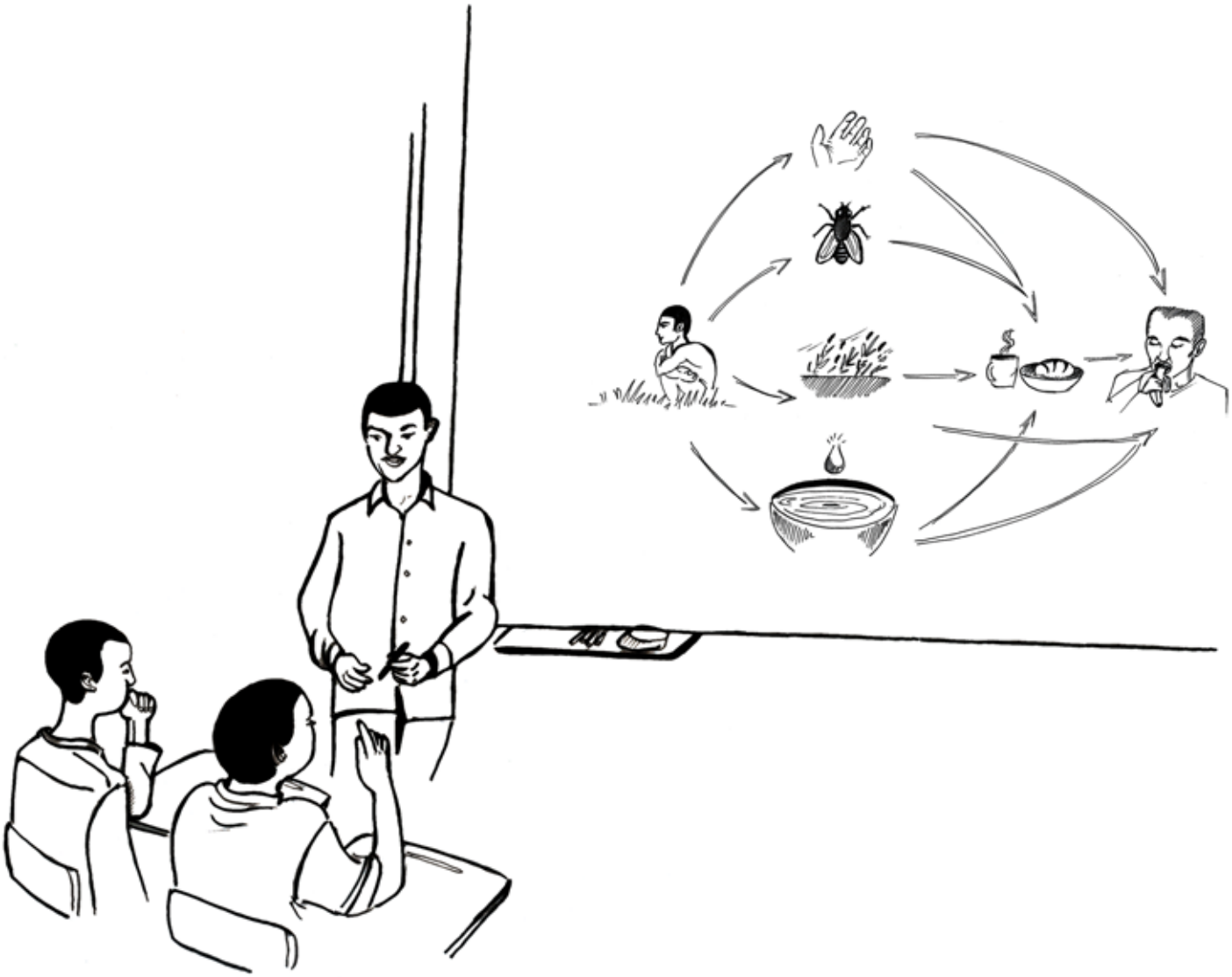
Safe Water School

Training Manual

2nd Edition



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Safe drinking water for all.

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SODIS is an initiative of Eawag - the Swiss Federal Institute of Aquatic Science and Technology. SODIS aims to provide people in developing countries with safe drinking water.

The Antenna Technologies Foundation is committed to reducing the extreme poverty and health problems in developing countries by bringing innovation in science and technology to bear at the base of the pyramid.

The Section “Global Programme Water Initiatives” is an operationally active, thematically oriented unit that contributes to finding solutions to the global challenges linked to water.

Please contact us if you require assistance in the use of this manual. For additional information and downloadable documents, consult our websites www.sodis.ch and www.antenna.ch.

Contact:

SODIS
Ueberlandstrasse 133
8600 Duebendorf
Switzerland
Tel. +41 (0)58 765 52 86
Fax +41 (0)58 765 53 99
Email: info@sodis.ch

Antenna Technologies Foundation
Avenue de la Grenade 24
1207 Geneva
Switzerland
Tel. +41 (0)22 737 12 40
Fax +41 (0)22 737 12 49
Email: wata@antenna.ch

Author: Fabian Suter
Contributions: Menstrual Hygiene Chapters: Monika Tobler
Mini-WATA Chapters: Julie Bergamin, Carole de Bazignan
Drawings: Joel Graf, Fundación SODIS
Photos: Lasse Anderson (Safe Water School Project Kenya)
Fundación SODIS (Safe Water School Project Bolivia)
Antenna Technologies Foundation (Safe Water School Project Haiti)
Collaboration: Valérie Cavin, Paul Donahue, Sarah House, Yvonne Lehnhard, Samuel Luzi, Regula Meierhofer, Sylvie Peter, Monika Tobler, Karen Walker

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Welcome to the Safe Water School Manual

The Safe Water School Manual combines school lessons in water, sanitation and hygiene (WASH) with scientific experiments, games and art activities.

This manual will contribute to a school, that:

- **educates** students, teachers and staff in the areas of **water, hygiene and sanitation**
- has an adequate **WASH-infrastructure**
- has students, teachers and staff regularly and correctly **applying WASH-practices**
- raises awareness about the importance of **WASH-practices in the surrounding community.**

As the concrete goals of a Safe Water School vary from country to country, region to region, and from school to school, this 2nd edition can be used according to the requirements and wishes of each school.

Please choose the modules that are most interesting and useful for you and create your own manual. Feel free to use this manual to design modules specifically for your context. We would be delighted to hear of such initiatives!

There is good and informative literature available about WASH in schools. We provide a list of selected documents with links to them on www.sodis.ch/safewaterschool.

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- Module A: Water & Health
- Module B: Water Contamination
- Module C: Water Treatment
- Module D: Hygiene
- Module E: Sanitation

Section II – WASH Scientists
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Section III – WASH Engineers
- Module A: Water Treatment Station
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Section V – WASH Artists & Gamers
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Safe Water School

Training Manual

Section I: WASH School Lessons

Overview - WASH School Lessons

The modules are arranged according to the following five modules:

- **Module A: Water & Health**
  The first module focuses on disease transmission. It underlines the importance of combining good water, hygiene and sanitation practices to build disease transmission barriers.

- **Module B: Water Contamination**
  The lessons of this module are about contamination and recontamination of water at the source, during delivery and while storing water.

- **Module C: Water Treatment**
  This module gives an overview of different water treatment methods. It informs about the advantages and drawbacks of each method and explains how to apply them step-by-step.

- **Module D: Hygiene**
  This module includes personal, as well as environmental hygiene. Its focus is hand washing with soap, which is considered to be the single most important hygiene measure to prevent the spread of pathogens. A special lesson for menstrual hygiene management is included.

- **Module E: Sanitation**
  The lessons of this module focus on the proper use of toilets and latrines.

Most lessons are designed for primary schools. Some specifically labelled lessons, such as the lesson about menstrual hygiene, are intended for older students. Combined with modules from other sections, such as “WASH Scientists” or “WASH Engineers”, the WASH School Lessons can be appropriate and attractive as well for older children.

Welcome to the WASH School Lessons!

Methodology

The lessons are based on the life-skills approach, and are inspired by the participatory teaching and learning methods PHAST and CHAST. These methods were selected because they have been shown to be helpful in empowering school children to improve water, sanitation and hygiene (WASH) practices at school and at home.

Life skills approach

The lessons pursue the life-skills approach of developing and improving knowledge, attitudes and skills.[1]

- **Development of knowledge:** Development of knowledge includes facts, for example, about diseases, and an understanding of the relation of facts, such as how drinking safe water reduces the risk of diseases.

- **Development of attitudes:** Attitude includes personal biases and preferences, and can predispose peoples' actions. For example, the attitude of viewing open faeces as a problem predisposes people to safely dispose faeces.

- **Development of skills:** Skills are learned capacities to achieve predetermined results. The focus of the lessons is developing hands-on skills, for example, proper hand washing.

PHAST (Participatory Hygiene and Sanitation Transformation)

PHAST is an innovative approach designed to promote hygiene behaviours, sanitation improvement and community management of water and sanitation facilities among adults. The underlying principle of PHAST is that no lasting behavioural change will occur without health awareness and understanding. PHAST focuses on specifically developed participatory techniques, which allow community groups to discover existing problems for themselves. This is followed by analysis of one's own behaviour and subsequently the development of solutions to problems.[2]

CHAST (Children's Hygiene and Sanitation Training)

The CHAST approach adapts PHAST for use with children. Children have less knowledge and experience and fewer responsibilities. They are also naturally inquisitive and eager to learn. The CHAST approach takes advantage of these natural attributes. It involves the use of images, games, role-play, songs, and puppet shows to communicate hygiene messages in a fascinating and memorable way.[3]

[1] *IRC: Life Skills-Based Hygiene Education. 2004.*
[2] *PHAST: Step-by-step Guide. 1998.*
[3] *CHAST: A Practical Facilitation Handbook. 2009.*

Composition of the lessons

All lessons have the same basic structure:

- **Page with Teacher's information:** The page with Teacher's information provides key information for the preparation of a WASH School Lesson. It includes an overview of the objectives, the time required and the materials for the lesson.

- **Introduction with key messages:** Introductory key messages orient the children about the key elements of the lesson.

- **Exercises with basic information, problem identification and analysis:** The combination of basic information, problem identification and analysis aims at increasing knowledge and changing one's attitudes.

- **Exercises with solution development and hands-on practice:** The solution to a problem should be developed jointly by teachers and students whenever possible. It is essential for children to learn existing solutions for the identified problems and about their ability to solve them independently. Immediate application of the solutions is the first step of integrating them into day-to-day school life.

- **What did we learn today?:** Repetition questions help to anchor the new knowledge, attitudes and skills. It is aligned with the objectives and key messages of the lesson.

- **Message to bring home:** The involvement of parents, grandparents and also brothers and sisters is crucial for the continuous development of the skills of the children. This section shall help students to transfer the topics of every lesson into their family life.

The lesson can be combined with modules from other sections to mix teaching in the classroom with scientific experiments, games or other activities.

For a lively and interesting class, we highly recommend enriching the lessons with information about the local context or playful and creative activities, such as songs, games or puppet shows. General background information for all five topics are available in the section "WASH Experts".

Module A: Water & Health

Lesson: Introduction to Water & Health

Teacher's information

Preparation for the teacher

Identify the key areas associated with water and hygiene at school, such as water storage containers or hand washing stations

Objectives – Knowledge

Know the water-related problems at school

Know five good behaviours to prevent diseases

Objectives – Attitudes

Consider water as a precious resource

View open faeces as a problem

Objectives – Skills

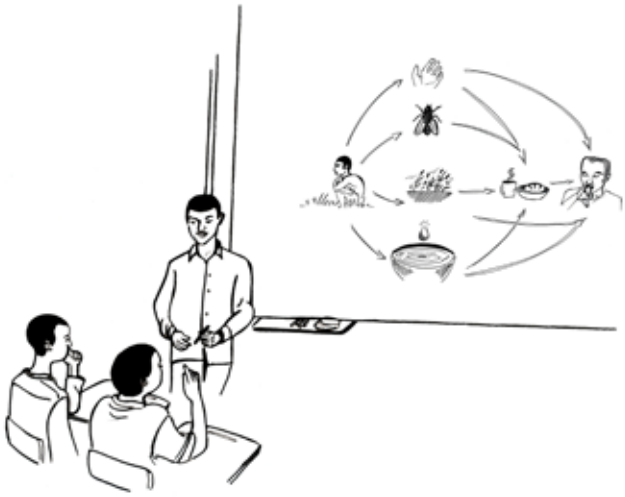
Be able to distinguish a "clean" from a "dirty" household

Time

90 minutes

Materials

Images: Water cycle, Personal water use, Disease transmission routes, Disease transmission barriers, Dirty household and clean household



Teacher explaining the disease transmission routes

Key message of the lesson

- **Water is the basis of all life, but it can also cause illness and death.**
- **Faeces can contain millions of dangerous small organisms.**
- **The diseases are normally transmitted via fingers, flies, fields, fluids, and food.**

The origin of water

Image: Water cycle

1. Divide the class in groups and distribute the same image of the water cycle to all the groups. Let the children discuss the water cycle in the group and create a story about a water drop.

   Alternative for young children: Explain the water cycle by telling the story of a raindrop: "Once upon a time there was a raindrop floating on the sea. The sun warmed the water and the drop evaporated. It rose as water vapour. With many other drops, it formed a cloud ..."

2. Ask one child of each group to present his/her story in front of the class.

Water cycle

Personal water use

Images: Personal water use

1. Distribute the images “Personal water use” to the children and let them look at the images.

Drinking water

Playing with water

Cleaning face

Washing clothes

2. Ask them to describe the water use on their images before hanging them on the wall.

3. Inform the children about the links between water and hygiene.
   - Water is used for many hygiene behaviours, such as hand washing or brushing teeth.
   - Water is the basis of all life, but it can also cause illness and death.

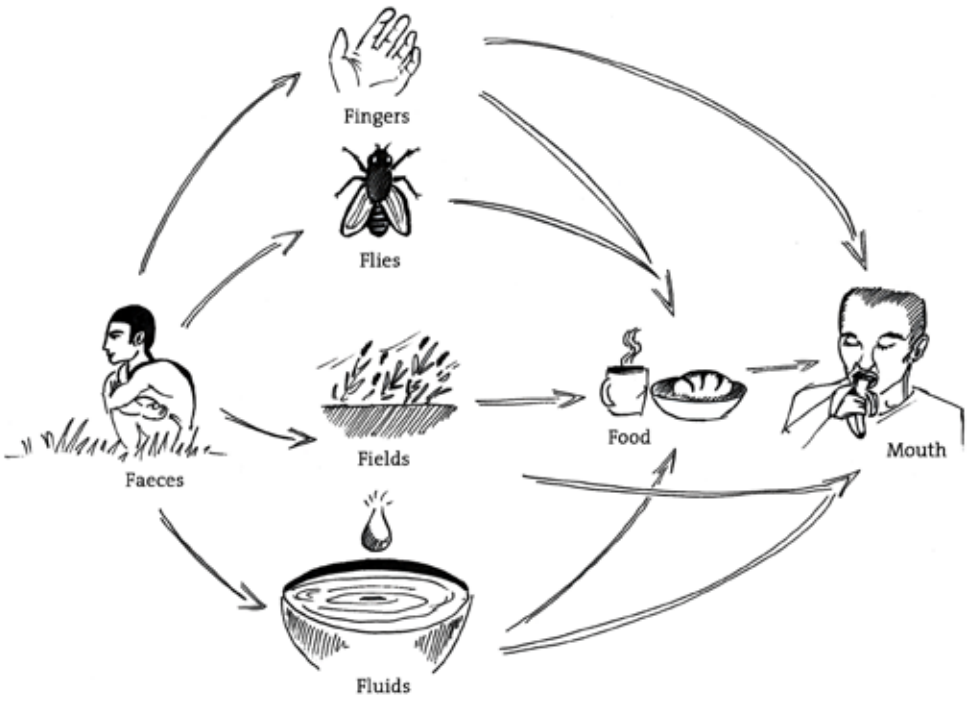
Woman washing clothes with soap

Disease transmission routes

Images: Disease transmission routes

1. Inform the children about the dangerous organisms in faeces and their dissemination via the faecal-oral route.
   - The diseases are mostly spread by organisms found in human excreta.
   - One gram of human faeces can contain 10000000 viruses, 1000000 bacteria, 1000 parasite cysts, and 100 parasite eggs.
   - The diseases are normally transmitted by faecal-oral routes via fingers, flies (insects), fields, fluids, and food.

