DROPS OF KNOWLEDGE FOR RIVERS OF CHANGE

GLOBAL TEACHING AND LEARNING MATERIAL

A hands-on guide to teaching
and learning about
water, sanitation, hygiene,
and the environment

SWAROVSKI
WATERSCHOOL

BACKGROUND INFORMATION

Most children in the world spend a considerable amount of time at school, not only learning, but also playing and using facilities such as toilets, kitchens, and gardens. This provides a great opportunity for teaching about water at school. Sanitation and hygiene, for instance, are two important topics to discuss with children and also for everyone to practice on a daily basis when performing any activities that involve water, such as using the lavatory and washing hands before lunch.

Another important topic to explore is the local environment surrounding the school. Is it dry or wet? Does it rain a lot, or are their droughts? Does it become flooded very often? Is it close to a river, a lake, or the sea? Or is it far from natural waterways? These are just some of the water-and-school topics you can talk about.
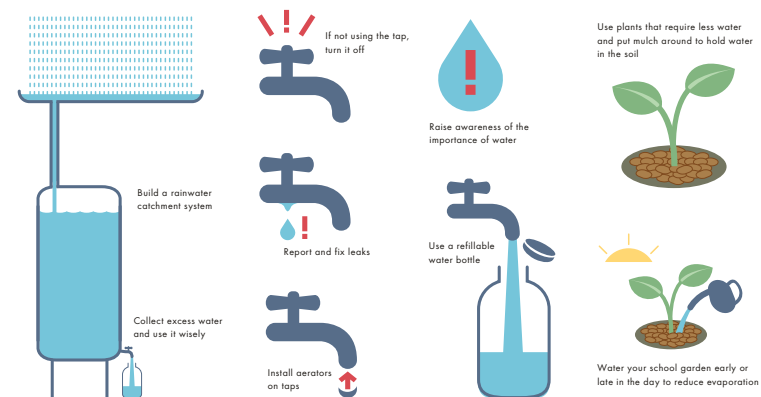
After pinpointing characteristics of the local ecosystem, teachers and students can discuss how we use water for hand washing, toilet flushing, drinking, activity cleanup, preparing food, and many other purposes. All of these ideas can prompt students to consider the next question: How can we improve the way we use water at school?

Module 5 aims to empower students and teachers to identify water-related issues at school, then make a plan and take action. Does your school have safe water to drink? Does the school's sanitation system pollute the local river? Do you know anyone who has had a disease caused by unsafe water? Through these questions and related activities, we are assessing our water use at school and preparing for the challenges we might face today or in the future.

DID YOU KNOW? Almost half of all schools in low-income countries do not have access to water and sanitation facilities. When there are no clean, safe toilets and washing facilities, girls are especially vulnerable to dropping out of school.[1]

Worldwide, children have been losing 443 million school days a year due to water-related diseases[2] that could often be prevented through better sanitation and hand-washing facilities.

SOURCE: **(1)** UNICEF, "Raising Even More Clean Hands: Advancing Health, Learning and Equity through WASH in Schools," New York: United Nations Children's Fund, 2012, pp. 2, 17. Available at: www.unicef.org/wash/schools. **(2)** Watkins, Kevin, UNDP Human Development Report 2006: Beyond Scarcity; Power, Poverty and the Global Water Crisis, New York: United Nations Development Programme, 2006, p. 6. Available at: www.undp.org/content/undp/en/home/librarypage/hdr/human-development-report-2006.html

Source: http://www.melbournewater.com.au/getinvolved/saveandreusewater/pages/save-water-at-school.aspx

Sometimes, the issues we face are beyond our capabilities to solve and require we get assistance from local government or specialists in water resources and health. Rather than being a setback, dealing with these other kinds of organizations can be a great opportunity to learn about different professions and the way things work at school and in the community. Students and teachers can then apply the knowledge they have gained in their communities and at home to improve everyone's quality of life.

Now it is time to take action. Because issues related to water are not simple, and involve multiple subjects, it will be important to consider all the possibilities for learning, teaching, and taking action. An excellent first step is

to organize a committee of teachers who will address the issues from different perspectives. Collaboration among teachers, staff, students, school directors, parents' groups, and local education authorities will enable the school community to take action together to benefit everyone.

