clean cloth or a plate so that flies do not land on it; clean up pet feces.

Story 2

Cristina is a housekeeper for a family with two children who attend primary school. Cristina does all the food shopping and often prepares dinner for the family as well. While at the market, Cristina uses a shop latrine. There is no place to wash her hands, so she decides to wait until she gets back home. Cristina buys the food and goes home. She washes her hands but not the food from the market. When the children and family come home, Cristina serves them a delicious meal of chicken filet with rice and beans and fresh papaya from the market. Several days later everyone is home with stomach sickness.

Disease transmission: FECES to HANDS to FOOD to MOUTH

Healthy Habits: Wash hands immediately after using the latrine or bathroom; wash all fruits and vegetables before eating them.

Story 3

Luis walks along the drainage every day on his way to and from school. He notices that people are dumping trash into the drain canal. One day at school it rains heavily for three hours. As he walks home that afternoon, Luis notices that some of the trash has moved and clogged the storm drains; water is flowing heavily through the street and smells bad because the sewage system has overflowed. Luis continues home. When he arrives home, he drinks water straight from the faucet before going outside to play with his friends. Less than two weeks later, Luis and his neighbors start experiencing severe diarrhea and fevers.

Disease transmission: FECES to WATER to MOUTH

Healthy Habits: Keep trash in bins until collection; treat/filter all water before using it to drink; clean food and utensils; maintain clean sewage systems by not throwing trash and diapers into toilets.

Soap And Water

What is the simplest way to help stop the spread of disease?

Grade Level:

Introduction: Ensino Infantil and higher
Activity: Ensino Fundamental I and higher

Subject Areas:

Science, Health, Art (music)

Duration:

Preparation: <1 minute
Introduction: 30 minutes
Activity: 45 minutes
Conclusion: 10 minutes

Setting:

Classroom

Skills:

Gathering information (reading, listening, observing); Analyzing (comparing, discussing); Interpreting (defining problems); Applying (experimenting, proposing solutions); Evaluating (assessing); Presenting (demonstrating, describing)

Vocabulary:

attraction, germs, molecules, soap

Summary

Students learn the importance of using both soap and water to correctly practice the healthy habit of hand washing.

Objectives

Students will:

- identify the benefits of using soap for hand washing.
- create a song that can serve as a timer for healthy hand washing.
- recognize and perform proper hand washing techniques.
- identify when it is important to wash hands.

Materials

Introduction

- *The Soap Story—Resource Page on page 24*

Activity

- *Hand Washing Diagram—Resource Page on page 25 (make copies for students if possible)*
- *Hand Washing Phrases on page 23 (written on board)*

Making Connections

Many students recognize that washing their hands is important. However, some may not know when, how or why to do it. Hands-on practice and a catchy song can help students further develop the healthy habit of frequent hand washing.

Background

Hand washing is the simplest, most effective way of preventing germs from spreading. Proper hand washing helps remove germs that cause disease, and can stop many diseases from spreading through indirect and direct contact.

Washing hands with soap and water for at least 20 seconds removes many germs. Washing with only water provides little benefit.

Soap consists of long molecules that help to remove oil, dirt and germs. One end of the molecule is attracted to water. The other is repelled by water molecules, but attracted to grease and dirt. Soap removes grease and dirt from the hands. Friction from the motion of rubbing hands together pulls more dirt and grease free from the skin. Rinsing washes away the suspended dirt and grease, along with the germs.

Wash and rinse hands with clean water. If running water is not available, a barrel with a tap that can be turned on and off, a pitcher and basin or bottle of water are alternatives that can provide sufficient water flow to rinse thoroughly. See the extension activity on how to make a tippy tap on page 26.

Drying hands on dirty towels, clothing, or other objects can quickly re-contaminate freshly washed hands. Shaking hands dry is a better way to avoid picking up new germs.

Procedure

Introduction

This activity is suitable for all ages including *Ensino Infantil*, *Ensino Fundamental* and adults.

1. Ask students when and why they think it is important to make sure their hands are clean.

Remind them that diseases can be transmitted in many ways. Ask them to suggest different ways hands can transmit diseases. These may include direct contact with people, dirty surfaces (such as toilets), feces and animals; sneezing, coughing or yawning into a hand; putting dirty hands in your mouth and eating or preparing food with dirty hands. You may want to list student ideas on the board.

2. Ask students why hand washing with clean water and soap is one of the most effective ways to prevent spreading disease.

Do they know why soap is necessary and why washing with only water is not an effective method to wash hands?

3. Designate a wall in the classroom as a hand. Tell students they will act out “The Soap Story,” a short story about the importance of using both soap and water when washing hands using the “hand” (wall) as the setting.

4. Divide the class into four groups and assign each group one of the following roles:

- Group 1: Dirt
- Group 2: Water
- Group 3: Soap
- Group 4: Rinse water

5. Read each role aloud and show each group how to act

How Can our School maintain soap at all times?