2. Divide the class into groups and distribute the images “Disease transmission routes” to all the groups.



Disease transmission routes (F-Diagram)

3. Let the children arrange the images of the disease transmission routes. Give them an example of one disease transmission route, such as faeces - fingers - mouth.
   - What are the different routes by which pathogens are transmitted from the faeces to the mouth?

4. Let the groups show and explain their diagrams to the other groups. Ask them for local examples of disease transmission.

Disease transmission barriers

Images: Disease transmission routes, Disease transmission barriers

1. Place the disease transmission routes in front of the class.

2. Have the class place the images of “Disease transmission barriers” on the right place.

   Optional: As the distributed images do not cover all situations, the groups could draw additional transmission barriers, such as covering food or cooking food.

Latrine

Safe water storage

Boiling

Washing hands

3. Ensure understanding of the disease transmission routes and repeat that there are easy and efficient ways to create disease transmission barriers.
   - Water quality improvements (e.g., water treatment)
   - Hygiene improvements (e.g., hand washing, food storage)
   - Sanitation improvements (e.g., proper use of toilet)

Disease causes at home

Images: Dirty household and clean household

1. Inform the children about the most prevalent local diseases and their symptoms. Include information about diarrhoea.
   - Diarrhoea causes people to lose liquid from their bodies and can result in death.
   - Many diseases can be prevented efficiently by drinking safe water, washing hands properly and disposing faeces safely.

2. Divide the class into two groups. Hand out the images “Dirty household” to one group and the image “Clean household” to the other group. Let them discuss the images and prepare a presentation in front of the class about the good and bad behaviour as illustrated by the images.

Dirty household

Clean household

3. Tell the group with the image “Dirty household” to present its image. Help the children name all the bad behaviours shown on the image.
   - Flies in the house, chicken on water storage container, open defecation from child and animals, open waste disposal, faecal contamination of the water source, untied animals near the house, unhygienic food storage.

4. Tell the group with the image “Clean household” to present its image. Help the children name all the good behaviours shown on the image.
   - Protected water source, latrine, tied animals, distance between house and animals, water-storage container with lid, clean house, container for waste disposal.

5. Explain the key message of the two images.
   - The family in the “Dirty household” has a greater risk of becoming ill due to bad handling of water and poor hygiene practice.
   - The family in the “Clean household” has a reduced risk of becoming ill as it applies easy and efficient improvements and practices.

Practical Exercise – Water and health walk

1. Walk around in the school compound and show the different points related to water and health to the students, such as the water source, water storage containers, hand washing station or toilets

2. Show the children what the school has already undertaken to improve the health situation and point out the remaining challenges.
   - Positive examples: soap available, clean toilet, sufficient water supply
   - Negative examples: no soap available, dirty toilet, insufficient water supply

What did we learn today?

Can organisms come from faeces into your mouth? How?

Can we take action to prevent diseases? Which actions?

What distinguishes a “clean” from a “dirty” household?

Message to bring home

Faeces can contain millions of dangerous small organisms.

Open faeces are a threat to health.

Possible situation during the water & health Walk

Module B: Water Contamination

Lesson: Introduction to Water Contamination

Teacher's information

Objectives – Knowledge

Know the difference between safe and unsafe water

Know the potential water contamination stages

Objectives – Attitudes

Reject the use of unsafe water

Regard safe storage of water as an integral part of water treatment

Objectives – Skills

Capable of storing water safely and handling it hygienically

Time

90 minutes

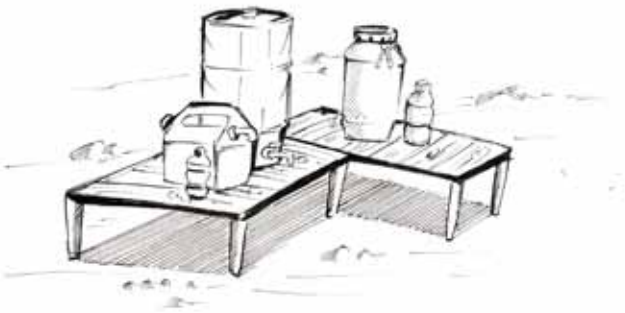
Materials

1 glass/cup

0.2 litre of safe water

1 twig

Images: A look into water, Water sources, Water contamination, Water recontamination



Safe water station with storage containers and bottles

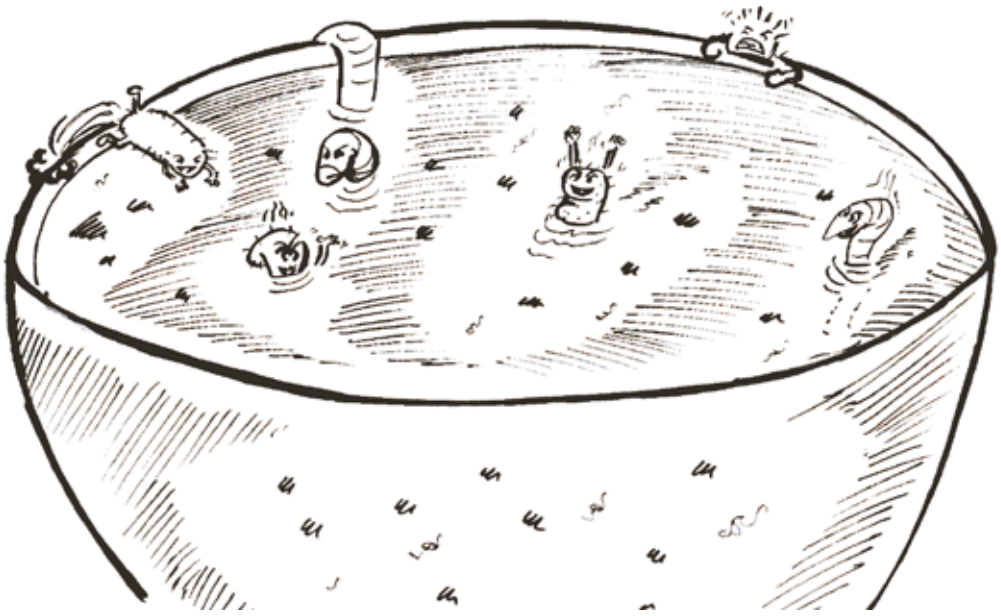
Key messages of the lesson

- **Water contamination can occur at the source, during transport or through improper storage.**
- **Safe water does not remain automatically safe.**
- **Recontamination of water can be prevented by simple measures.**

Safe water

Image: A look into water

1. Explain the differences between safe and unsafe water.
   - Water contains very small organisms like bacteria and viruses that are invisible to the human eye. Some of the small organisms pose a severe threat to human health as they cause different diseases with the following symptoms: vomiting, stomach pain or diarrhoea.
   - Also, clear water can be contaminated.
   - Safe water is free from disease-causing organisms and harmful chemical substances.



A look into contaminated water

Water quality at the source

Images: Water sources

1. Ask the children what kind of water source they use.
   - Where does your water at home come from?
   - Do you know other water sources?

2. Hang up the images “Water sources”. Discuss the quality of the different water sources and explain how to protect them.
   - Groundwater is usually much purer than surface water but may also be contaminated.
   - The risk of surface water contamination is very high.
   - Rainwater harvested from sheet or tile roofs is relatively pure.

3. Explain the water source of the school to the students.

River

Pond

Protected well

Rain

Water contamination and recontamination

Images: Water contamination, Water recontamination

1. Divide the children into groups and distribute the series of images “Water contamination” to each group. Let the groups discuss the images and arrange them in the correct order.

Unsafe water storage

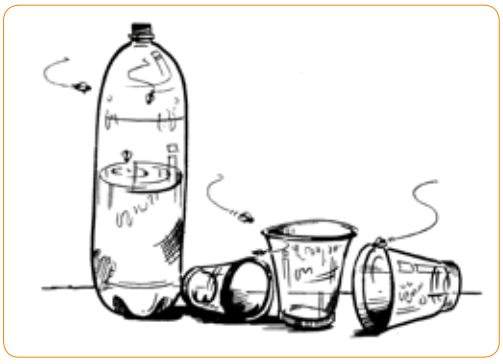
Diarrhoea

2. Ask one child of each group to hang up the series of images and to present the story of water contamination.

3. Inform the children that water can get contaminated at the source, during transport or through improper handling and storage. Start a discussion about the different stories.
   - Are the stories similar?
   - At which stage did the people make mistakes? What could they improve?

4. Show the images “Water recontamination“. Ask the children to identify the topic of the images and to group them into the categories “good behaviour” and “bad behaviour”.

Safe water storage



Dirty bottles and cups

5. Explain the different actions to prevent recontamination of safe water.
   - Transport the water safely to the storage place.
   - Store the water safely.
   - Wash hands, cups and dippers with soap before using the water.

Practical Exercise - Do not drink contaminated water

Materials: 1 glass/cup, 0.2 litre of safe water, 1 twig

1. Fill the glass with safe water and ask if anyone is willing to drink it. Let him/her take some sips. If there is no safe water available, fill the glass with available water and continue with the next step.

2. Walk through the school or the community and find some open faeces. Take a piece of grass or twig, touch the faeces and dip it into the water.

3. Ask if anyone is willing to now drink the water. Normally, nobody wants to drink it. Ask why they refuse to drink it. Emphasise the fact that water can also be contaminated if it is clear. If some children want to drink the water, do not let them. Repeat the message about the dangerous faeces.

4. Dispose or clean the used materials properly.

Water and faeces

What did we learn today?

Why is some water not safe for drinking?

Do you think the water you drink at school is safe?

How do you store water safely?

Would you drink water contaminated with faeces?

Message to bring home

Water can be contaminated at the source, during transport or through improper storage.

Safe water does not remain automatically safe.

Recontamination of water can be prevented by simple measures.

Module C: Water Treatment

Lesson: Introduction to Water Treatment

Teacher's information

Preparation for the teacher

Organize some locally available water treatment products, such as a SODIS-bottle or chlorine solution, and filters.

Homework for students

The students should bring water treatment tools used at home, such as bottles, chlorine solution, and filters.

Objectives – Knowledge

Know four water treatment methods

Objectives – Attitudes

Consider household water treatment as important for health

Objectives – Skills

Capable of pretreating turbid water

Time

45 minutes

Materials

Locally available water treatment products
1 litre of turbid raw water
1 cloth and vessel or other materials for water pretreatment
Images: Water treatment

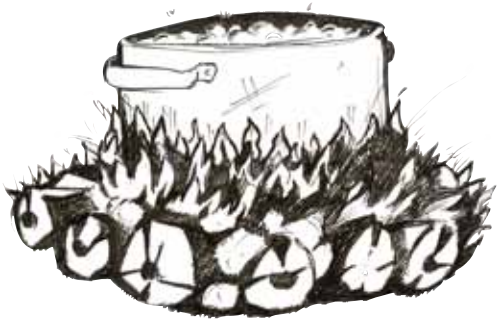
Key messages of the lesson

- **Solar water disinfection, chlorination, boiling, and filtration are water treatment-methods used at home or at school.**
- **All the methods have advantages and drawbacks.**

Water treatment at home

Materials: Water treatment products

1. Invite the children to show the water treatment products they brought from home and start a group discussion about water treatment.
   - Do you treat the water at home? How? How often?
   - Do your friends or neighbours treat the water? How? How often?
   - Are you connected to a centralised water supply?



Vessel for boiling

Chlorine in flask

PET bottle

Water treatment methods

Images: Water treatment

1. Inform them about the concept of water treatment.
   - Water treatment destroys the pathogenic microorganisms in the water.
   - Water treatment makes the water safe and prevents diseases.

2. Explain the SODIS method and show related tools.
   - The SODIS method is very easy to apply. All it requires is sunlight and PET bottles.
   - A transparent PET bottle is cleaned with soap. The bottle is filled with water and placed in full sunlight from morning to evening. The UV-A rays in sunlight kill germs. After at least six hours the water is disinfected and can be consumed.

3. Explain chlorination and its key steps and show related tools.
   - Chlorine is a disinfectant that kills germs.
   - Chlorine exists in tablet and liquid form or as granular powder.
   - Care should always be taken when working with chemicals.

4. Explain boiling and show related tools
   - Boiling treats the water by heat treatment.
   - Rule of thumb: water should be brought to rolling boil for one minute.

5. Explain filtration with focus on the locally available filters and show related tools.
   - Water impurities are removed with a filter by means of a fine physical barrier, a chemical or a biological process.

6. Divide the children into groups and distribute the series of images “Water treatment” to each group. Let the groups discuss and arrange the images in the correct order. Support the school children in finding the correct order. One child of each group hangs the series on the wall and tells the story of water treatment.

SODIS method

Chlorination

Practical Exercise – Pretreatment of turbid water

Materials: 1 cloth and vessel or other materials for water pretreatment

1. Explain the reason for reducing water turbidity.
   – If the water is turbid, pretreatment is necessary for efficient functioning of the chlorination, the SODIS method and filtration.

2. Demonstrate one or more locally practised water pretreatment method to reduce water turbidity.

Woman filtering water

What did we learn today?

Which water treatment methods do you know?
Is water turbidity important for water treatment?

Message to bring home

Solar water disinfection, chlorination, boiling, and filtration are water treatment methods.
These methods can be applied at school and at home.

Module C: Water Treatment

Lesson: Solar Water Disinfection

Teacher's information

This lesson contains two parts. On the first day, the children become familiar with the SODIS method and learn to apply it. On the second day, they can drink their own SODIS water.

Homework for students

The students should bring bottles to treat water with the SODIS method.

Objectives – Knowledge

Know the four steps of the SODIS method
Understand the SODIS method, its advantages and drawbacks

Objectives – Attitudes

Consider SODIS as a useful method for water treatment

Objectives – Skills

Capable of selecting a suitable bottle to apply the SODIS method
Capable of recognising when water is too turbid for the SODIS method
Capable of applying the SODIS method independently

Time

30 minutes (Day 1)
15 minutes (Day 2)

Materials

PET bottles
Water to fill the bottles
Soap
Images: SODIS method

Key messages of the lesson

- **The SODIS method is an efficient and easy method to disinfect water.**
- **The SODIS method only requires sunlight and PET bottles.**

SODIS method

Materials: Bottles brought from home
Images: SODIS method

1. Show the images "SODIS method" and introduce SODIS to the children.
   - The SODIS method is very easy to apply as it requires only sunlight and PET bottles.
   - Step 1: Wash the bottle well with soap the first time you use it.
   - Step 2: Fill the bottle with water.
   - Step 3: Expose the bottles to the sun from morning to evening for at least six hours.
   - Step 4: Store or drink the safe water.