SWS INDIA

THEMATIC CONCEPTS

Water and sanitation – Access to sanitation, the practice of good hygiene, and a safe water supply could save 1.5 million children a year.[22]

Rainwater harvesting – Schools and communities that are facing water shortages could dramatically boost supplies by collecting and storing rain falling freely from the clouds.[23]

Gray water and black water – Wastewater is composed of domestic gray water (water from baths, sinks, washing machines, and kitchen appliances) and black water (water from toilets), as well industrial wastewater that may have additional chemical contaminants. The wastewater pollutes natural water systems, resulting in a range of negative impacts that can be avoided by treatments.[24]

"I'd like to ask all the kids in the world to help clean up the garbage and plastic bottles at their schools and to tell people not to put rubbish in the water, especially plastic."

— MARIA JULIANA, AGE 11, ESCOLA DOM FLORIANO, RIO TAPAJÓS, BRAZIL

ACTIVITY 5.1: CHILD-LED SCHOOL WATER, SANITATION, AND ENVIRONMENT MAPPING

Before beginning this activity, review the basic terms with your students: a "hazard" is a human-made or natural danger that causes damage to people, property, and the environment; a "risk" is the potential for something to go wrong or for something harmful to occur. A "risk assessment" is a survey that investigates, monitors, and anticipates factors that could combine to harm children and adults in a community. Managing or reducing risk means acting to limit the possibilities for something to go wrong and being prepared to deal with the effects of a disaster if one occurs, so that individuals and communities can prevent or reduce damage or even loss of life.

During a school mapping project, the children in your group can interact with their peers and the wider community while collecting and recording data. This technique builds knowledge, provides a participatory method for monitoring and evaluation, and strengthens risk-reduction capacities. The mapping exercise will also enhance children's understanding of the links between the natural environment, health, and personal empowerment. The exercise is designed to be fun and participatory, and teachers are encouraged to adapt it in new ways. Children can plot vital features of their community—schools, health centers, toilets, water points, environmental hazard zones, and so forth—by placing icons on a grid. Characteristics that describe each feature in more detail can also be assigned to these icons.

Encourage your students to be detectives! The school environment can provide some unlikely but very effective opportunities for addressing environmental issues. Help students map the physical location of their schools and the child-friendly services within them, such as safe water points and separate latrines for girls, boys, and staff; school and classroom infrastructure, including the presence of informal learning centers; school gardens, canteens, or food services; and environmental hazards such as stagnant water and solid waste.

Time: 90 minutes / **Thematic Areas:** Science, Geography, Social Studies / **Goal for Learning:** Work with children to map their school grounds for hazards, and identify opportunities for children to contribute to making improvements.

Materials: ☐ Marking pens/markers (different colors if available) / ☐ Poster paper

22 UN Water, "Sanitation," 2013. Open PDF from: www.unwater.org/downloads/sanitation.pdf. **23** See, for example: UNEP, "Harvesting Rainfall a Key Climate Adaptation Opportunity for Africa," Nairobi: United Nations Environment Programme, November 13, 2006, http://www.unwater.org/downloads/Rainwater_Harvesting_090310b.pdf. **24** Environmental Performance Index, "Water Resources," Yale University, 2015, http://epi.yale.edu/our-methods/water-resources.

ACTIVITY STEPS:

1 Work with the students to develop and write out a checklist of things that could be mapped. The samples listed here should be adapted for your school:

Energy use – electricity (for lighting, heating, etc.)
Energy use – cooking
Water use – drinking (add other uses)
Sanitation – where facilities are located, where they are needed
Waste – where it comes from, where it ends up
Pollution – where it comes from
Environmental problems – where they are located
People – Where are we? Where are the people our age?
Programs, community groups – Where do they take place or meet?

2 Questions to consider for the investigation can be decided as a group. These questions could include:

— Does the school have latrines? How many? What kind? What is the condition of the latrines? Are there sufficient cleansing materials? If there are no latrines, where do students and teachers go to relieve themselves?

— Does the school have a place to wash hands? With soap? Water? Are there enough places to wash hands for the school's population?

— Where do students and teachers get drinking water? Is it safe, e.g., from a pipe, or treated and stored properly?

— Does the school have a clean courtyard or school grounds? Animals? Trash?

— Do teachers give any lessons on hygiene? Do the lessons cover hand washing, safe drinking water, and using latrines?

3 Draw a baseline map of the school that shows basic information, such as the locations of water points, toilets, gardens, and playgrounds. Then divide the participants into groups and allocate tasks that are required to conduct the survey of resources and risks. For example, if the school has toilets, is soap available for hand washing? Is anything broken? Do doors lock from the inside for safety and privacy? Are existing pit latrines cleaned out regularly?

If the map indicates a playground, is there garbage on the ground? If so, where does it come from and what can be done to clean it up and prevent future rubbish from accumulating? Are there puddles or other areas of standing water on the playground that could be slippery for children or breeding grounds for mosquitoes?