- Have parents contribute to a Healthy Hands Fund and buy soap.
- Have a bake sale and sell pasteis or empanadas to raise money for soap.
- Keep soap in your classroom where students can take it with them when they use the bathroom and return it after they are done.
- Cut the soap with water to make it last longer—it is just as effective at washing hands.
- Maintain a bottle of soapy water by the school sinks at all times so students can wash their hands during recess hours for example, even if they don't go to the classroom to get the soap.



out their role as described in “The Soap Story” on page 24.

Have each group practice their action once before reading the story.

6. Ask each group to come to the front of the room as their group is called in the story, (in the following order: dirt, water, soap, rinse water).

7. Read “The Soap Story” aloud, pausing to let each group perform their role.

8. After all groups have performed their actions, repeat the story, moving more quickly the second time through.

9. Ask students to review why washing with soap and water is effective. Be sure that they understand soap removes dirt and germs more effectively than water alone.

10. Ask students where they think the rinse water goes when they are finished with it. They will likely

answer down the drain or in the street. Try to get students to think about where the water ends up (in the ocean or Guanabara Bay!)

Activity

This activity is suitable for use at levels *Ensino Fundamental* to adults.

- 1. Tell students that in addition to washing with water and soap, the length of time spent washing their hands is critical.** Ask students if they know how long they should wash their hands (20 seconds using the proper technique).
- 2. Write the phrases from the Hand Washing Phrases on page 23 on the board or make handouts for students.**
- 3. Have students create a song that lasts 20 seconds that includes all the phrases from the Hand Washing Phrases. Students can do this as a class or in groups.**

4. **Demonstrate the gestures from the Hand Washing Diagram, explaining each step of the hand washing process and how it relates to the phrases.** Students can also see these methods in the Project WET *Healthy Water, Healthy Rio* Student Activity Book.
5. **Each group or the whole class should sing their hand washing song several times after the gestures from the Hand Washing Diagram on page 25 to practice proper hand washing techniques.**
6. **If you have musical instruments available students can sing their hand washing song while playing instruments or while others play instruments.** Students may also wish to dance while performing the hand washing gestures.
7. **The song can be sung during hand washing to remind students to wash each part of their hands and make sure they wash long enough.**

Conclusion

Discuss hand washing with the class. Use the following questions as guidelines:

Hand Washing Phrases

- Wet your hands
- Rub your hands with soap
- 20 seconds
- Front and back of hands
- Fingers and thumbs
- Clean your nails
- Rinse hands with water

- What are some problems we may have to overcome to wash our hands? (There is no soap available or no water.)
- How do we eliminate these problems? (Store water in clean containers when water is available to be sure to have enough water when it is temporarily unavailable; have several families pitch in for soap and share the soap—you can mix soap with water in water bottles to make it last longer).
- What are some diseases students see at home and in their communities because people don't wash their hands, bodies or living areas? (Stomach sickness, flu, etc.)
- What are the benefits of hand washing with soap and clean water? (Prevents disease transmission.)

Assessment

Have students:

- identify important times for hand washing.
- explain why using soap is important.
- practice proper hand washing techniques.
- sing a hand washing song.

Extensions

Have students create a hand washing educational campaign for the school or community. Use creative approaches like songs, posters, and poems to teach others about proper hand washing.

Older students can teach younger students their hand washing song.

Construct a Tippy Tap using the instructions on page 26. The Tippy Tap should be used in a location where hand washing facilities are needed

but unavailable.

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The Soap Story — Resource Page

Read the story in the left column aloud and have each group act out the corresponding role to the right. You may want to practice the roles first.

Story

Eduardo has been out all day. Dirt and germs cling to his hands, and they like it there!

He uses water to wet his hands. But water does not remove most dirt and germs from his hands.

So Eduardo uses soap. Soap is a long molecule with one side attracted to dirt like a magnet and the other side attracted to water. Soap pulls the dirt from the hand.

Eduardo washes his hands with rinse water. The rinse water rushes over the dirt, water, and soap, and removes everything in a big flood!

Roles

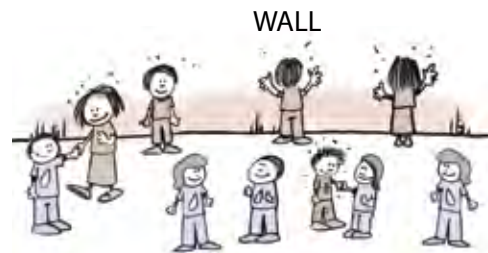
Dirt:

Each person will cling to the wall like dirt and germs to hands.



Water:

The group lines up in front of the dirt group facing the wall.



Soap:

Each person stands in between the water and dirt groups and takes the hand of one water and one dirt.



Rinse Water:

As a group, the rinse water runs through and gathers the water, soap and dirt and removes them all from the wall. This group travels as a whole and moves all the other students away from the wall like a giant wave. The students can make water sounds for a fun effect.



Hand Washing Diagram

How to wash your hands

Get ready

Have soap and clean water ready. Store soap where it can drain, so it does not sit in a pool of water, which can waste soap and encourage germ growth.