Cleaning PET bottles

Filling bottles with water

Exposing bottles to the sun

Drinking safe water

2. Ask the children to show the bottles they brought from home. Explain why some bottles are suitable for the SODIS method and others not.
   - Good bottles: PET (symbol:), transparent, unscratched, not bigger than three litres
   - Bad bottles: coloured, scratched, damaged, bigger than three litres

3. Explain the advantages and drawbacks of the SODIS method in the local context.

Practical Exercise - The SODIS method (Day 1)

Materials: PET bottles, water, soap

1. Conduct Step 1: Wash the bottle well with soap the first time you use it.
   - Use appropriate bottles: PET (symbol:), transparent, unscratched, not bigger than three litres
   - Clean bottle and lid with soap

2. Conduct Step 2: Fill the bottle with water.
   - Turbidity test with newspaper or fingers. Turbid water needs to be pretreated.
   - Due to expanding warm water, do not fill the bottle to the top.

3. Conduct Step 3: Expose the bottles to the sun from morning to evening (sunny weather) or two days (cloudy weather)
   - Walk through the school area together with the children and look for a good place to practice the SODIS method. If available at school, use the SODIS station.
   - Lay the bottles horizontally on a clean surface in the sun where they will not be in the shade. If possible, place them on a reflective surface, like a sheet of corrugated iron.
   - UV-A rays of the sun kill germs.
   - Rule of thumb for cloudy weather: if less than half of the sky is clouded over, placing the bottles from morning to evening (at least six hours) will be sufficient to disinfect the water. If more than half of the sky is covered with clouds, the bottles must be placed in the sun for two consecutive days. The method does not work satisfactorily during days with continuous rainfall.

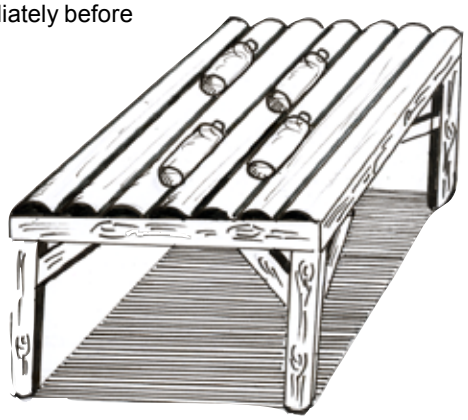
Student placing bottles on a SODIS table

Practical Exercise - The SODIS method (Day 2)

Materials: 1 PET bottle, suitable bottles brought from home

1. Take the bottles back to the classroom and ask the students to remember the first three steps of the SODIS-method.
   - Step 1: Wash the bottle well with soap the first time you use it.
   - Step 2: Fill the bottle with water.
   - Step 3: Expose the bottles to the sun from morning to evening for at least six hours.

2. Conduct Step 4: The water is ready for consumption. You can drink the water together or the students can take the bottles with them back home and drink it there.
   - The water can be stored for several days if the bottle is kept unopened after treatment and stored in a cool, dark place.
   - To prevent recontamination, drink the water directly from the bottle or pour it into a clean cup or glass immediately before drinking.



SODIS station

What did we learn today?

What are the four steps of the SODIS method?
Which bottles are suitable for the SODIS method?
Can we apply the SODIS method if the water is turbid?
Why is it important to expose the bottles for at least six hours?
Does the SODIS method work identically in sunny or cloudy weather?

Message to bring home

Explain or demonstrate the SODIS method.
Where could we place the SODIS bottles at home?
Where can I find bottles to apply the SODIS method?

Module C: Water treatment

Lesson: Chlorination

Teacher's information

Preparation for the teacher

Organize chlorine to treat the water.

Homework for students

The students should bring chlorine products to this lesson.

Objectives – Knowledge

Know different types of chlorine

Understand chlorination, its advantages and drawbacks

Objectives – Attitudes

Consider chlorine as a useful method for water treatment

Objectives – Skills

Capable of chlorinating 20 litres of water

Capable of recognising when water is too turbid for chlorination

Time

45 minutes

Materials

20 litres of water from a source used for drinking

Chlorine in different forms (locally available types)

1 jerrycan (20 litres) with water

Images: Chlorination

Key messages of the lesson

- **Chlorine is the most commonly used chemical disinfectant worldwide.**
- **Getting the correct dosage of chlorine ensures a good water taste.**

Water disinfection with chlorine

Materials: Chlorine in different forms
Images: Chlorination

1. Show the images "Chlorination" and introduce chlorination. Present the advantages and drawbacks of chlorination in the local context.
   - Chlorination consists in adding chlorine to water to purify it.
   - Chlorine is left for 30 minutes in the water to allow reactions with the germs.
   - Chlorine is the most commonly used disinfectant worldwide.

Disinfecting water with chlorine

Drinking safe water

2. Invite the children to present the chlorine products they brought from home.
   - Who uses chlorine products at home?
   - How often do you use chlorine at home?

3. Explain the use of the different chlorine products.
   - Chlorine can be found in different forms, such as tablets, powder granules or liquid solution.
   - Liquid chlorine can be produced with a simple device using only salt and water.
   - It is important to read the instruction of each chlorine product before using it.

Practical Exercise - Chlorination

Material: Chlorine product, 1 jerrycan (20 litre) with water

1. Add the correct amount of chlorine to the clear water in the 20 litre jerrycan.
   - Before treating with chlorine, the water must be clear.

2. Shake the container vigorously and wait 30 minutes before consumption.
   - The chlorine destroys microbes in 30 minutes.
   - Chlorine hinders recontamination. Properly stored, the water remains safe.

3. If possible, show the places where there is chlorinated water at the school.

What did we learn today?

What happens to the germs when chlorine is added to the water?

Why does chlorine hinder recontamination?

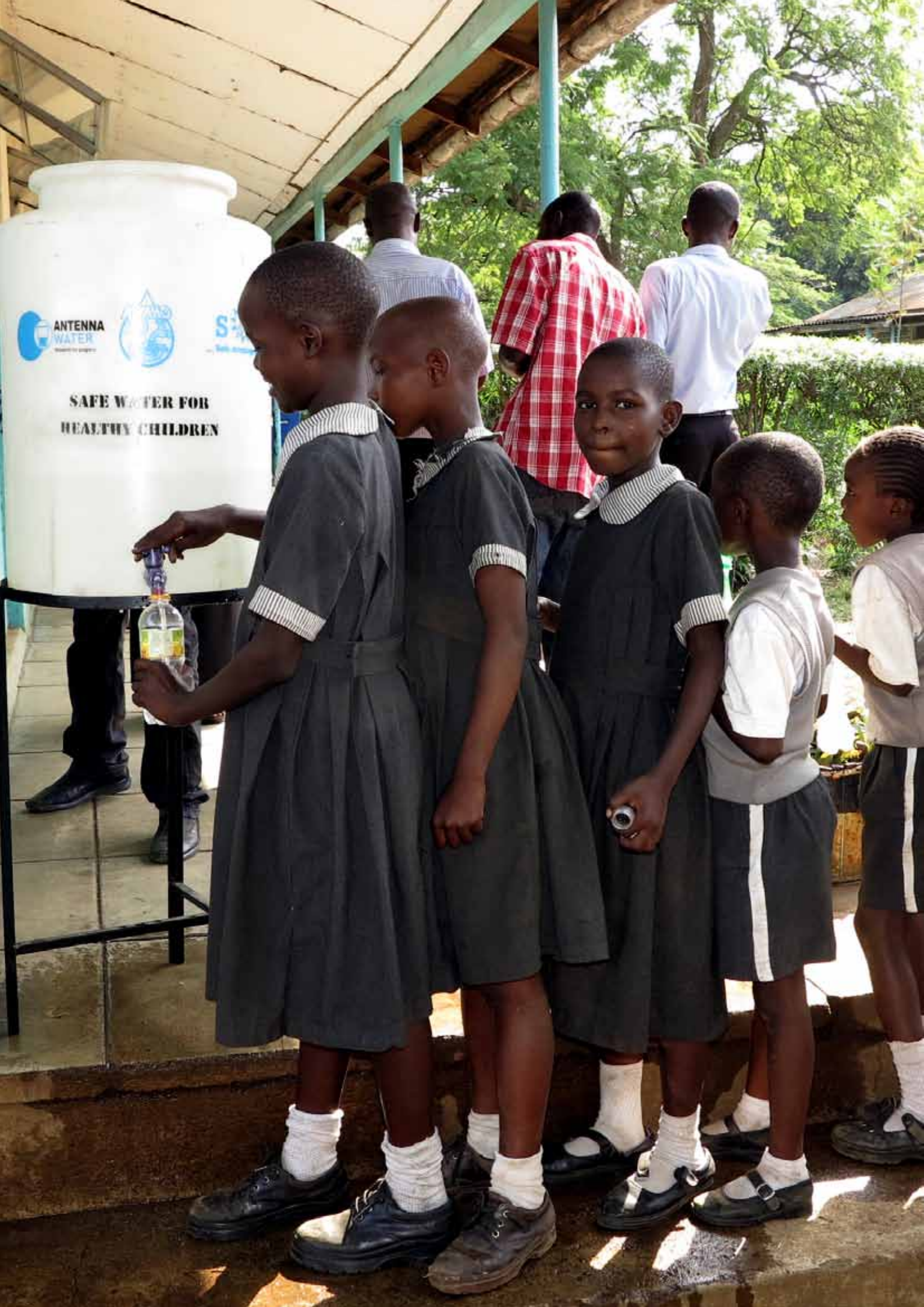
Why is it important to wait for 30 minutes before drinking the chlorinated water?

Message to bring home

Explain or demonstrate the chlorine method.

Do we have access to chlorine products?

Labelled chlorine solution


ANTENNA
WATER
SAFE WATER FOR
HEALTHY CHILDREN

Module D: Hygiene

Lesson: Introduction to Hygiene

Teacher's information

Objectives – Knowledge

Know two personal and environmental hygiene practices
Know three critical times of hand washing
Know three key steps of hand washing

Objectives – Attitudes

Willing to wash hands at school and at home

Objectives – Skills

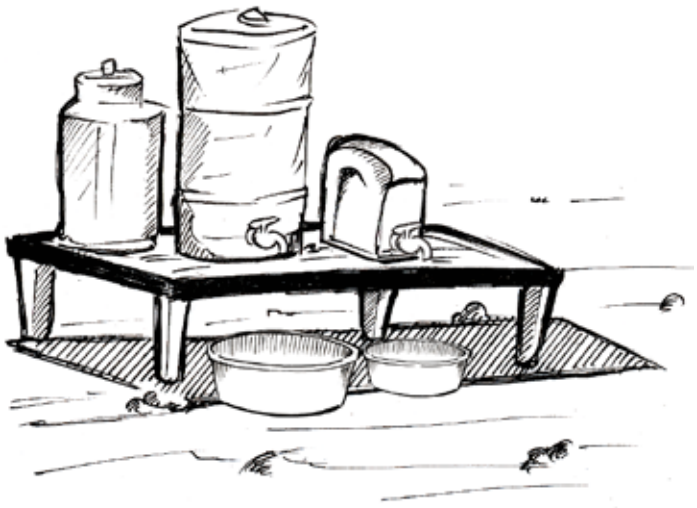
Capable of washing hands properly

Time

45 minutes

Materials

Soap/ash/detergent
Images: Clean hands



Hand washing station with containers and vessels

Key messages of the lesson

- **Hygiene includes personal and environmental hygiene practices.**
- **Hand washing is the single most important hygiene practice.**
- **Proper hand washing includes three key steps at three critical times.**

What is hygiene?

1. Ask the school children if they understand what hygiene is and which hygiene practices they know and already apply.
   - Hygiene is a set of practices performed for the preservation of health.
   - It includes personal and environmental hygiene practices.
   - Personal hygiene practices are: washing hands, washing children's hands and face, washing hair, brushing teeth, bathing regularly, etc.
   - Environmental hygiene practices are: cleaning your surroundings, food storage in covered containers, water source protection, etc.

Hand washing is the most important hygiene practice

Hand washing with soap

Images: Clean hands

1. Explain that the lesson focuses on hand washing because it is the single most important hygiene measure. An easy way to learn proper hand washing is the 3 x 3 method related to three critical times and three key hand washing steps.

2. Ask the children when they should wash their hands.
   - After defecating and after changing or cleaning babies
   - Before cooking or preparing food
   - Before eating or feeding children

3. Show the images “Clean hands”. Explain and discuss the three steps of hand washing. Emphasise the importance of using soap.
   - Wash both hands with water and soap, ash or detergent
   - Rub the front and back of your hands and in between your fingers at least three times
   - Dry hands

Dirty hands

Washing hands with soap

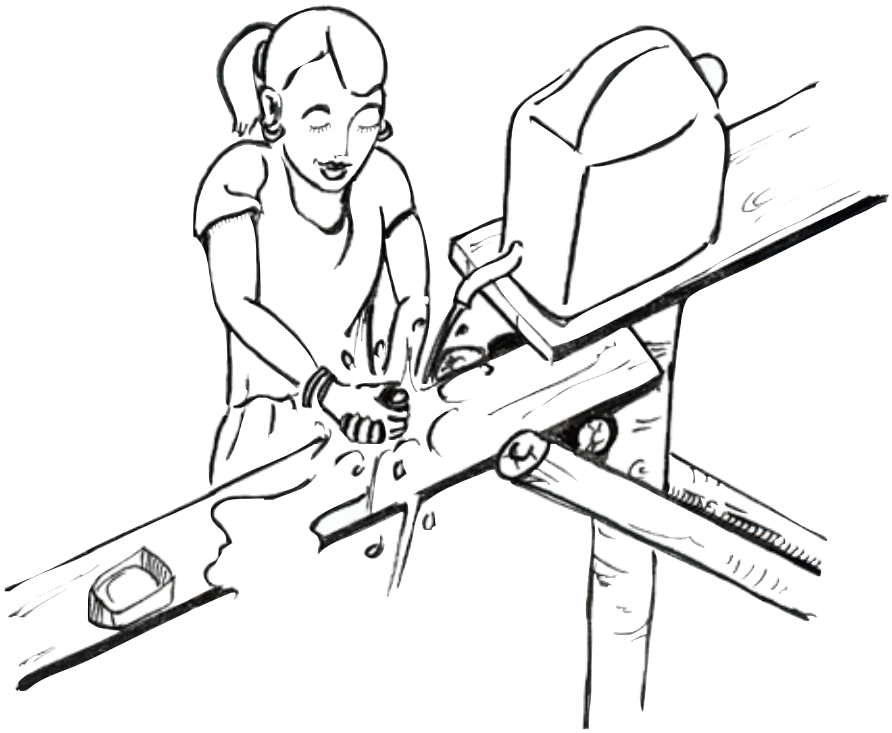
Rubbing front and back of the hands

Drying hands

Practical Exercise - Hand washing

Material: Soap

1. Practice together the three key steps of proper hand washing. The school children watch each other and those watching can comment on the correct steps.
   - Wash both hands with water and soap, ash or detergent
   - Rub the front and back of your hands and in between your fingers at least three times
   - Dry hands



Girl washes her hands with soap

What did we learn today?