What is the condition of the school garden? Is there a compost bin? Are paths kept clear of debris? What is growing in the garden? Is there a nearby source for watering?

OBSERVATION AND DISCUSSION:

Draw the students' findings on a map of the school, then cross-check the accuracy of the information on the map with experts in the community. After the map is finished, display it in a public place in the community.

Discuss and analyze the information obtained, especially information about risks and resources. Use the map as a guideline for developing a Swarovski Waterschool action plan.

WATER MAPPING, SWS THAILAND

ACTIVITY 5.2: MAKING A RAINWATER CATCHMENT SYSTEM

We use water in many different ways. In some places, people are fortunate to have easy access to water that is safe, clean, and readily available in homes and schools at the turn of a tap. But millions of people around the world still do not have easy access to safe water nearby. Many children, and women, must make long, difficult journeys to collect water from unsafe sources. In some cases, students are kept from school in order to collect drinking water for their families.

Rain is the greatest source of freshwater. It can be stored and reused, offsetting the need for processed or treated water. Many of the activities for which we use water—such as watering our gardens, cleaning our houses, and flushing toilets—can be done safely with harvested rainwater. It is important to note, however, that this water cannot be used as a source of safe drinking water unless it is filtered and treated.

Rainwater harvesting allows individuals and communities to manage their own water supplies. The term "rainwater harvesting" refers to the collection and storage of rainwater that runs off surfaces as it falls from the sky. Rainwater harvesting directs water from rooftops or other built surfaces into barrels or tanks. The water stored in these vessels can be used to carry out many everyday tasks.

In this activity, children will create a simple rainwater catchment system and learn its key components. This project is most likely to be appropriate for older students, ages 12–18.

Time: 90 minutes / **Thematic Areas:** Science, Environmental Education / **Goal for Learning:** Gain access to water for schools, homes, or the wider community by catching rainwater and storing it.

Materials: ☐ Small, clean plastic bottles (1 for each student to use as a "rain barrel") / ☐ Scissors / ☐ Mosquito netting or other finely meshed fabric; each student's rain barrel will need a piece of netting approximately 30 × 30 centimeters (12 × 12 inches) / ☐ Cellophane tape or glue stick / ☐ 1 piece of aluminum foil for each barrel, 30 × 30 centimeters (12 × 12 inches) / ☐ 1 straw for each barrel / ☐ 1 cup of water for each student

ACTIVITY STEPS:

1 Cut the water bottle evenly across, around one-third of the way from the top. Students will use the bottom part of the bottle for a rain barrel and the top part can be used to make the funnel. Make sure the bottom part is securely placed on a surface and able to stand on its own.

2 Cover the top of the bottle with the mosquito net or fabric, and secure the covering with tape or glue. Emphasize that all rainwater catchment devices must be covered at all times to keep the water from being contaminated by debris, animals, insects, etc.

3 Ask students to use the aluminum foil, the straw, tape/glue, and scissors to create a device that will funnel water into the container, but not through the netting on top of the container. Encourage students to innovate and engineer the best way to get the water into the container. Then reset the devices firmly on a flat surface.

   Hints – Cut a hole in the side of the container, closer to the top than the bottom; the top of the water bottle or aluminum foil can be shaped into a funnel that drains into the container through the hole. The straw could also be inserted into the container through the hole. Students may need to prop the funnel part up against a wall or a box.

4 Test the students' devices by pouring a cup of water into the channeling funnel or straw, without touching the device or the container. Note that if it is raining hard, or if water is poured too quickly, the funnel will overflow, causing flooding below. A catch basin can be very helpful in capturing and using this overflow in a constructive way. The aim is to represent a real-life water-harvesting system, in which rain is captured as it falls, without human intervention, while minimizing the damage that can be caused by excess water, i.e., flooding.

ADDITIONAL RESOURCES:

GardenGate Magazine, "How to Harvest Rainwater," www.gardengatemagazine.com/52droughttolerant

GrowNYC, "Rainwater Harvesting," 2105, www.grownyc.org/openspace/rainwater-harvesting

McClain, Michael E., "Balancing Water Resources Development and Environmental Sustainability in Africa: A Review of Recent Research Findings and Applications," AMBIO: A Journal of the Human Environment, 2013, vol. 42, pp. 549–565. Available at: http://link.springer.com/article/10.1007%2Fs13280-012-0359-1

Nelson, Ben, "Build a Rainwater Collection System," Mother Earth News, July 24, 2013, www.motherearthnews.com/diy/build-a-rainwater-collection-system-zb0z1307zsal.aspx