Roll up sleeves to the elbow.

Wet hands and wrists. Keep your hands lower than your elbows as you wash, so water flows to your fingertips rather than up your arms.

Wash!

Apply soap to your hands and lather thoroughly.

Use firm, circular motions to wash hands and arms up to the wrists, covering all areas, including palms, back of the hands, fingers, between and sides of fingers, knuckles, and wrists.

Wash hands for at least 20 seconds.

Repeat the process if your hands are very soiled.

Clean under your fingernails.

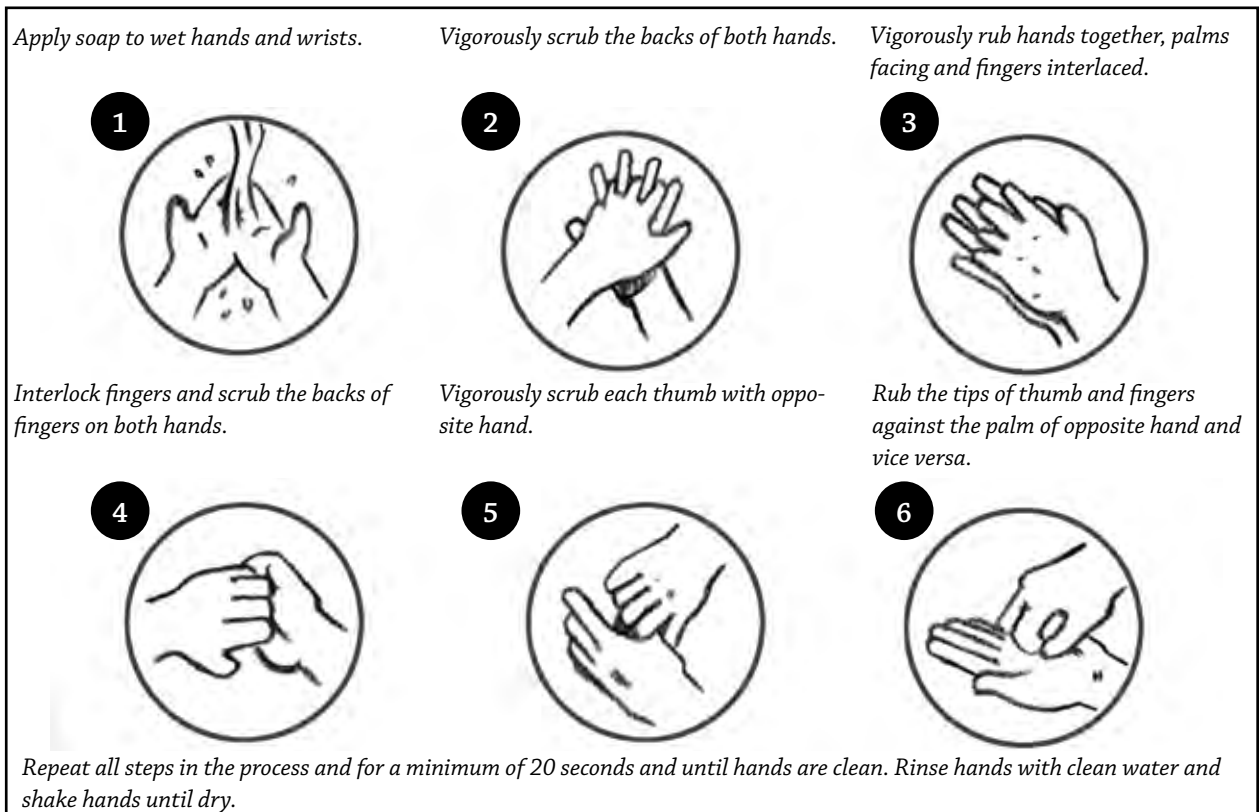
Rinse

Rinse your hands using running water, if possible. If not available, use a bucket with a tap that can be turned on and off, a pitcher and basin or bucket, or a Tippy Tap.

Do not dip your hands into a basin of water to rinse them. Your hands contain dirt and germs that could contaminate the water for future use.

Dry

Shake your hands dry to avoid picking up new germs from your clothing or towels.



Hand Washing Diagram

Extension Activity—How to Make a Tippy Tap

This activity should be supervised by an adult.

Objectives

Students will:

- discuss where hand washing stations are important to have in their community.
- learn how to construct a Tippy Tap to wash hands at using locally available materials.

Materials

- One empty bottle
- One large bottle with cap or a plastic container with a handle and a cap (one to four liters)
- Three pieces of cord, the length of an adult's arm
- Knife

Procedure

Warm Up

Have the students come up with ideas about where they think it would be important to have a hand washing station. Ask them why they chose these locations.

Activity

Soap Container and Soap Hanger

1. Using the knife, cut off the bottom of an empty bottle.
2. Place two small holes in opposite sides of the cut bottom.
3. Place small holes in the bottom of the container, for water drainage.