Name two personal and environmental hygiene practices.

What are the three critical times of hand washing?

What are the three key steps of hand washing?

Why is it important to use soap for hand washing?

Message to bring home

Which hygiene practices do we apply at home?

Do we have soap?

Module D - Hygiene

Lesson: Menstrual Hygiene

The lesson is intended for children between the ages of 10 and 14.

Teacher's information

Menstrual hygiene is not only a matter for girls. Often, there are taboos and myths around the topic which impact the behaviour of the boys. Also, girls might need the support from brothers to maintain a good menstrual hygiene. Thus, it is important to educate both boys and girls on menstrual hygiene.

Ideally, this lesson is taught by a female and a male teacher together. If this is not feasible, a local nurse could take the part of the female teacher.

It is assumed that the children participating in this lesson have a basic understanding of the changes occurring in their bodies during puberty. This lesson does not claim to give information valid in all cultural settings, but intends to present a possible approach to the topic.

Preparation for the teacher

Discuss with other teachers existing beliefs, myths and taboos and find facts to verify if they are true.
Discuss with other teachers the challenges girls face at school and at home when they have their menses.
Discuss with other teachers how boys in their roles as classmates and brothers can help.

Objectives – Knowledge

Know about the local myths and taboos and if they are true.
Know the challenges that girls face when having their menses

Objectives – Attitudes

Challenge myths and taboos
Be supportive to girls and women who are having their menses

Time

45 minutes

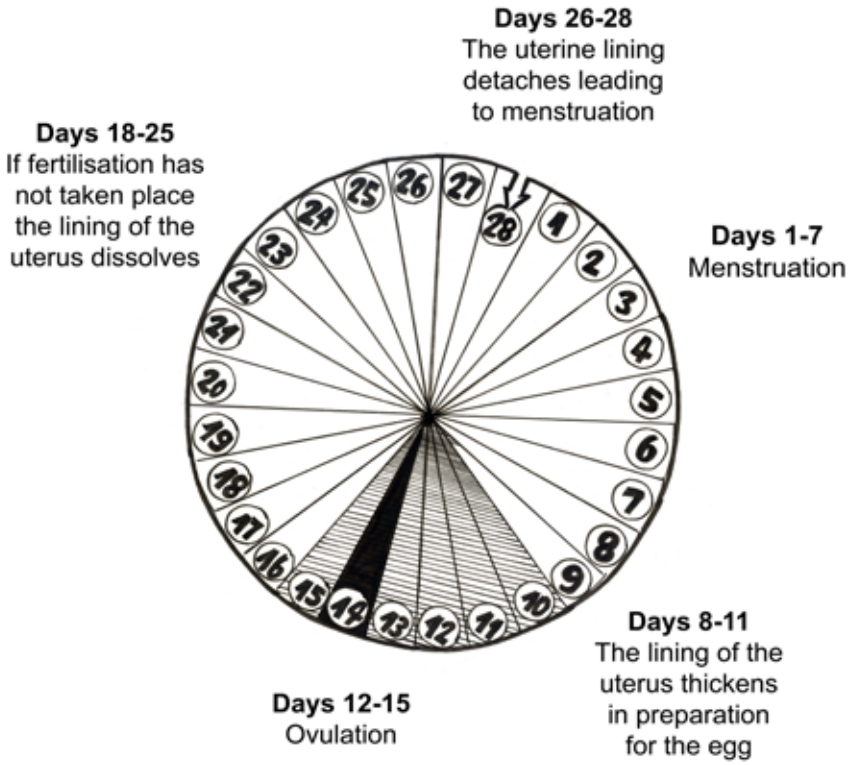
Key messages of the lesson

- **Menstruation is a natural part of every woman's life and is nothing to be ashamed of.**
- **Many myths and taboos around menstruation are false.**

What is menstruation?

1. Ask the school children if they understand what menstruation is?
   - Menstruation is the monthly discharge of blood of non-pregnant girls and women from puberty to menopause. It is natural.
   - The bleeding lasts from two to seven days.
   - The whole menstruation cycle takes about 28 days, but can vary between 19 and 35 days.
   - Girls typically start to menstruate between the ages of nine and 19. This is also the time when a girl becomes a woman and can get pregnant.

2. Reassure them that there are no stupid questions.



The menstrual cycle

Local beliefs and taboos

1. Divide the class into boys and girls and then, depending on the size of the class, into groups of three to five children. If possible, place the groups where they cannot hear each other.

2. Give some examples about local beliefs and traditions related to menstruation, such as:
   - while menstruating, girls and women are not allowed to touch certain foods
   - used sanitary napkins can be used for witchcraft

3. Ask the groups to write down what else they know about menstruation, what girls and women are not allowed to do during menstruation and what girls and women have to do during menstruation.

4. Collect and present the statements. For each statement, explain if it is true or false and present the facts.

Woman drying clothes and pads in the sun

Challenges girls face

1. Ask the groups to write down challenges girls face at school or at home when having their menses.

2. Collect and present the statements. Eventually complement them with other challenges you know of.

3. Discuss with the class, what role boys as classmates and brothers can have to help girls with their challenges.

Challenges	Role of boys as classmates and brothers
Cramps or other pain	Be patient and sympathetic
Need to go to the bath-room frequently	Respect this need
Feel sad, stressed or unhappy some days before the period	Be patient. These emotions are normal and cannot be avoided.
Many myths and taboos around menstruation	Challenge taboos, social norms and stigmas
Feel embarrassed when having their menses	Make clear that you think of menstruation as a natural thing

What did we learn today?

Are the myths you know about menstruation true or false?

What difficulties do girls have during their menses?

Message to bring home

Menstruation is a natural part of every woman's life and nothing to be ashamed of.

Many myths and taboos around menstruation are false.

Module E: Sanitation

Lesson: Introduction to Sanitation

Teacher's information

Objectives – Knowledge

Know the four steps of proper toilet/latrine use

Objectives – Attitudes

Be willing to wash bottom and hands after using the toilet/latrine

Objectives – Skills

Capable of using a toilet/latrine hygienically

Time

45 minutes

Materials

Soap/ash/detergent

Toilet with hand washing station

Key messages of the lesson

- **Sanitation is strongly linked to hygiene practices.**
- **The safe use of a toilet comprises four steps: safe disposal of faeces, hygienic anal cleansing, toilet cleaning, and washing hands with soap.**

Sanitation

1. Inform the children about sanitation.
   - Good sanitation means safe disposal of human urine and faeces.
   - The main problems are inadequate sanitation systems and unhygienic use of the existing sanitation system.

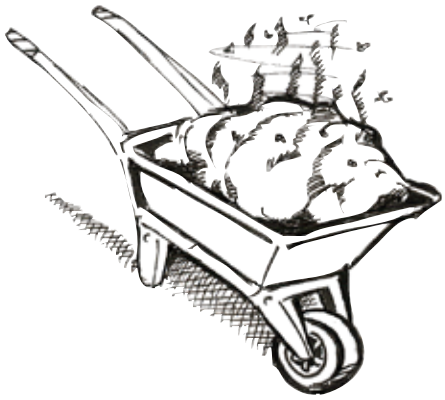
2. Ask the children where they defecate at home and at school. Emphasise the importance of safe faeces disposal.
   - One gram of human faeces can contain 10 000 000 viruses, 1 000 000 bacteria, 1 000 parasite cysts, and 100 parasite eggs.
   - Unsafe disposal of faeces poses a significant threat to human health.

Faeces generated at school

1. Show the children the importance of safe disposal of faeces by calculating the amount of faeces produced at school in one month.
   - 1 defecation of 100 g x faeces per day x number of people at school x 30 days.

2. Visualise the amount of faeces, for example, by comparing it with truck or wheelbarrow loads.
   - How many truck or wheelbarrow loads would be needed to transport all the faeces?

3. Explain what happens with open faeces and how they get back to the mouths of children.



Wheelbarrow with faeces

Practical Exercise - Proper use of toilet or latrine

If there is a toilet/latrine in the school area, go to it with the school children and demonstrate how to use it properly.

1. Show the correct position during toilet use.
2. Symbolically show how to squat so that all faeces drop down the hole.
3. Symbolically show how to clean the body after using the toilet and how to clean the toilet.
4. Afterwards, everyone should wash their hands.

What did we learn today?

Why is open defecation dangerous?

What are the four steps of proper toilet use?

How does a dirty latrine affect your health?

Message to bring home

Open defecation and dirty toilets/latrines affect our health.

Single pit latrine

Safe Water School

Training Manual

Section II: WASH Scientists


21 28 35 42 49 56 63
24 32 40 48 56 64 72
36 45 54 63 72 81

Module A: Water Treatment with WATA Technology

Scientific Practice: Chlorine Production with Mini-WATA

Teacher's information

There are currently two different Mini-WATA devices in use. The first generation produces 0.5 litres of concentrated chlorine in five hours, the second generation produces 0.5 litres of concentrated chlorine in three hours. Besides the chlorine production time, both devices follow exactly the same procedure.

This lesson provides information for the first Mini-WATA generation, producing chlorine in five hours. If you conduct the scientific practice with a Mini-WATA of the newer generation, please use its production time in the lesson. Please check the website www.antenna.ch/en/research/safe-water/wata-devices for further information about WATA-devices.

Preparation for the teacher

Read the Mini-WATA user guides "Mini-WATA" and "Mini-WATA - Use with solar power supply".

Objectives – Knowledge

Know the steps of chlorine production with the Mini-WATA

Objectives – Attitudes

Confident with the production of chlorine with the Mini-WATA

Objectives – Skills

Capable of producing chlorine with Mini-WATA
Capable of maintaining the equipment for chlorine production

Time

45 minutes (with a break of 5 hours)

Materials

Salt and container for saturated brine
Log-book to record chlorine production
1 Mini-WATA kit
Mini-WATA user guides: "Mini-WATA", "Mini-WATA - Use with solar power supply"

Mini-WATA

Materials: 1 Mini-WATA kit

1. Explain the Mini-WATA.
   - The Mini-WATA is a small device that produces liquid chlorine.
   - It requires only clear water, salt and an external power source.
   - The Mini-WATA fits snugly into a 0.5-litre plastic bottle.
   - It produces 0.5 litre of chlorine concentrate in five hours, enough to treat up to 2 000 litres of water.

Mini-WATA

2. Present the Mini-WATA kit materials in class and explain the two power supply options.
   - The Mini-WATA is supplied with clips that can be coupled to a solar panel of min. 10 watts.
   - If there is access to electricity, the Mini-WATA is supplied with a transformer that can be plugged into the network (110 V or 220 V).

3. Ask the children to touch and manipulate the device and explain the advantages of the Mini-WATA.
   - Simple – you only need water and salt
   - Robust – it does not break easily
   - Low cost – salt and water do not cost much
   - Production at source avoids transport and storage issues

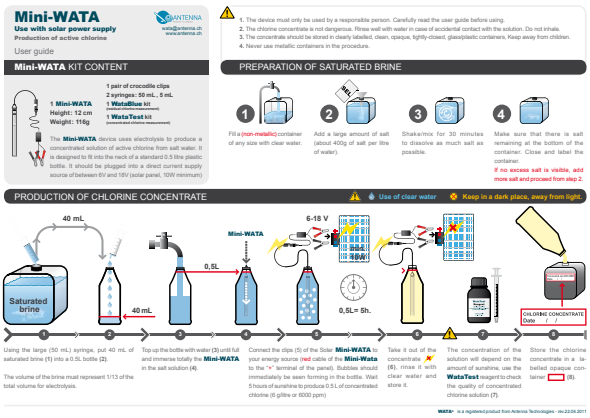
Preparation: Produce saturated brine

Materials: User guide "Mini-WATA", salt and container for saturated brine

1. Read together the user guide "Mini-WATA" and insist on the importance of following the described steps. There is no need to learn them by heart!

2. Choose a production place with the children that is cool, ventilated and shielded from sunlight. Explain the function of saturated brine, and prepare and label it according to the user guide "Mini-WATA".
   - Saturated brine is water with the maximum possible amount of salt.
   - It helps to use the correct amount of salt to produce chlorine.
   - It can be stored and reused. Please make sure that there is always salt remaining at the bottom of the container.

3. Ask one of the children to practise how to prepare saturated brine and ask the others to comment.



User guide „Mini-WATA"

Step 1: Produce chlorine

Materials: 1 Mini-WATA kit, user guides "Mini-WATA" and "Mini-WATA - Use with solar power supply", log-book to record chlorine production

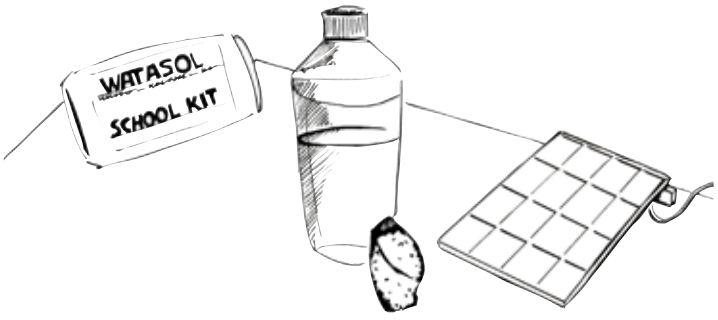
1. Demonstrate the production of chlorine according to the user guide "Mini-WATA".
   - Chlorine concentrate can be produced either with a solar panel or with electricity from the grid.
   - The Mini-WATA produces 0.5 litre of concentrated chlorine in five hours.
   - As soon as the Mini-WATA is connected to the power supply, bubbles will emerge from the container. This means the process is working!

2. Hand out a log-book to record chlorine production and ask the children to designate someone to fill it in.

3. Ask one of the children to practise the chlorine production and ask the others to comment on it.

4. While the Mini-WATA is running, talk with the children about the maintenance of the Mini-WATA and about the shelflife and safety of chlorine.
   - Maintain the Mini-WATA by rinsing with clear water after each use and not letting it run for ten hours in a row.
   - Use active chlorine within 24 hours of its production.
   - Chlorine is safe if the following points are considered: Do not inhale the concentration. Work in a well ventilated area. Never use a metallic container during the procedure. Do not drink the concentrated solution. Do not spill it on your clothes as it has bleaching power

5. After five hours, disconnect the Mini-WATA, complete the log-book, rinse the device with clear water and store all the materials in a secure place.



Mini-WATA kit with a solar panel. The bottle and the salt are used for the production of saturated brine.

What did we learn today?

How does the Mini-WATA work?

What precautions have to be taken to make chlorine production safe?