Stockholm Environment Institute, Rainwater Harvesting: A Lifeline for Human Well-Being, Nairobi: United Nations Environment Programme, 2009. Open PDF from: www.unwater.org/downloads/Rainwater_Harvesting_090310b.pdf

UNEP, "Potential for Rainwater Harvesting in Africa: A GIS Overview," United Nations Environment Programme, October 2005. Open PDF from: https://www.researchgate.net/publication/265842568_Mapping_the_Potential_of_Rainwater_Harvesting_Technologies_in_Africa_A_GIS_Overview_on_Development_Domains_for_the_Continent_and_Nine_selected_Countries

WATER CATCHMENT
SYSTEM EXPLAINED BY A
STUDENT, SWS BRAZIL

RAINWATER TANK,
SWS UGANDA

"The rain water enlivens all living beings of the Earth ... both movable and immovable ... and then returns to the ocean with its value multiplied a million fold."

— CHANAKYA, 300 BC

ACTIVITY 5.3:   BUILDING A "BANANA CIRCLE" TO FILTER GRAY WATER AND REDUCE POLLUTION

Wastewater includes household gray water—from baths, sinks, washing machines, and kitchen appliances—and black water that comes from toilets, as well industrial wastewater that may have additional pollutants and toxic chemicals. In many communities around the world, wastewater pours into natural water systems without any treatment, causing pollution and the associated damage to ecosystems. This can be avoided by applying techniques for treating gray water that are practical and can even be fun!

The banana circle is a permaculture method that filters gray water and provides food at the same time, transforming waste into a valuable food source. All the nutrients from the gray water are absorbed by the bananas planted in the circle and by microorganisms in a compost pile in the middle of the growing banana plants. It is also possible to use other plants, such as papaya, sweet potatoes, or cassava, but bananas have the advantage of being "heavy feeders" that use (and filter) a lot of water.

BANANA CIRCLE, SWS BRAZIL

Soap and some detergent residues can go into the banana circle, but do not let detergents or other liquids that contain harsh chemicals into the system—they are likely to kill beneficial bacteria in the soil. Any product containing boron should be avoided completely because it is toxic to plants even in small amounts. Many "green" cleaners can be used instead of high-strength (possibly toxic) products.

An environmentally friendly substitution for chlorine bleach, for example, is hydrogen peroxide, which breaks down quickly in the environment.[25] Vinegar, which is safe and bio-degradable, can be used instead of ammonia.

In September 2014, a group of Swarovski Amazon/Brazil Waterschool participants learned about the banana circle eco-technique during a workshop at the Irma Dorothy School. They were motivated to explain to others how this technique works and their experience is reflected in the activity outlined below. (Note: If banana plants are not complementary to your local environment, other fruit trees can function in a similar manner to filter gray water; please research other options that are suitable for your region) The suggested age for this activity is 13–18 years old.

Time: 90 minutes (sustainable building and upkeep will take a longer period of time) / **Thematic Areas:** Science, Environmental Education, Horticulture / **Goal for Learning:** Strengthen students' knowledge of the power of natural (eco-) filtration of water, which can reduce common forms of gray water pollution in waterways.

☞ **Materials:** ☐ 6 banana plants (or other fruit trees, as appropriate to your location) / ☐ Organic matter / ☐ Shovel / ☐ Hole digging tool

ACTIVITY STEPS:
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1   Select an area to build the banana circle, for example, near a drainage pipe located between the school kitchen, baths, or sinks and a nearby waterway.

2   In the soil of the area you have chosen, mark a circle that is 2 meters (6.5 feet) wide.

3   In the center of the circle, dig a hole that is 50 centimeters to 1 meter (2–3 feet) deep. Pile the soil from the hole around the edge to create a mounded garden bed, adding organic matter to enrich the soil.

25 Marshall, Glenn, "Greywater Re-Use: Hardware, Health, Environment and the Law," Permaculture Association of Western Australia, 1997, http://permaculturewest.org.au/ipc6/ch08/marshall/index.html.

4 Make six small holes in the mounded bed around the larger hole, and plant the banana plants in the small holes around the rim of the basin.

5 Cover the large hole with organic matter (branches and leaves); this will later be used as the space for a compost pile

6 Water the banana plants and make sure that they have taken root before the banana circle starts to receive wastewater. Then make sure the wastewater drainage pipe (or gutter) flows to the circle or that wastewater is carried to it. (Note: Use the large hole in the center as a compost pile for organic matter, such as egg shells, coffee grounds, fruit peels and skins, etc.)