4. Tie a piece of cord into the holes, making a hanging container for the soap. Set aside.

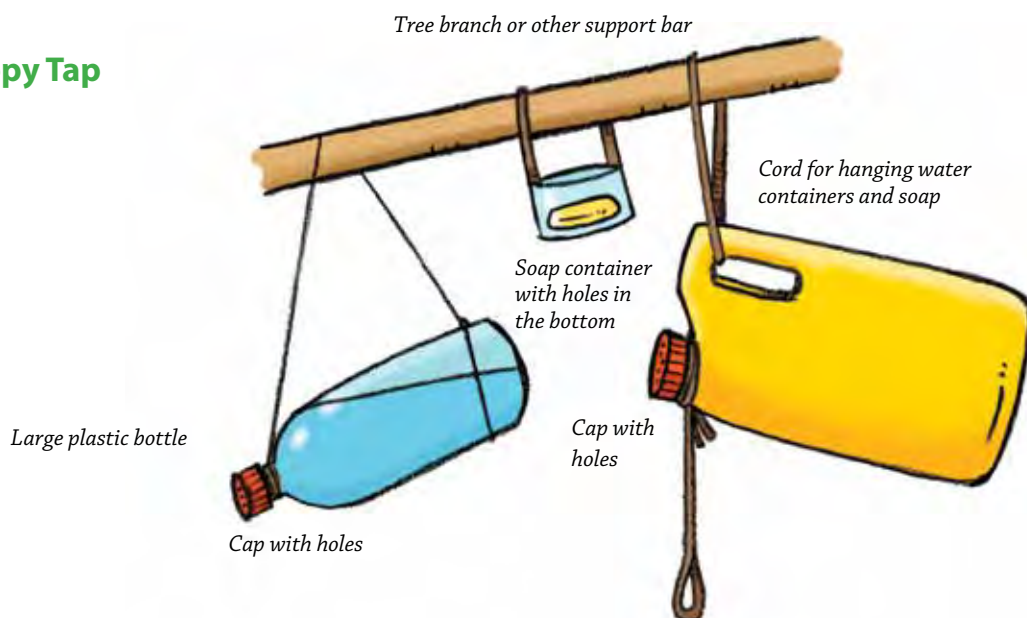
Tippy Tap

1. Clean the inside of one large water container. Fill the container with clean water.
2. Use a hammer and clean nail to put holes in the cap of the large water container. Place the cap back on the container.
3. Use one piece of cord for hanging the container. Tie one end of the cord around the base of the container and tie the other end to the handle or front of the container. Hang the Tippy Tap on a branch or at a location near a latrine.
4. Use a second piece of cord as a pull cord to tip the Tippy Tap. Tie one end of the cord around the nozzle. Tie a loop large enough to be a handle in the other end.
5. Tie the cord with the soap container at a location where the Tippy Tap is hanging.
6. You are now ready to wash your hands with soap and water using the Tippy Tap!

Conclusion

- Have the students come up with suggestions on how they could improve the design of the tippy tap using other materials or recycled materials.
- Encourage students to ask an adult to help them build a hand washing station at home or in their community.

Diagram of a Tippy Tap



Avoiding Dengue Fever

Avoiding mosquito bites can keep you and your community healthy.

Grade Level:

Introduction: Ensino Infantil and higher
Activity: Ensino Fundamental I and higher

Subject Areas:

Science, Art (drama), Health, Physical Education

Duration:

Preparation: 2 minutes
Introduction: 20 minutes
Activity: 45 minutes
Conclusion: 10 minutes

Setting:

Classroom, theater facility, large common room or outdoor area

Skills:

Gathering information (observing, listening); Analyzing (identifying components and relationships among components); Interpreting (relating, summarizing, identifying cause and effect); Applying (planning, designing, composing, proposing solutions); Presenting (demonstrating, performing)

Vocabulary:

dengue fever, immune system, symptom, vector transmission, virus

Summary

Students learn to identify and prevent the transmission of dengue fever by acting out symptoms and healthy habits.

Objectives

Students will:

- understand what a vector disease is.
- describe how dengue fever is transmitted.
- identify how to prevent the transmission of dengue fever.

Materials

Introduction

- *Area for Healthy Habits tag game*

Activity

- *Copy or copies of Dengue Scenarios – Resource Page on page 31*

Making Connections

Understanding the transmission pathways of dengue fever helps students to learn how healthy habits can help prevent contracting dengue fever.

Background

Dengue fever is rapidly increasing in urban areas throughout the world and is one of the most common diseases in Rio de Janeiro. It is a vector-transmitted disease, which means it is transmitted through contact with infected insects or other animals that transmit certain diseases. Common examples

of vector-transmitted diseases are dengue fever, malaria, Chagas disease (also known as American trypanosomiasis) and rabies.