Background information: Chlorine production

Maintenance

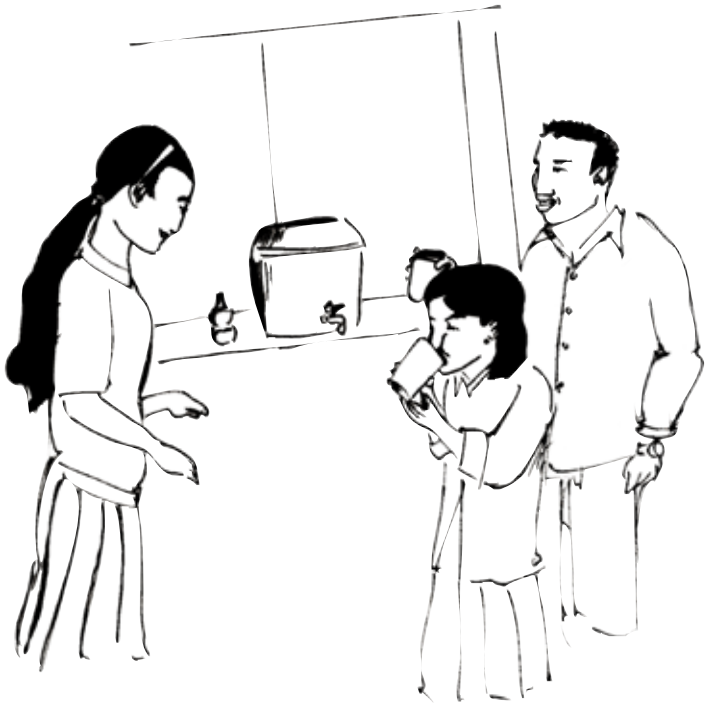
Rinse the Mini-WATA with clear water after each use. Do not use soap. Dip it in a solution of water and vinegar or lemon for one night when there is too much white deposit on it. Do not let it run for more than ten hours in a row. Clean the solar panel with a cloth and water to remove dust.

Shelflife of chlorine

Use active chlorine within 24 hours of its production. The concentration of active chlorine decreases with time. High temperature affects the stability of chlorine. You should measure its concentration with the WataTest before proceeding to treat water.

Rain

During rainy periods, the solar panel will not have enough energy to make the Mini-WATA work. Stop production, store all the materials in a proper place and start again when it is sunny. The process of chlorine production can be restarted. If you produce for two hours one day, the next day three hours will be sufficient to obtain the total offive hours needed.



Family drinking chlorinated water

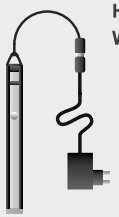
Mini-WATA

Production of active chlorine

ANTENNA Research for progress
wata@antenna.ch
www.antenna.ch

User guide

Mini-WATA KIT CONTENT



1 **Mini-WATA**
Height: 12 cm
Weight: 114g

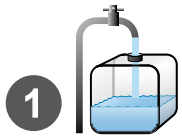
1 power supply 5V / 1A
2 syringes : 50 mL, 5 mL
1 **WataBlue** kit
(residual chlorine measurement)
1 **WataTest** kit
(concentrated chlorine measurement)

The **Mini-WATA** device produces concentrated solution of active chlorine from salt water, through an electrolysis process. It is designed in order to fit into the neck of a standard 0.5 litre plastic bottle. Its power supply accepts 110V or 220 V alternative current.

⚠

1. The device must only be used by a responsible person. Carefully read the user guide before using.
2. The chlorine concentrate is not dangerous. Rinse well with water in case of accidental contact with the solution. Do not inhale.
3. The concentrate should be stored in clearly labelled, clean, opaque, tightly-closed, glass/plastic containers, keep away from children.
4. Never use metallic containers in the procedure.

PREPARATION OF SATURATED BRINE



Fill a (non-metallic) container of any size with clear water.

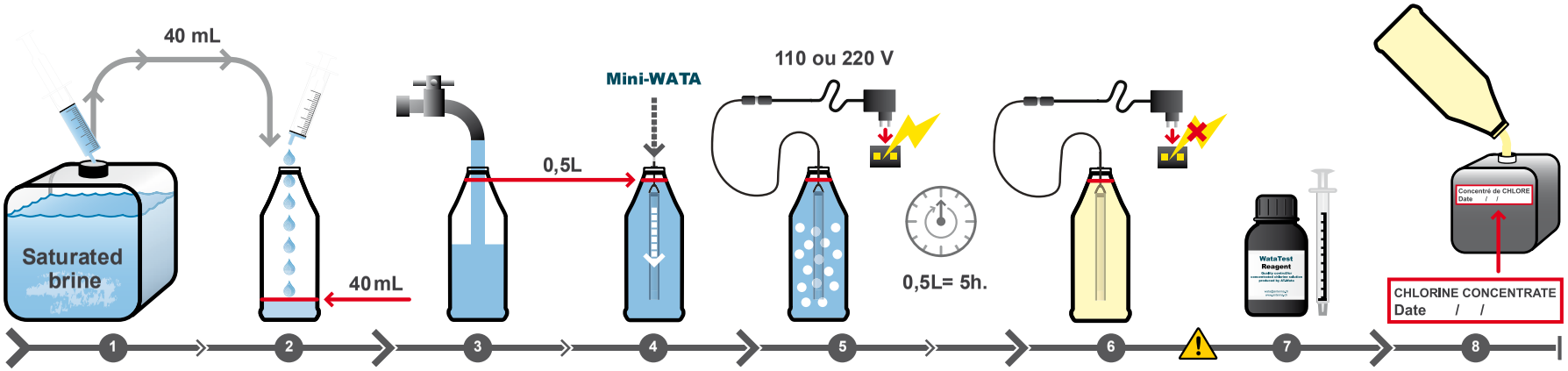
Add a large amount of salt (about 400g of salt per litre of water).

Shake/mix for 30 minutes to dissolve as much salt as possible.

Make sure that there is salt remaining at the bottom of the container.
Close it and label the container.
If no excess salt is visible, add more salt and proceed from step 2.

PRODUCTION OF CHLORINE CONCENTRATE

⚠ Use of clear water Keep in a dark place, away from light.



Using the large (50 mL) syringe, put 40ml of saturated brine **(1)** into a 0.5L bottle **(2)**.

The volume of the brine must represent 1/13 of the total volume for electrolysis.

Top up the bottle with water **(3)** until full and immerse totally the **Mini-WATA** in the salt solution **(4)**.

Plug in the **Mini-WATA** power supply **(5)** (110 or 220 V). Bubbles should immediately be seen forming in the bottle. Wait 5 hours to produce 0.5 L of concentrated chlorine (6 g/litre or 6000 ppm)

Unplug the device **(6)**. Take it out of water, rinse it with clear water and store it.

Proceed to the quality control check of the concetrated chlorine with **WataTest** reagent **(7)**.

Store the chlorine concentrate in a labelled opaque container **(8)**.

Mini-WATA

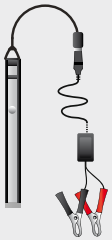
Use with solar power supply

Production of active chlorine

User guide

ANTENNA Research for progress
wata@antenna.ch
www.antenna.ch

Mini-WATA KIT CONTENT



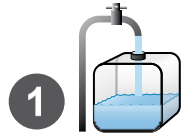
1 **Mini-WATA**
Height : 12 cm
Weight : 116g

1 pair of crocodile clips
2 syringes : 50 mL , 5 mL
1 **WataBlue** kit
(residual chlorine measurement)
1 **WataTest** kit
(concentrated chlorine measurement)

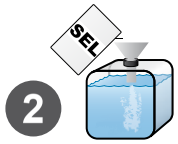
The **Mini-WATA** device uses electrolysis to produce a concentrated solution of active chlorine from salt water. It is designed to fit into the neck of a standard 0.5 litre plastic bottle. It should be plugged into a direct current supply source of between 6V and 18V (solar panel, 10W minimum)

1. The device must only be used by a responsible person. Carefully read the user guide before using.
2. The chlorine concentrate is not dangerous. Rinse well with water in case of accidental contact with the solution. Do not inhale.
3. The concentrate should be stored in clearly labelled, clean, opaque, tightly-closed, glass/plastic containers, Keep away from children.
4. Never use metallic containers in the procedure.

PREPARATION OF SATURATED BRINE



Fill a (non-metallic) container of any size with clear water.



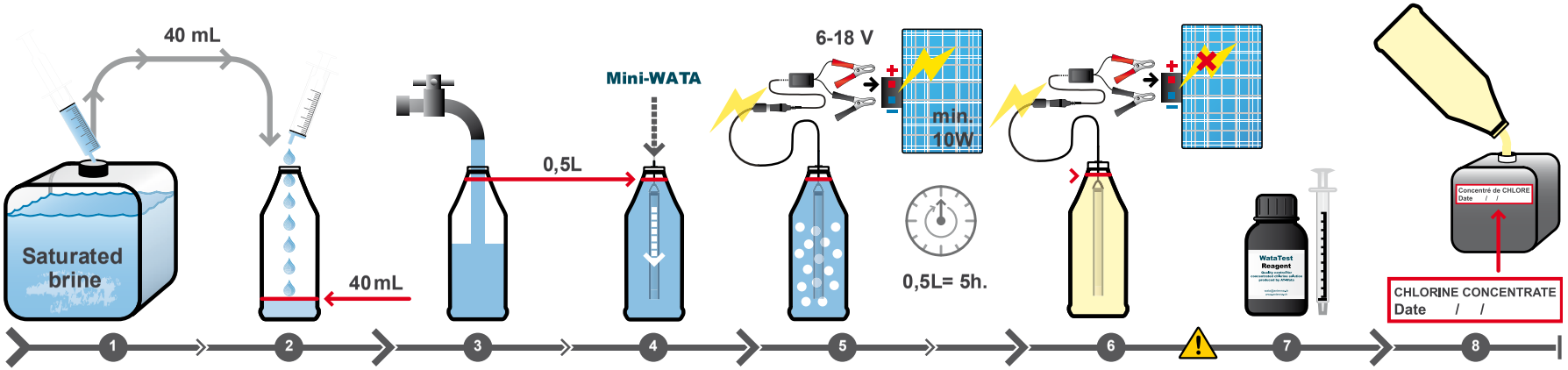
Add a large amount of salt (about 400g of salt per litre of water).

Shake/mix for 30 minutes to dissolve as much salt as possible.

Make sure that there is salt remaining at the bottom of the container. Close and label the container.
If no excess salt is visible, add more salt and proceed from step 2.

PRODUCTION OF CHLORINE CONCENTRATE

Use of clear water — Keep in a dark place, away from light.



Using the large (50 mL) syringe, put 40 mL of saturated brine **(1)** into a 0.5L bottle **(2)**.

The volume of the brine must represent 1/13 of the total volume for electrolysis.

Top up the bottle with water **(3)** until full and immerse totally the **Mini-WATA** in the salt solution **(4)**.

Connect the clips (5) of the Solar **Mini-WATA** to your energy source (red cable of the **Mini-Wata** to the "+" terminal of the panel). Bubbles should immediately be seen forming in the bottle. Wait 5 hours of sunshine to produce 0.5 L of concentrated chlorine (6 g/litre or 6000 ppm)

Take it out of the concentrate **(6)**, rinse it with clear water and store it.

The concentration of the solution will depend on the amount of sunshine, use the **WataTest** reagent to check the quality of concentrated chlorine solution **(7)**.

Store the chlorine concentrate in a labelled opaque container **(8)**.

Module A: Water Treatment with WATA Technology

Scientific Practice: WataTest

Teacher's information

Preparation for the teacher

Read the Mini-WATA user guide "WataTest reagent kit"

Prepare liquid chlorine at 6 g/l

Objectives – Knowledge

Know the steps of the WataTest

Objectives – Skills

Capable of testing concentrated chlorine

Time

45 minutes

Materials

Liquid chlorine at 6 g/l produced in advance

Log-book to record chlorine production

1 Mini-WATA kit

Mini-WATA user guide "WataTest reagent kit"

Labelled chlorine solution

Step 2: Test the chlorine concentration with the WataTest

Materials: User guide "WataTest reagent kit", 0.5 litre of liquid chlorine, log-book

1. Read the user guide "WataTest reagent kit" together and insist on the importance of following every step. There is no need to learn them by heart!

2. Demonstrate how to test the chlorine concentration with the WataTest according to the user guide. Use the chlorine produced in advance.
   - The Mini-WATA produces a solution of 6 g/l of chlorine.
   - It is important to test the solution to make sure the concentration is right.
   - The WataTest measures the chlorine concentration.

3. Explain the results of the WataTest.
   - The number of drops divided by two gives you the chlorine concentration.
   - 12 drops show a chlorine concentration of 6 g/l.

4. Ask one of the children to practise the procedure and ask the others to comment on it.

5. Explain and demonstrate the proper storage of the chlorine in an opaque plastic container and the importance of labelling the container with the concentration of chlorine obtained, the production and expiry date. Ask one child to prepare a label and stick it on the container with the chlorine concentration.

6. Complete the log-book with the children, choose a storing place which is cool and shielded from sunlight and store the container properly.

What did we learn today?

How does the WataTest work?

Background information: WataTest

Importance of WataTest

Mini-WATA reliably produces 0.5 litre of chlorine at 6 g/l after five hours. However, the concentration may vary due to the initial water quality, dosage and quality of salt, electrical supply quality, reaction time, and environment. It is, thus, important to check the chlorine concentration after each production. WataTest is a non toxic reagent used to check the chlorine concentration produced.

Adapting

If the strength is below 5 g/l, connect the Mini-WATA to the solar panel or the grid and continue the process. If it is 5.5 g/l or higer than 6 g/l, add chlorine to it according to the table:

Chlorine concentration in g/l	Amount of chlorine to be added (20 litres)
5.5	5.50 ml
6	5.00 ml
6.5	4.60 ml
7	4.28 ml

Chlorine storage and labelling

After each production, store chlorine in an opaque plastic container and label it with the concentration of chlorine obtained and date of production and expiry. Place the container in a cool place away from sunlight.

Chlorine flask

WataTest reagent kit*

Quality control check for concentrated chlorine solution produced by WATA

User guide

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WataTest KIT CONTENT

1 flask of WataTest reagent
1 syringe (1 mL) *to be used only for taking a* **WataTest** *reagent sample*
1 plastic pipette (3 mL) *to be used only for taking a chlorine concentrate sample*

⚠ **ALWAYS USE A CLEAN AND DRY SYRINGE TO TAKE THE WataTest SAMPLE**

PROCEDURE

1. Mix well the concentrated chlorine solution you want to measure.
2. Using the plastic pipette, take exactly 2 ml of chlorine solution and place it in a cup or small recipient.
3. Shake well the **WataTest** flask.
4. Fill the syringe with **WataTest** reagent and be prepared to count the drops you use. Close the flask immediately.
5. Add one drop of WataTest to the recipient and mix gently. If after a few seconds, the contents remain transparent, add another drop of **WataTest** reagent.
6. Continue to add drops of reagent until the sample remains a dark colour after mixing.

RESULT

Chlorine content (in g/L) = the number of WataTest drops divided by two.
Example: 12 drops = 6 g/L active chlorine
Any strength above 6g/L is fine. If the test shows a strength below 6g/ L, then change the instructions for diluting the chlorine. Check the details in your user guide for active chlorine.

STORAGE

Keep **WataTest** away from light and at room temperature (25°). To avoid liquid's oxydation close tightly the flask after each use. Beware of expiry date.

* this reagent is non-hazardous.