OBSERVATION AND DISCUSSION:

Ask students to think about (and research) the ingredients in the soap and shampoos they use for washing dishes or their bodies. Prepare a list of ingredients and discern hazardous and eco-friendly additives, and explain the findings to the group.

Discuss why harsh chemicals cannot be used in a banana circle, explaining that if chemicals are highly toxic, they will kill the plants.

ADDITIONAL RESOURCES:

Global Islands Network, "Kiribati," www.globalislands.net/greenislands/index.php?region=9&c=53

Permaculture Research Institute, "Banana Circles," April 8, 2014, http://permaculturenews.org/2014/04/08/banana-circles

PointReturn, "A Banana Circle," December 13, 2009, http://pointreturn.com/2009/12/a-banana-circle

Wickboldt, Beau, "Banana Circle Permaculture Kitchen Garden, Thailand," Rak Tamachat Permaculture Education Center, www.raktamachat.org/banana-circle-kitchen-garden

> "Until you dig a hole, you plant a tree, you water it and make it survive, you haven't done a thing. You are just talking."
>
> — WANGARI MAATHAI

PLANTING A TREE, SWS INDIA

ACTIVITY 5.4:   PLANTING A SCHOOL GARDEN

School gardens are interactive areas where students can learn by doing. A garden can enhance and build students' values and appreciation for the environment, while strengthening their understanding of the use of water. As students care for their plants every day, they can also learn about different subjects by observing how food is grown and the interdependence between plants, water, trees, birds, and insects, among other important resources and beings of the planet.

Fostering patience can be part of the educational process: some plants take a long time to grow, sometimes years, before they can provide food, shade, or a pleasant environment for learning and playing. Some plants grow more quickly, and vegetable and flower gardens can serve as laboratories where children can learn from an interdisciplinary approach that considers real-life experiences and stimulates participation and action.

Time: 90 minutes to introduce (NOTE: the time for planning and planting a garden seems more time consuming. Could be listed as 4–5 hours/week for setup and 1–2 hours/week for upkeep) / **Thematic Areas:** Science, Health, Horticulture / **Goal for Learning:** Stimulate understanding of the importance of water to all forms of life, and develop appreciation and values related to caring for local environments and the planet.

👉 **Materials:** ☐ Seeds / ☐ Organic matter / ☐ Shovel / ☐ Soil / ☐ Hole digging tool

SCHOOL GARDEN IN CHINA

ACTIVITY STEPS:

1 Decide who will be responsible for the garden. At first, it can be an experienced teacher; she or he will then gradually engage a group of students to take responsibility for building up and caring for the garden.

2 List the tools, equipment, seeds, and seedlings that will be needed. The cost need not be high, and it is always better to start a small garden with the possibility of expanding it in the future. The plantings and size of the garden will also depend on the available space.

3 Find the best place for starting the garden. It is very important to consider access to water: watering is one of the main activities for garden maintenance.

4 Decide what plants to grow, always considering space and climate. Children should participate in the decision of what to grow, but also be sure to choose plants that are easy to cultivate. (Note: You might want to plant a tree to see how much longer it takes to grow versus a particular flower or vegetable.)

5 Set a schedule for who will perform what tasks. Children can maintain the garden, and tasks can be divided among different groups. School gardens should be supported by the school director, teachers, parents, and the community in order to be a great success.

SCHOOL GARDEN IN CHINA

6   Prepare the soil to receive the plants, always considering organic approaches.

7   Plant seeds and saplings, considering the appropriate distance between them. Keep a timeline of growth benchmarks, such as the first sprout, the first flower, and the first full plant, vegetable, etc.

OBSERVATION AND DISCUSSION:

Talk about why it is important to water the garden and discuss with students the best timeline for watering (daily, twice a day, every two days) as required to keep the plants green and healthy.

Brainstorm the connection between caring for the garden and other parts of our lives.

ADDITIONAL RESOURCES:

ANIA (Association for Children and Their Environment), Peru, www.aniaorg.pe

FAO, Setting Up and Running a School Garden: A Manual for Teachers, Parents and Communities, Rome: Food and Agriculture Organization of the United Nations, 2005. Available in web and PDF format at: www.fao.org/docrep/009/a0218e/A0218E01.htm

School Garden Wizard, United States Botanic Garden and Chicago Botanic Garden, http://schoolgardenwizard.org

"Even if I knew that tomorrow the world would go to pieces, I would still plant my apple tree."

— MARTIN LUTHER KING JR [26]

26 Inspiring Quotes by Martin Luther King Junior, www.biography.com/news/martin-luther-king-famous-quotes

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