In order to prevent getting infected by a disease, we must first understand how it is spread. Dengue fever is transmitted to humans from an infected female Aedes mosquito. Aedes mosquitoes act as vectors, acquiring the virus from an infected person and then transferring it to uninfected people. Practicing the following healthy habits helps prevent the spread of dengue fever:

- Remove stagnant water from around your house to prevent female mosquitoes from laying their eggs.
- Wear clothing that covers your body during times of heavy rains or if infected.
- Use insect repellent.
- Properly dispose of garbage and solid waste in closed containers.
- Seek medical attention immediately in order to prevent the spread of the virus.

There are several strains of the dengue virus. Dengue fever is rarely fatal; however, severe dengue, also known as dengue hemorrhagic fever, is a complication that can be potentially fatal, especially if left untreated. The best way to diagnose and treat dengue fever is to consult a doctor or nurse. When you are sick, a doctor or nurse may ask you about your personal habits and the

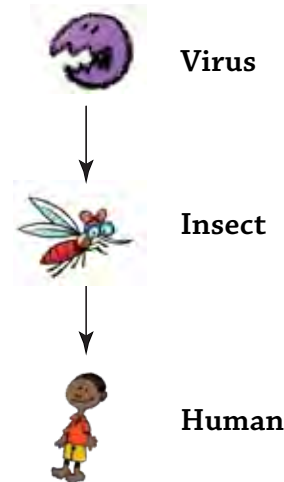
symptoms you are experiencing. In addition, they may conduct laboratory tests to diagnose the illness. This helps them diagnose the illness properly through a process of elimination. There is no specific treatment for dengue, but according to the World Health Organization, early detection and access to proper medical care lowers fatality rates below one percent.

Procedure

Introduction

This activity is suitable for all ages including *Ensino Infantil*, *Ensino Fundamental* and adults.

- 1. Establish a defined area where your students can play a game of *Healthy Habits Tag* to simulate how dengue fever is transmitted through a community and how using healthy habits can prevent transmission.**
- 2. Ask for two or three volunteers to be “it.” Bring these students to the front of the room or game area. Explain that these students will be mosquitoes ready to infect other people with dengue fever.**
- 3. Ask for three more volunteers. Bring all of these volunteers to the front of the room or game area, next to the students who have been identified as the “mosquitoes.”**
- 4. Quietly explain to the three new volunteers and the “mosquitoes” that the new volunteers represent healthy habits that prevent becoming infected by dengue fever. Each of these students must be tagged three**



This diagram illustrates possible scenarios for vector disease transmission.

times before becoming “ill” with dengue fever.

Tell the volunteers that this is a secret, and they should not tell others about their immunity. (For younger students, you may just want to tell them they cannot get sick at all because they practice healthy habits.)

- 5. Assign roles to the volunteers. Use the three healthy habits listed below to assign roles to the volunteers, or create your own healthy habits for this activity.**
 - Role 1:** You removed stagnant water from outside your house.
 - Role 2:** Your family properly covered all water containers outside the house.
 - Role 3:** You wore long clothing to prevent getting bitten by mosquitoes after heavy rains.
- 6. Explain to the group that if you are tagged by a student who is a “mosquito” you must leave the playing area and sit on the sidelines.** Designate an area as “the hospital,” and tell students that when they are tagged out they must go to the hospital.
- 7. Time the game so that it lasts an appropriate amount of time (approximately five minutes).** After time expires, gather the group.
- 8. Have students raise their hands if they did not become sick after the first or second time they were tagged.** Ask the healthy habit volunteers to reveal their secret to the class.
- 9. Ask students who went to the hospital how it felt to sit down while their classmates continued to play.** They will likely respond it was not fun. Remind them that being ill is not fun either!
- 10. If there is enough time, repeat the game with three new volunteers and different healthy habits to prevent the spread of dengue fever.**

Activity

This activity is suitable for use at levels *Ensino Fundamental* to adults.

Preparation: Make copies of the **Dengue Scenarios—Resource**

Page on page 31 so that each group has one scenario.

- 1. Divide the class into groups of four to eight students. Assign each group a scenario from the *Dengue Scenarios—Resource Page on page 31*.** More than one group can represent the same scenario.
- 2. Write the definition of vector transmission and copy the diagram on page 28 on the board and explain what it means to the students.** Give copies of the *Dengue Scenarios—Resource Page* (on page 31) to students or provide students with all of the information about the scenarios.
- 3. Instruct the class that each group will prepare a short performance (possibly a skit, dance or song) to teach classmates about the transmission and symptoms of dengue fever.** Encourage groups to be

creative and accurately share as much of the information on the scenarios as possible.

- 4. Each performance should be no more than three minutes.** Give students 10 minutes to prepare. Circulate among the groups to check progress, note missing elements and offer ideas.
- 5. Have groups present their short performances. (Option: groups could each write a verse of a song based on the scenarios and create a class song about the prevention of dengue fever. Each group would sing their verse.)**
- 6. After each performance is complete, have a brief discussion about the scenario that was presented.** Ask students to recall the most important details of each presentation, such as symptoms, disease transmission and methods of prevention.