Module A: Water Treatment with WATA Technology

Scientific Practice: Water Treatment with Chlorine

Teacher's information

Preparation for the teacher

Read the Mini-WATA user guides "Use of active chlorine concentrate" and "WataBlue reagent kit"

Prepare liquid chlorine at 6 g/l

Objectives – Knowledge

Know the steps of the WataBlue

Objectives – Skills

Capable of treating water with chlorine

Capable of testing water with the WataBlue

Time

45 minutes

Materials

3 jerrycans (20 litres) of water from a source used for drinking

Log-book to record chlorine production

Cups

1 Mini-WATA kit

Mini-WATA user guides "Use of active chlorine concentrate" and "WataBlue reagent kit"

WataBlue test

Step 3: Treat water by adding chlorine

Materials: User guide "Use of active chlorine concentrate", 3 jerrycans (20l) of water, concentrated chlorine (6 g/l)

1. Read the user guide "Use of active chlorine concentrate" together and insist on the importance of following every step. There is no need to learn it by heart!

2. Demonstrate the treatment of water by adding chlorine to the first 20-litre jerrycan. Add the right amount of chlorine to the jerrycan.
   – right amount for 20 litres = 5ml of concentrated chlorine (6g/l)

3. Ask two of the children to treat the water of the remaining two 20-litre jerrycans by adding chlorine. Explain that one child should add too much chlorine and the other child should add insuffcient amounts of chlorine to the jerrycan. Ask the others to comment on it.

Step 4: Test free residual chlorine with WataBlue

Materials: User guide "WataBlue reagent kit", 3 water samples with different amounts of chlorine, WataBlue

1. Explain the concept of free residual chlorine.
   – Free residual chlorine stops the water from becoming recontaminated.
   – It indicates that enough chlorine was used to treat the water.
   – Very contaminated water needs more chlorine.

2. Present the three water samples to be tested (sample 1: not enough chlorine, sample 2: right amount of chlorine, sample 3: too much chlorine). Ask the children to describe how they smell and to identify the sample with the right amount of chlorine.

3. Explain the test of free residual chlorine with WataBlue according to the user guide "WataBlue reagent kit". Conduct the WataBlue-Test with the three water samples. Use a clean pipette for each sample.
   – A white sample indicates that there is not enough chlorine in the water.
   – A light blue sample indicates that the water is safe and has the right amount of chlorine to hinder recontamination.
   – A dark blue sample indicates that the water is safe and that too much chlorine was added, causing a bad taste.

4. Ask the children to practise the WataTest and discuss the water quality with them.
   – Chlorine prevents recontamination.
   – Properly stored water stays safe.

Water is safe to drink

Materials: Cups

1. Taste the safe water with the children. Say to them:
   – Congratulations, you have safely produced a concentrated chlorine solution and treated your water with it.

2. Discuss the amount of drinking water needed at school per day and calculate the amount of chlorine needed.
   – Amount of water needed per day at school = Number of school members x amount of water needed per day and person
   – Amount of chlorine needed per day at school: 0.25ml of chlorine (6g/l) is needed to treat 1 litre of water of average quality. Multiply this number with the amount of water needed per day at school.

3. Organise the production of chlorine. Designate a person to be responsible for operation and maintenance and keeping the logs.

What did we learn today?

How to you know that water is safe to drink?

Background information: Water treatment with chlorine

Water treatment with chlorine
The quantity of chlorine concentrate necessary for water treatment depends on the initial water quality. For water of average quality, 0.25 ml of chlorine produced with Mini-WATA is needed for every litre of water to be treated. Adapt the amount of chlorine to be added to water according to the water volumen.

Turbidity
For effective disinfection, water must be clear (with low turbidity, < 5 NTU).

Use of active chlorine concentrate

produced with WATA
Drinking water chlorination & Disinfection and cleaning

User guide

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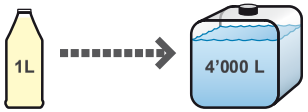
⚠ **The concentration of active chlorine decreases with time, it should be used within 24 hours after its production.**

DRINKING WATER CHLORINATION

The quantity of active chlorine concentrate necessary for water treatment depends on the initial water quality.
For water of average quality, **1 litre of concentrate produced using WATA is sufficient for the treatment of about 4 m³ of water**.

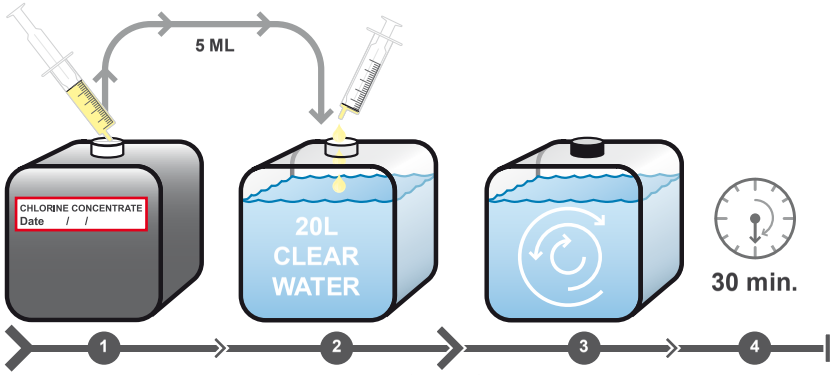
Active chlorine concentrate produced with **WATA**: **6 g/L**



Dilution **1 : 4000**
Clear water to treat

⚠
- Important: only chlorinate clear water. **If the water is cloudy or dirty, filter it before treatment.**
- Residual chlorine level for drinking water should be between 0.5 and 1 ppm.
- The treated water should be stored in a clean, opaque and closed container.
- Drinking water chlorination should always be performed under the supervision of a qualified person.

PROCEDURE



With a small syringe **(1)**, add 5 mL of chlorine concentrate to 20 litres of water **(2).**

Shake vigorously **(3)**.
Rinse the syringe thoroughly.
Wait 30 minutes (4) for the chlorine to act on any microbes.

The WataBlue reagent allows the measurement of the quantity of residual active chlorine in the water.

DISINFECTION AND CLEANING

The active chlorine concentrate produced with the **WATA** devices is used in the same way as bleach, using the following dilutions:

APPLICATIONS	VOLUME OF CHLORINE CONCENTRATE	VOLUME OF WATER	PREPARATION
• Washing food	1	100	Allow to react for 5 minutes then rinse with drinking water
• Dishes & crockery • Kitchen utensils • Work surfaces	1	5	Allow to react for 5 minutes then rinse with drinking water
• Floors • Bathrooms • Latrines	1	3	Allow to react for 5 minutes then rinse with drinking water
• Laboratory equipment • Pipettes & tubes • Boxes of human samples	1	1	Allow to react for at least 12 hours then rinse with drinking water

Disinfection of wounds: The active chlorine concentrate produced by **WATA** compares with Dakin solution.
For this use, the chlorine concentration must be of 6g/L.
WataTest reagent measures the concentration of chlorine.

Using a clean compress, apply the concentrated chlorine directly on the wound like a disinfectant.

⚠ **Surgery and sterilization:** Chlorine disinfection is not sufficient for surgical instruments. These have to be sterilized in an autoclave or a hot air oven.

WataBlue reagent kit*

Drinking water residual chlorine measurement check

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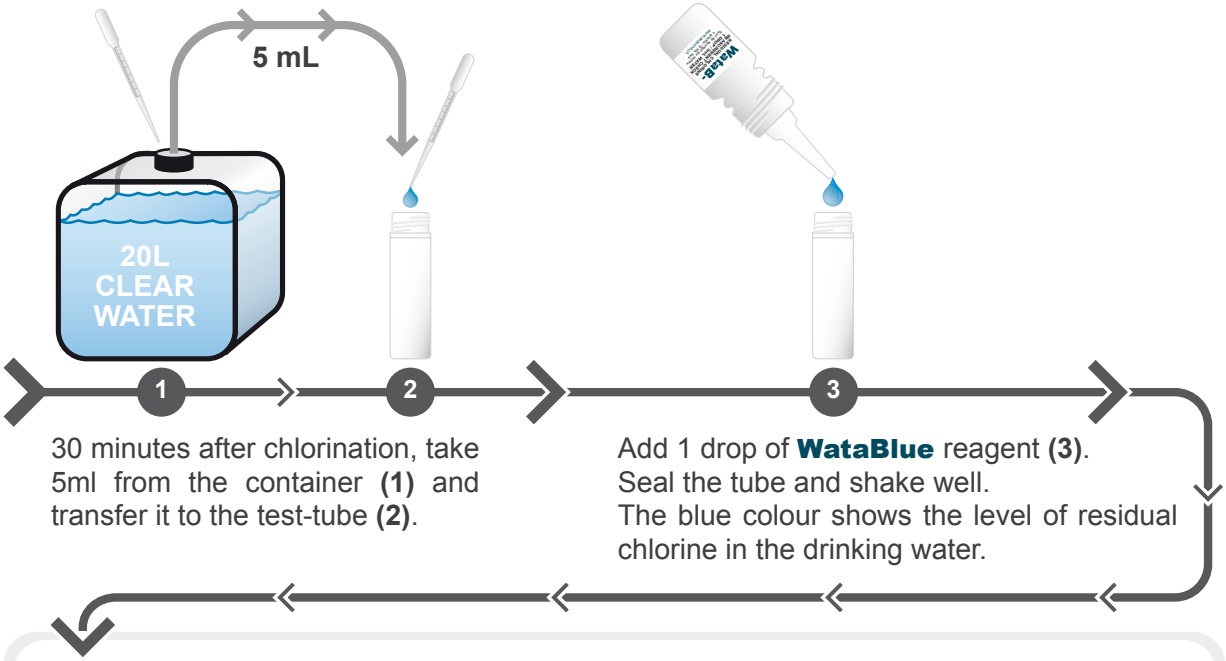
User guide

WataBlue KIT CONTENT

1 bottle of WataBlue liquid reagent
1 plastic pipette (3 ml) - *only to be used in the testing of water samples*
1 test-tube - *only to be used for this test*

QUALITY CONTROL PROCEDURE



30 minutes after chlorination, take 5ml from the container **(1)** and transfer it to the test-tube **(2)**.

Add 1 drop of **WataBlue** reagent **(3)**.
Seal the tube and shake well.
The blue colour shows the level of residual chlorine in the drinking water.

If the sample remains colourless, double the dose of chlorine in the water, wait 30 minutes and proceed from stage 1 (<0.5 ppm).

If the sample colour is light blue, you have safe drinking water (0.5-1 ppm).

If the sample colour is dark blue, reduce the chlorine dose by half, wait 30 minutes and proceed from stage 1 (>1 ppm).

Rince the test tube between 2 tests

STORAGE

Keep **WataBlue** away from light and at room temperature (25°). To avoid liquid's oxydation close tightly the flask after each use. Beware of expiry date. Please note that with time, the reagent can turn red/brown. This will not affect the quality of the test.

* this reagent is non-hazardous.


AT WATE

Module B: Water Quality Test

Scientific Practice: Measure the Quality of your Water

Attention: You will handle potentially hazardous material in this lesson!

Teacher's information

Preparation for the teacher

Prepare SODIS water, chlorinated water and raw water

Objectives – Knowledge

Know what the water quality test measures

Understand why E. coli is used as indicator bacteria

Objectives – Attitudes

Consider water quality testing as important

Objectives – Skills

Capable of testing water quality with supervision of a teacher

Time

30 minutes (Day 1)

30 minutes (Day 2)

Materials

1 ml of SODIS water

1 ml of chlorinated water

1 ml of contaminated raw water

1 waterproof pen

1 vessel with hot (> 70 ^{0}C) water

1 vessel for discharge

3 water quality tests (Compact Dry EC)

3 syringes

Image: A look into water

Key messages of the lesson

- **A water quality test can detect small organisms invisible to the human eye.**
- **The presence of E. coli bacteria indicates recent faecal contamination.**

Water quality test - Day 1

Image: A look into water
Materials: 3 water quality tests, 3 syringes, 1 ml raw water, 1 ml SODIS water, 1 ml chlorinated water, 1 waterproof pen

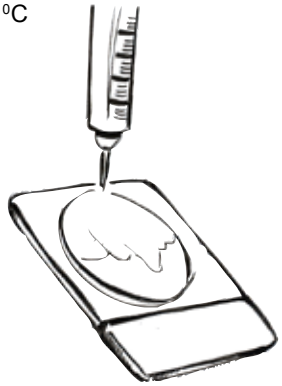
1. Explain why you carry out a water quality test. Show the school children the image "A look into water".
   - The water contains very small organisms like bacteria and viruses that are invisible to the human eye.
   - Some of the microorganisms pose a severe threat to human health as they cause different diseases with the following symptoms: vomiting, stomach pain or diarrhoea.
   - Because they are so small and invisible, we will conduct a water quality test to determine if the water contains dangerous small organisms.

2. Explain how the test works and why it measures E. coli.
   - E. coli is almost exclusively of faecal origin.
   - E. coli is easy to measure.

3. Prepare the water quality test together with the children.
   - It essential for the test to be carried out under the highest possible hygienic conditions. This includes personal hygiene (washing hands with soap), environmental hygiene (clean room) and materials that are disinfected with hot water (> 70 ^{0}C).

4. Inoculation of the E. coli plate
   - Use a 1-ml sterile syringe and fill it with the water to be analysed.
   - Remove the lid of the E. coli plate and place it face up on a clean surface. Do not touch the inside of the lid. Distribute the 1-ml water sample over the E. coli plate.
   - Close the lid.
   - Label the lid with the water type used (raw water, chlorinated water, SODIS water) and the date.

5. Incubation of the E. coli plates
   - Place the E. coli plates in a dry and dark place at a temperature of 25 – 35 ^{0}C for 24 hours.
   - Clean the other equipment and store it in a dry and clean place.



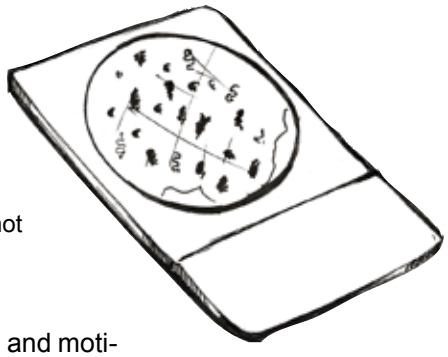
Inoculation of an E. coli plate

Results of the water quality test - Day 2

Materials: 3 water quality tests

1. Take the plates stored for 24 hours and carry out the last steps of the water quality test.

2. Count the E. coli with the children.
   - Count the number of blue spots (E. coli) and record the E. coli concentration for 100 ml of water by multiplying the count of a 1-ml sample by 100.
   - The red spots are coliform colonies. They do not have to be counted in this test because they do not indicate faecal contamination.



E. coli and coliform colonies

3. Interpret the test results together with the children and motivate the children to treat their water at school and at home.
   - Safe water does not show a single blue spot (E. coli colony).
   - Is there faecal contamination in the raw water?
   - Is there faecal contamination in the chlorinated water?
   - Is there faecal contamination in the SODIS water?

4. Dispose the used test.
   - Burn the test or disinfect it with hot water (> 70 ^{0}C) or with chlorine!

What did we learn today?

What is the purpose of a water quality test?
Is water disinfection with the SODIS method efficient?
Is water disinfection with chlorine efficient?

Message to bring home

Tell your family about the quality of the raw water, chlorinated water and SODIS water.
Explain to your family how you measured the water quality.

Background information: Water quality test

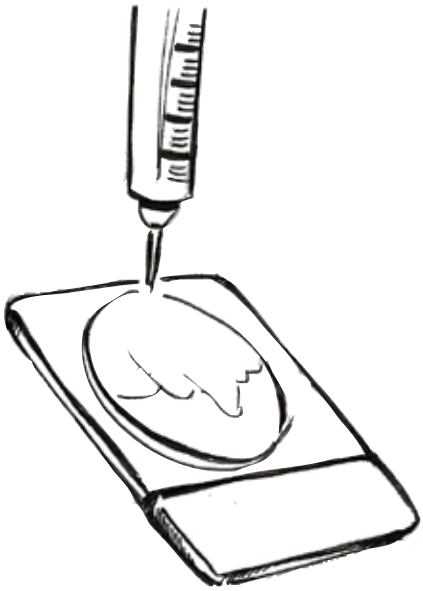
There are several types of water quality tests, which measure different indicators of water contamination, such as microorganisms, heavy metals or pesticides. The water quality test “Compact Dry EC” measures bacteria present in the environment and in the faeces of human and warm-blooded animals, such as cows or dogs. The test detects two groups of bacteria:

Total coliform bacteria
They are generally harmless and found in the natural environment (e.g., vegetation, soil). If only total coliforms are detected in drinking water, faecal contamination is unlikely.

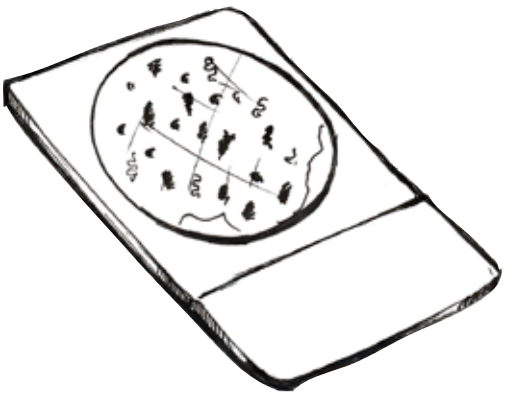
Escherichia coli (E. coli)
E. coli bacteria are present in great quantities in the intestines of humans. Most E. coli are harmless, but some strains can cause illness. The presence of E. coli in the water sample indicates recent faecal contamination.

Water quality tests require a well-equipped laboratory and trained staff. However, since such conditions are often unavailable, an adapted test method can be conducted with the following materials:

- 1 water sample
- 1 E. coli plate
- 1 syringe
- 1 vessel with hot water (> 70 ^{0}C)
- 1 vessel for discharge
- 1 labeling material, such as a waterproof pen, paper or stickers



Inoculation of 1 ml water sample



Result after 24 hours

Safe Water School

Training Manual

Section III: WASH Engineers

Overview - WASH Engineers

By combining education and infrastructure the school is able to create a hygienic environment with access to safe water. Solid installations with appropriate materials and the right location in the school allow the children to apply their skills and facilitates integration of new behaviours into everyday school life.

A Safe Water School contains four main infrastructural elements:

Water treatment station
The water treatment station is a place where the school water is treated. This manual includes descriptions for building and operating water treatment stations for the SODIS method and chlorination.

Safe water station
The safe water station is a clean and elevated place to store water. It is made up of a table or board and ideally also comprises a closet to store cups and glasses.

Hand washing station
Hand washing stations are fixed places where the children can wash their hands. The manual includes guidelines for the construction of two hand washing stations.

Toilet/Latrine
The installation of a toilet or latrine reduces open defecation. A guideline for construction of a single pit latrine is provided in this manual.

Principles for the choice of an adequate infrastructure

- **Facilities should be children-friendly**
  - Right size and age-appropriate
  - Easy to use
  - Easy to clean
  - Adapted to school size
  - Safe, not scary or smelly
  - Weatherproof

- **Facilities should be gender-friendly**
  - Separate sanitation facilities for boys and girls, male and female teachers
  - For older students, girls' menstrual hygiene needs must be met

- **Facilities should be environment-friendly**
  - Latrine site should not contaminate the water source
  - Wastewater drained or recycled
  - Safe solid waste collection and disposal

- **Facilities should be parent- and school budget-friendly**
  - Choose low-cost affordable models
  - Parents should be key stakeholders and involved in decisions related to finances, facility models, operation and maintenance

- **Facilities should be operation- and maintenance-friendly**
  - A good operation and maintenance plan needs to be in place
  - Students should be involved as much as possible in operation and maintenance
  - Financing plans for operation and maintenance should be put in place before starting any building or purchasing[4]

Toilet with hand washing station

[4] *USAID: Wash-friendly schools. Basic guide. 2010.*

Module A: Water Treatment Station

SODIS Station

The SODIS station is made of a solid place to treat water with the SODIS method. It facilitates the application and improves the efficiency of the method. The SODIS station consists of a locally manufactured table and ideally has a sheet of corrugated iron for additional water heating.

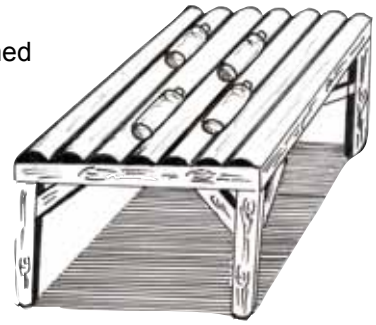
Place

The selected place should provide sufficient solar radiation and be easily accessed by children. If a table cannot be built, the SODIS station can also be positioned on a low roof or on a wall.

Table

The illustration shows a table built with wood and corrugated iron. Stability and additional water heating from the iron are its key assets. Bamboo or sticks can be used as an alternative construction material.

The size can be adapted according to the requirements. An inclined surface can direct the bottles perfectly towards the sun and increase the impact of UV-A radiation. The table should be high enough to prevent animals from urinating on it, but still reachable for children.



SODIS table with bottles

Bottles

We recommend the use of PET bottles when applying the SODIS method, as these are light and do not break. They are also readily available in many regions. However, glass bottles or special SODIS bags can also be used.

The bottles must be transparent and colourless. PET bottles with only a light bluish tinge are also suitable for the SODIS method. Heavily scratched bottles must be replaced. The bottles must not hold more than three litres, as UV radiation is reduced with increasing water depth.

Transparent and colourless PET bottle

Module A: Water Treatment Station

Mini-WATA Station

The Mini-WATA is a small and simple device to produce chlorine at 6 g/l. It requires clear water, salt and a power supply (solar panel or grid).

Place

A shady and well-ventilated area is ideal for using the Mini-WATA.

Mini-WATA kit

The Mini-WATA kit includes the Mini-WATA device and all the necessary materials to produce chlorine and control its quality.

Mini-WATA kit, water, salt and solar panel

It contains:

- 1 Mini-WATA device
- 1 solar panel (10 watt minimum)
- 1 pair of crocodile clips (for solar panel) or 1 power supply 5 V / 1 A (for electricity)
- 1 WataTest kit (for concentrated chlorine measurement)
- 1 WataBlue kit (for residual chlorine measurement)
- 2 syringes: 50 ml (for production of chlorine), 5 ml (for water treatment)
- 0.5-litre plastic container (for chlorine production and storage of chlorine)
- 2.5-litres container (for storage of all materials)

The chlorine produced and not used right away for water treatment, should be stored in a dark place. Thus, the provided 0.5-litre plastic container is best suited to protect chlorine from sunlight. If no opaque bottles are available, use a PET bottle and cover it by a cloth or some similar material. The Mini-WATA kit has valuable equipment. Store it in a secure place.

For the production of chlorine and the water treatment there are some further materials needed:

- For production of the saturated brine: clear water, 1 bottle and salt
- For water treatment: clear water, water storage tank, e.g., 20-litre jerrycan

Module A: Water Treatment Station

Safe Water Station

A safe water station consists of a table or board, which serves as a base for vessels or bottles to store the water, as well as cups or glasses for drinking. Ideally, it also comprises a closet to store cups and glasses.

Place

The safe water station should be located in a fixed, clean and elevated place.

Storage vessels

There are different locally available and low-cost vessels (buckets, pots, jerry cans, barrels, used beverage containers, flexible bags, and flagons). However, only some of these, in particular, jerry cans, some plastic beverage containers and some flexible vessels are suitable for safe water storage.

Safe water station with closet

Suitability of storage vessels is influenced by five key factors:

- **Ease of transport and use**
  The vessels are of 10 - 25 litre capacity for households, rectangular or cylindrical in shape with one or more handles, and have a flat bottom for ease of transport and storage.

- **Durability**
  The vessels are ideally made of light, oxidation-resistant plastic.

- **Cover**
  They are equipped with a 6 - 9 cm screw top that is small enough to discourage or prevent the introduction of hands or the dipping of utensils.

- **Safe withdrawal of water**
  The vessels are ideally fitted with a durable, protected and easily closed lid, spigot, spout or other narrow orifice for dispensing water.

- **Instructions**
  The vessels are ideally provided with pictorial and/or written instructions for use affixed permanently to the container, including an affixed certificate of approval or authenticity.[5]

[5] *Sobsey M. et al.: Managing Water in the Home. 2002.*

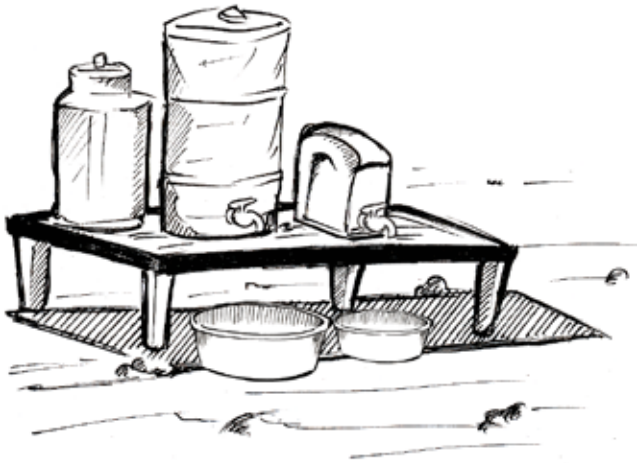
Module B: Hand Washing Station

Build a Hand Washing Station

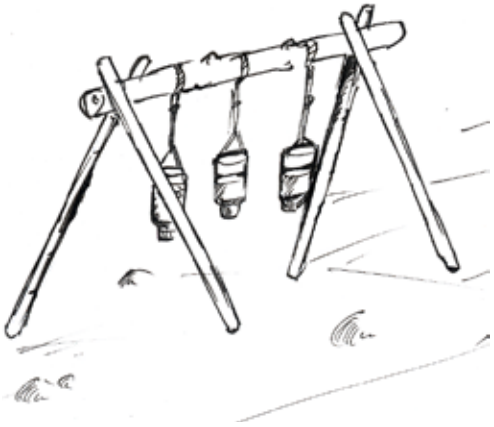
Hand washing stations are fixed places where the children can wash their hands. They should always be equipped with soap and soakaways for draining the wastewater. Two guidelines for the construction of a hand washing station are included; both models are simple to build and maintain.

Place

Hand washing stations should be placed near the toilet and at an appropriate height for children. Gender specific sanitation facilities should have gender specific hand washing stations. It is important for girls and boys to have the possibility to wash hands and bodies in privacy.



Hand washing station with containers and vessels



Hand washing station with bottles

Hand washing station Tippy Tap

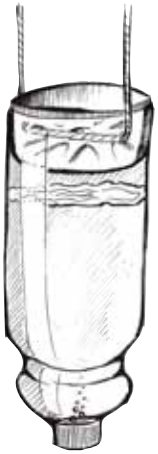
Build a Hand washing station with bottles

- **Materials**
  - Wood, metal or bamboo
  - Nails
  - Bottles (0.5 – 3 litres)
  - Strong rope

- **Step 1: Set up the framework**
  Use wood, metal or bamboo to build the framework of the hand washing station. There are many ways to set up this framework, which mainly consists of a stable horizontal pile on solid pillars. Make sure that the wastewater is collected in containers or that soakaways prevent muddy pools.

- **Step 2: Prepare the bottles**
  Cut empty PET bottles with screw caps into two pieces about 5 cm above the bottom of the bottle. Pierce each side of the bottle parts with a hot nail or knife. Pull the rope through the holes.

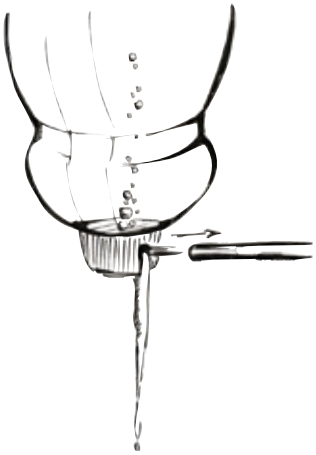
  The small part hangs inside the larger one and functions as a tap or soap dish. While filling the larger part of the bottle with water, the smaller part hangs hangs alongside on the rope.



- **Step 3: Hang the prepared bottles on the framework**
  Hang the bottles on the piles. Make sure that the bottles hang at an appropriate height for children.

  The hand washing station is now ready for use. The children can turn the screw cap until water emerges to wash their hands according to the three key steps of hand washing. To prevent recontamination of the water, it is important that the children touch the screw caps with caution.

Optional: To avoid direct contact of the screw cap with dirty hands, the cap is equipped with an additional structure for the exit of the water. Pierce the cap on one side with a hot nail and prepare a clean stick or match to seal the hole.



Build a Hand washing station with a water container

Specially fabricated containers with a tap and spigot are widely used options for hand washing stations. The containers can be placed on a table together with soap. Another container for wastewater collection or a soakaway to prevent muddy pools should be placed on the ground. Hand washing stations with containers can also be produced with a five-litre container hanging on a horizontal stick.[6]

- **Materials**
  - Tools to dig
  - 4 sticks of wood, metal or bamboo
  - 1 nail
  - 1 candle
  - 1 soap
  - 1 water container (volume about five litres)
  - 2 strong ropes

- **Step 1: Set up the framework**
  Use wood, metal or bamboo to build the framework of the hand washing station. Dig two holes, about 70 cm apart and 50 cm deep. Place a stick in every hole, make sure that they are levelled and fill the holes with soil and stone to stabilise the framework. Then, place a stable horizontal pile on solid pillars. Place a container for wastewater collection or build a soakaway (e.g., gravel basin) to prevent muddy pools.

- **Step 2: Prepare the container**
  Take an empty and clean plastic container. Heat a nail with a candle and make two holes in the container, one in the lid, and the other about 10 cm below the lid. The holes should have a diameter of about 3 mm.

  Attach the rope on one end to the remaining stick. On the other end, pass the rope through the hole in the lid and tie a knot to stop its passage through the hole. Make a hole in the soap, pass a piece of rope through it and tie a knot.

- **Step 3: Hang the prepared container and soap on the framework**
  Make sure that the container hangs at an appropriate height for the children. If the container cannot be hung directly on the framework, use another rope or part of a plastic bag.

  The hand washing station is now ready for use. The children can tip the stick lying on the ground until water emerges to wash their hands according to the three key handwashing steps.

[6] *University of Twente: How to make a Tippy Tap. 2008.*

Module C: Toilet/Latrine

Build a Single Pit Latrine

Please consult the “Compendium of Sanitation Systems and Technologies” for information on sanitation technologies. For specific information about menstrual hygiene friendly toilets, please consult the guidelines in “Menstrual hygiene matters”.[7]

Build a single pit latrine

For schools without a sanitation infrastructure, we have integrated a guideline to build a single pit latrine. The single pit latrine is one of the most widely used sanitation technologies. It can be built with locally available materials, does not require a constant source of water and can be used immediately after construction.