Conclusion

- As a class, discuss vector transmission. Do students understand that an infected person can spread dengue fever through mosquitoes?
- How should infected people prevent the spread of dengue fever? (Wear long clothes so that the mosquitoes that spread the virus can't bite them.)
- List as many healthy habits as the students can offer and discuss why the habits are beneficial.

Assessment

Have students:

- identify healthy habits to prevent dengue fever.
- identify the symptoms of dengue fever.
- identify transmission paths of dengue fever.

Extensions

Teach your community about dengue fever by creating a song about the prevention of its spread. The song can be recorded and played on your local radio station or performed at a community event.

How to Prevent the Spread of Dengue



Cover all water containers.



Use insect repellent.



Remove all stagnant water from around your house.

Ask a doctor, nurse, health educator or health volunteer from a nearby clinic to speak to students about preventing, diagnosing and treating dengue fever. You may choose to take students to the nearby health clinic to speak with the doctor or nurse there.

Research and create role-plays about other common diseases. Make up songs with actions to demonstrate the best disease-prevention methods.

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Photo © 2014 by Bruno Maia.

Open water containers attract mosquitoes, the host of the dengue virus.



Photo © 2014 by Suzan Christians.

Cover all water containers to help prevent the spread of dengue fever.

Dengue Scenarios—Resource Page

Make copies of these scenarios and give each group one scenario. Act out each scenario in a drama, song or dance. Include all the information below.

Scenario 1

Two people are living in the same house. One person wears long clothing, and the other wears little clothing. The person with little clothing gets dengue. The person with long clothing does not.

Symptoms may include:

- High fever
- Headache
- Severe eye pain
- Muscle and joint pain
- Rash

How to avoid dengue:

Wear long sleeves and pants or skirts.

Suggestions: Include a doctor or nurse, family member and neighbors. One person or several people can act as the mosquito.

Scenario 2

Two houses are next door to one another. One house has screens on the windows, and the other house does not. The neighbor without screens contracts dengue.

Symptoms may include:

- High fever
- Headache
- Severe eye pain
- Muscle and joint pain
- Rash

How to avoid dengue:

Put screens on windows to prevent mosquitoes from entering the house.

Suggestions: Include a doctor or nurse, family members and children. One person or several people can act as the mosquito.

Scenario 3

A house has uncovered water tanks and pools of water on the ground that attract mosquitoes. A child in the house contracts dengue. The neighbors want to remove the stagnant water that attracts mosquitoes because they are afraid of dengue.

Symptoms may include:

- High fever
- Headache
- Severe eye pain
- Muscle and joint pain
- Rash

How to avoid dengue:

Remove stagnant standing water, especially from old tires and open containers or jars.

Suggestions: Include a doctor or nurse, parents, pets and neighbors upset over the water that attracts mosquitoes. One person or several people can act as the mosquito.

Scenario 4

Children are playing outside. One child uses insect repellent, and the other does not. The child without repellent gets many mosquito bites and contracts dengue. The child with repellent does not.

Symptoms may include:

- High fever
- Headache
- Severe eye pain
- Muscle and joint pain
- Rash

How to avoid dengue:

Use insect repellent when there are many mosquitoes.

Suggestions: Include a doctor or nurse, family members and children. One person or several people can act as the mosquito.

Rain Water and Floods

I come from the sky and run through streets and gutters to the ocean. What am I?

Grade Level:

Introduction: Ensino
Infantil and up
Activity: Ensino
Fundamental I and up

Subject Areas:

Earth Science,
Environmental Science,
Ecology, Physical Fitness

Duration:

Preparation: 2 minutes
Introduction: 20 minutes
Activity: 30 minutes
Conclusion: 10 minutes

Setting:

Large playing field

Skills:

Analyzing information
(comparing and
contrasting);
Interpreting (relating,
summarizing); Applying
(designing)

Vocabulary:

floods, flood prevention,
rain water, storm drain,
storm water

Summary

In a whole-body activity, students investigate the movement of water through a city.

Objectives

Students will:

- mimic water flowing through the streets of Rio de Janeiro.
- understand how storm water can contribute to the pollution of a watershed.
- compare storm water flow with and without trash on streets.

Materials

Introduction

- *Trash items*

Activity

- *String or rope (at least 10 meters)*
- *Trash items*

Making Connections

Children have observed how water flows downhill and how it often transports litter or sediment. Understanding how waste disposal behaviors can affect storm water, flooding and watershed health can guide students to make good decisions about disposing of and reducing waste.

Background

Storm water is water that falls from the sky when it rains. When rain falls on surfaces that do not absorb water, such

as paved streets and sidewalks, it finds its way into sewers or waterways. This is called runoff. As storm water runoff flows over the streets and sidewalks, it gathers up dirt, debris, chemicals, sediment, trash or other pollutants that could harm water quality. Modern cities, including Rio de Janeiro, have storm water systems to prevent flooding of the streets.

Cities face the challenge of how best to manage storm water. Just as gravity pulls water from the sky down to earth, it also moves storm water downhill from high points to low points. In natural environments with plants and ground cover, about half of the precipitation soaks into the ground. These areas are called permeable surfaces. Approximately 40 percent of water reenters the atmosphere through evaporation and transpiration. In these permeable surfaces only 10 percent of storm water runs off into water sources.

In manmade environments with many paved streets and sidewalks, water runoff increases in direct proportion to the amount of impermeable surfaces. If a city is highly developed, as Rio de Janeiro is, and has 75 to 100 percent impermeable surfaces (such as pavement), then as much as 55 percent of the precipitation may run off into bodies of water. This runoff can contribute to flooding and water source pollution.

In order to manage storm water runoff, cities often have storm

What is storm water management?

Controlling storm water and where it goes. Cities often build canals or gutters to redirect rain water.



drains that divert the storm water underground or into canals and gutters. This prevents flooding on city streets. However, if debris or trash clogs these drains, then the system will not work properly. Keeping trash off the street can help maintain storm water systems and prevent polluting the receiving water sources, such as the Guanabara Bay.

Procedure

Introduction

This activity is suitable for all ages, including Ensino Infantil, Ensino Fundamental and adults.

Define a playing field that represents a street of Rio going downhill.

- 1. Inform students they are going to act out the role of rain water as it flows through the city (down the streets and into the Guanabara Bay). Have students go to one side of the playing field.** Designate an area at the other end of the playing field that represents the Guanabara Bay.
- 2. Tell the students they represent “raindrops.”** Ask students to think about what the rain would be like

at the height of a storm. Would there be a lot of water? (Yes.)

- 3. The raindrops will run through the “streets” of Rio de Janeiro as they would during heavy rains.** All students should run across the playing field.
- 4. Ask students where all the raindrops ended up.** They should say the Guanabara Bay.
- 5. Repeat the activity but place trash across the playing field. This time the raindrops must pick up all the trash they encounter as they run through the streets.** All students should end at the “bay” with trash.
- 6. Ask students where all the trash ended up.** They should say the Guanabara Bay. Discuss how to prevent trash from entering the Guanabara Bay. (Put trash in trash cans with lids.)

Activity

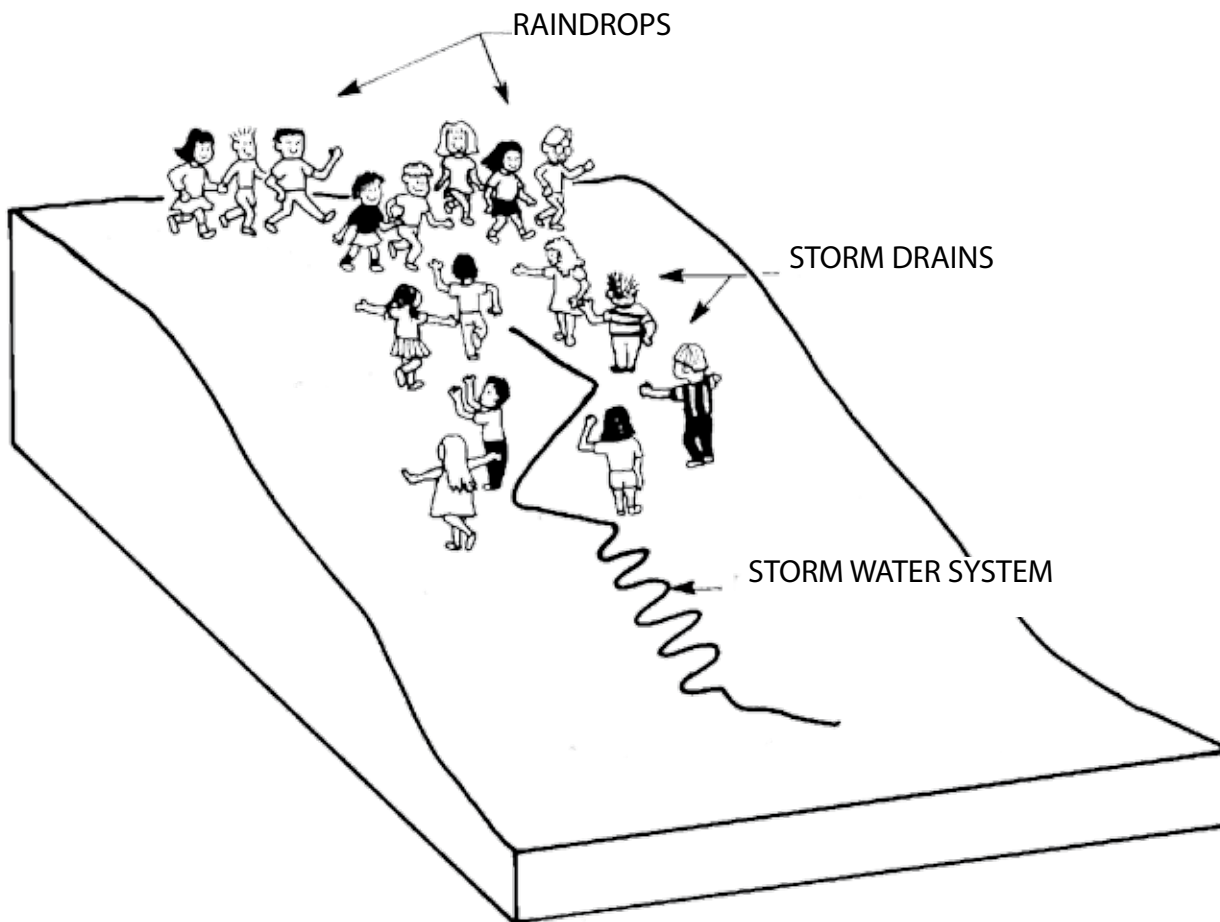
This activity is suitable for use at levels Ensino Fundamental to adults.

- 1. Ask students if they know what a storm drain is.** What is the role of a

storm drain? Refer to the definition of storm water management at the top of this page.

- 2. Inform students they are going to act out the role of storm water as it flows through the city (down the streets and into the Guanabara Bay). Arrange the playing field according to the diagram Watershed of Rio de Janeiro.** Lay string or a piece of rope down the middle portion of the field to indicate a stream or underground storm water pipe. (A section of the string can be angled back and forth up to represent the pipes of storm water drains.) Designate an area at the end of the string that represents the Guanabara Bay.
- 3. Divide the group in half so that half of the students represent “raindrops” and the other students represent “storm drains.”** The raindrops should assemble at one end of the playing field. The “storm drains” should position themselves somewhere between the raindrops and the “bay.”
- 4. The raindrops will run through the streets of Rio de Janeiro as they would during heavy rains. Storm drains remove the flow of water on the surface of the streets and help prevent flooding. To show this, students representing storm drains try to tag the raindrops.** The storm drains must keep one foot in place but can pivot and stretch their arms (representing canals and gutters funneling water into the drain).

Watershed of Rio de Janeiro



- 5. If a raindrop is tagged, the student simulates draining into the ground by circling three times around the drain then moves toward the string.** Raindrops cannot be tagged a second time.
- 6. Once raindrops reach the storm drainage system, they stand up and walk the length of the string.** If they encounter curves, they can spin about or jump to represent water moving through the drainage system. At the end of the system, they arrive at the Guanabara Bay where they should wait for the rest of the raindrops.
- 7. Ask students where all the raindrops ended up.** They

should say the Guanabara Bay.

- 8. Repeat the activity but have the two groups switch roles.** This time the storm drains will be raindrops and vice versa.
- 9. Place trash throughout the playing field to simulate trash in the streets (paper, plastic and other items representing trash compiled by the instructor before class).** As raindrops flow through the site, students must pick up trash. If tagged, raindrops drop all the trash they have collected at the feet of the drain (clogging the storm drain). The raindrops then have to stay in the streets

and cannot enter the storm drain system—students who have been tagged must stay in place and jump up and down.



Water carries trash and debris downhill, which can clog storm drains and lead to flooding.

Photo © 2014 by Bruno Maia

10. For any raindrops that make it through to the Guanabara Bay, have them drop their trash items. This symbolizes trash polluting the bay.

11. Have students look at where the water and trash is. Discuss problems associated with trash and clogged storm drains. Ask students the following questions:

- Why are there still raindrops in the street at the end of the activity? (Because trash clogged the drains.)
- What would happen during a heavy rain if water could not drain into the storm and sewer system due to clogged storm drains? (The streets would flood.)
- Why is there trash in the Guanabara Bay? (Because the water carried it there.)
- Where does trash end up if it is not disposed of properly? (In the bay or clogging storm drains.)
- How can trash harm the bay? (Trash can hurt wildlife, prevent fishing, make swimming unsafe, reduce tourism, etc.)
- How can students prevent trash from causing flooding and polluting the Guanabara Bay? (Ensure all trash is placed in trash bins with lids.)

Conclusion

Ask students to reflect on the streets and watershed around them. Where does the water flow when it rains? Are there streets near the school that are similar to the activity? How can students keep trash out of the streets?

Assessment

Have students:

- Describe how water moves through the city.
- Explain how water carries trash through the streets of the city
- Describe the role of storm drains and how trash can affect this role.

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A man removes trash from a clogged sewer system.

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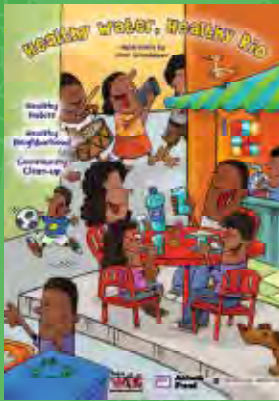
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Companion Publications



The *Healthy Water, Healthy Rio* student activity booklet is a companion to the *Healthy Water, Healthy Rio* educators guide and features hands-on activities for youth.



The *Healthy Water, Healthy Rio* coloring book is a companion to the educators guide directed at teaching young children about water and healthy habits.



Where Does Your Water Go? An interactive poster about the movement of water in the city of Rio de Janeiro.

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