The simplicity of the single pit latrine comes with limitations: flies and odours are normally noticeable, leachate can contaminate groundwater and the pits are susceptible to breaking down during floods. We, therefore, recommend constructing single pit latrines at a distance of 30 m from the next water source and also at an appropriate distance from any buildings.

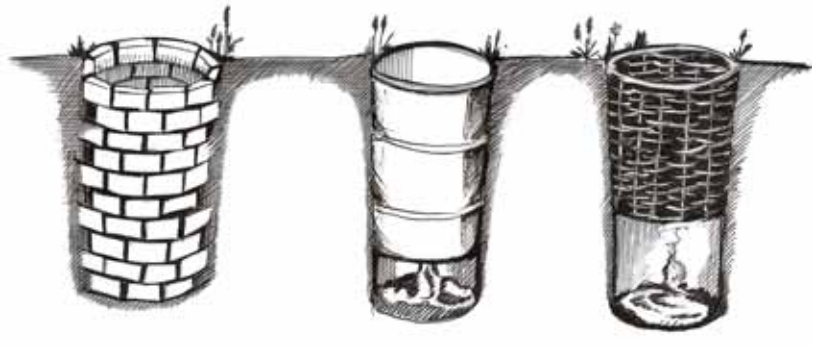
A full single pit latrine can be covered and the superstructure moved to a new pit or it can be pumped out and reused. If the pit is to be reused or built in soft, loose soil, it should be lined with adequate, locally available materials, like bricks, rot-resistant timber, concrete, oil drums, bamboo or stones.

- **Step 1: Dig a hole**
  The pit is ideally deeper than 3 m and of 1 – 1.5 m in diameter. The risk of collapsing increases if the diameter exceeds 1.5 m.

Single Pit Latrine: For gender specific improvements, please see the recomendations under „Step 4: Build a toilet house“.

[7] *Tilley E. et al.: Compendium of Sanitation Systems and Technologies. 2008.*
House S. et al: Menstrual hygiene matters. 2012.

- **Step 2: Line the pit**
  If the pit is to be reused or built in soft, loose soil, the upper half of the pit should be lined.



Pits lined with stones, concrete rings and bamboo

- **Step 3: Build a slab**
  The slab, commonly made of concrete, cement, wood or bamboo, covers the pit of the latrine. The slab can be the same size as the outer lining if it is stable. If not, the slab has to be at least 20 cm larger than the dimensions of the pit. A slab with a hole is used for disposing of the faeces or urine. The hole should not be too large to avoid small children from falling into the pit. A keyhole 10 cm wide and 40 cm long with a 20-cm diameter circular hole at one end is a good size.

Slab with cover

- **Step 4: Build a toilet house**
  There are many ways of building a toilet house with simple low cost materials. Its main objective is to offer privacy to the users.

  Since school sanitation facilities should be gender specific, we recommend separate toilets or latrines for boys and girls. Some important aspects to consider are:
  - School sanitation facilities have to be gender specific and, thus, separate toilets for boys and girls are required. They should also be at some distance from each other.
  - Latrines must be lockable from the inside.
  - In the girls toilets, a niche (e.g., some bricks taken out of the wall) or a shelf for new pads and a hook to hang cloths are necessary.
  - A disposal system for used pads needs to be provided inside the girls latrine (plastic bucket with lid, incinerator, etc.) and regularly managed. The disposal system must be developed in such a way that girls can comfortably use it and are not embarrassed when disposing their material.
  - There must be enough light inside so that the girls can comfortably change their pads and check the cloths for spots.


VALOR POSICIONAL DE LOS NUMEROS DECIMALES
CLASES
UNIDADES SIMPLES
PARTE DECIMAL
ORDEN
C D U
COMA O PUNTO Decimal.
VALOR POSICIONAL
NUMERAL
Literal
Tomando "Agua Segura" nos evitamos de ENFERMEDADES
Tomemos "Agua Segura"
Los alumnos de 5º Azul tomamos "Agua Segura"

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Section IV: WASH Girls

Module A - Menstrual Hygiene

Make your own reusable pad

The lesson is intended for girls between the ages of 10 and 14!

Teacher's information

Some questions about menstrual hygiene are sensitive and can only be discussed openly among girls or women. This lesson provides space for such questions and discussions. Cultural settings differ from place to place. This lesson does not claim to give information valid in all circumstances, but presents one way to approach the topic. The lesson should be led by a female teacher or a nurse. It is intended for girls between the ages of 10 and 14.

A pad making session provides girls with the pads they need and also gets them to talk about their problems. Involve mothers, women from the community and, if possible, a tailor to help with practical issues. In case the purchase of material is necessary, higher quality material can be bought in bulk at a cheaper price if many girls are making pads. Some poorer girls might not have access to the equipment needed, such as needles or scissors. By making pads in a group, such items can be shared. Having a sewing machine would increase the quality of the pad considerably. Check if some girls have access to a sewing machine.

Preparation for the teacher

Organize locally available pads (reusable and disposable)
Organize materials for the production of reusable pads
Make a pad according to the instructions on the images
Know where girls can receive medical advice

Objectives – Knowledge

Know the products available, where to get them or how to make them

Objectives – Attitudes

Discuss menstrual hygiene issues with colleagues

Objectives – Skills

Capable of using and disposing the products correctly
Capable of maintaining good menstrual hygiene

Time

90 minutes

Material

Locally available (disposable and reusable) pads
Cardboard women/puppets or underpants to attach the pads
Images: Make your own reusable pad

Key messages of the lesson

- **There are many options to properly handle the menses.**
- **There is no reason to be afraid of your first period.**
- **To stay healthy it is important to maintain good hygiene during your menses.**

Available Pads

Materials: locally available pads, cardboard women/puppets or underpants

1. Present the pads on a table. Let the girls look at them, touch them and ask questions. Explain the following for each product:
   - how it is used (attach them to the cardboard women/puppet or to the underpants)
   - how often it needs to be changed (generally every two to six hours)
   - where it can be purchased and how much it costs.

2. Show reusable pads and explain how they are washed and dried.
   - If necessary, pre-soak them in cold water. Do not soak them in hot water, as this will make the blood clot in the fabric.
   - Soak them for 20 minutes in a household chlorine solution (one part to nine parts water) or soapy water, and rinse them well.
   - Dry them in the sun or iron them to kill bacteria. If they were soaked in a chlorine solution, they can be dried anywhere. One option would be to place them in the bottom of a basin or directly on top of a roof so that they cannot be seen from below. Drying them outside underneath another cloth or over the cooling embers of a cooking fire is not ideal, but better than not drying them properly. To avoid discomfort and disease, the pads must be completely dry before using again.
   - Wash your hands by the 3x3 method.

3. Show disposable pads and the place where to dispose the used pads at school. Explain the options of how to dispose the pads outside school.
   - Put the pad in a bag or wrap it in paper and dispose dispose it in a regular waste management collection and disposal system.
   - Burn it.
   - If there is no other option, dispose it into a pit latrine. Never dispose pads in pour flush latrines.

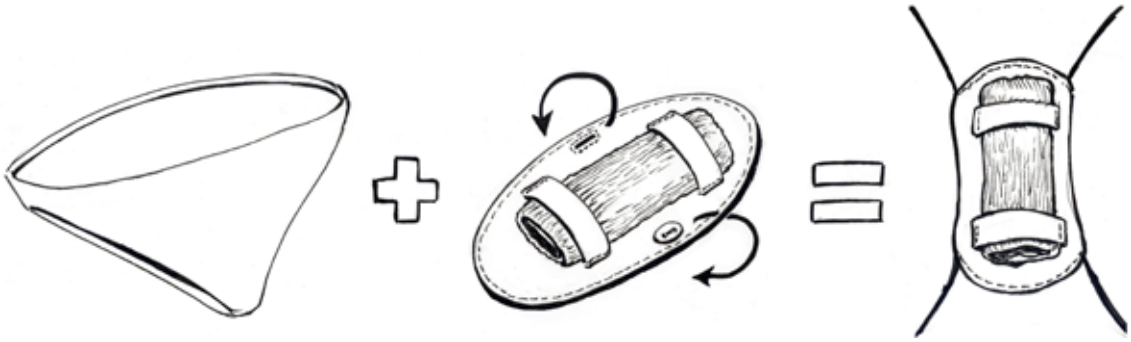
4. Explain to the girls what they should not do.
   - Do not use any material other than cotton or commercially available products.
   - Do not insert anything into the vagina except for commercially available tampons.

Explain how to make a reusable pad

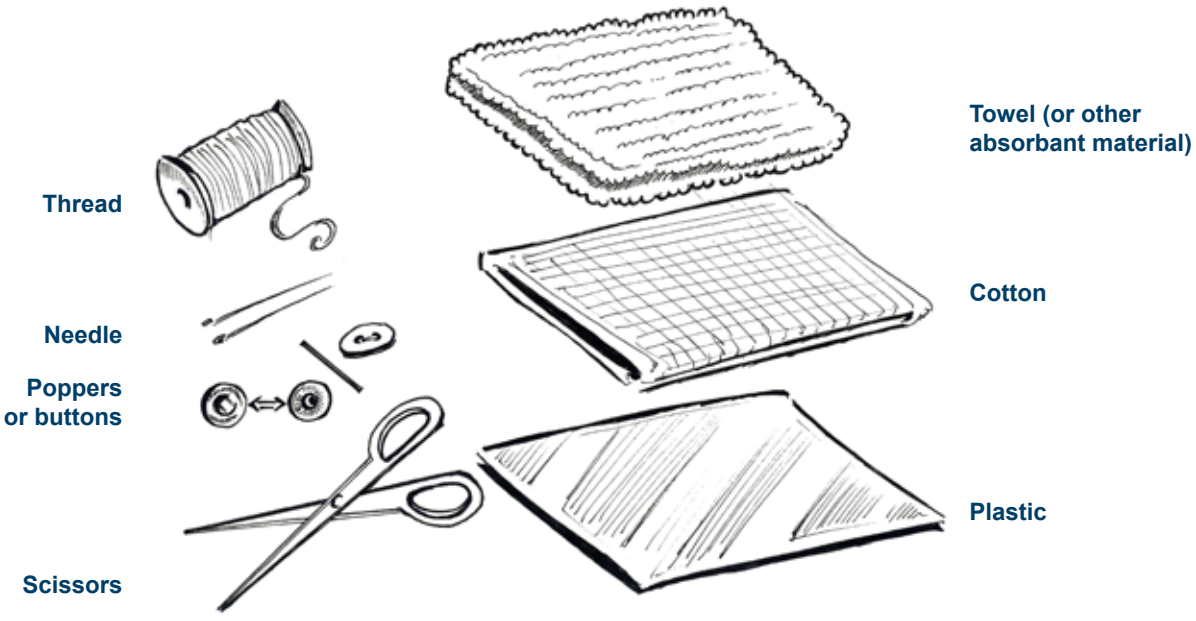
Acknowledgement: This exercise is adapted from "Menstrual Hygiene. Project Training Resource" developed by Irise Education Resources.[8]

Material: Thread, needle, poppers or buttons, scissors, towel or other absorbent material, cotton, plastic

1. Show the girls the images explaining how to make their own pads. Point out some important aspects and then start the production of a reusable pad. Follow the instructions step-by-step.
   - Each girl should have at least 3 base pads; one that she wears, one that is soaking and one that is drying.
   - Some girls are more skilled than others. If the sewing capacity is generally low, organize the work in an assembly-line, where less skilled girls cut out the material, while the more skilled sew.



Use of a reusable pad



Equipment to make a reusable pad

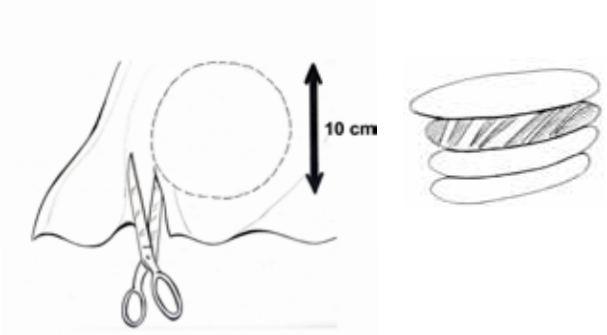
[8] *Wilson-Smith E.: Menstrual Hygiene Project. Training Resource. 2013.*

2. Equipment to make a reusable pad

Material: Thread, needle, poppers or buttons, scissors, towel or other absorbant material, cotton, plastic

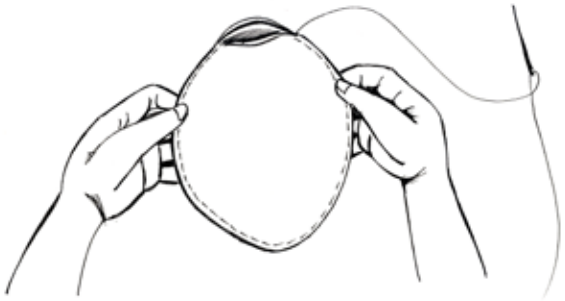
- A towel or other absorbent material. We recommend using a towel or a nappy fabric. However, cotton, wool or other similar products may work.
- Cotton: You can use an old cotton t-shirt or bed sheet. If you use a coloured piece of fabric, it might be easier to leave it outside for drying.
- Plastic: A plastic sheet can be placed between the absorbing material and the outer part to prevent leaking. A piece of table cloth, a shower curtain or a thick plastic bag can be used. With plastic bags one has to check if they make noises. Be aware that pads with plastic layers cannot be ironed anymore.

Make your own reusable pad

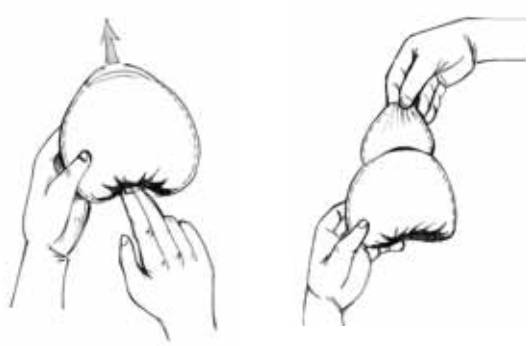


1. Draw around a plate or pan. Cut out three (3) circles of cotton and one (1) circle of plastic. Place the plastic between the cotton sheets.

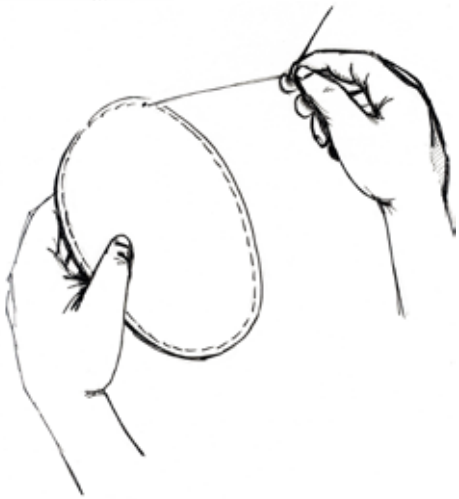
2. Sew the circles of cotton and plastic together, leaving a small hole



3. Turn it inside out

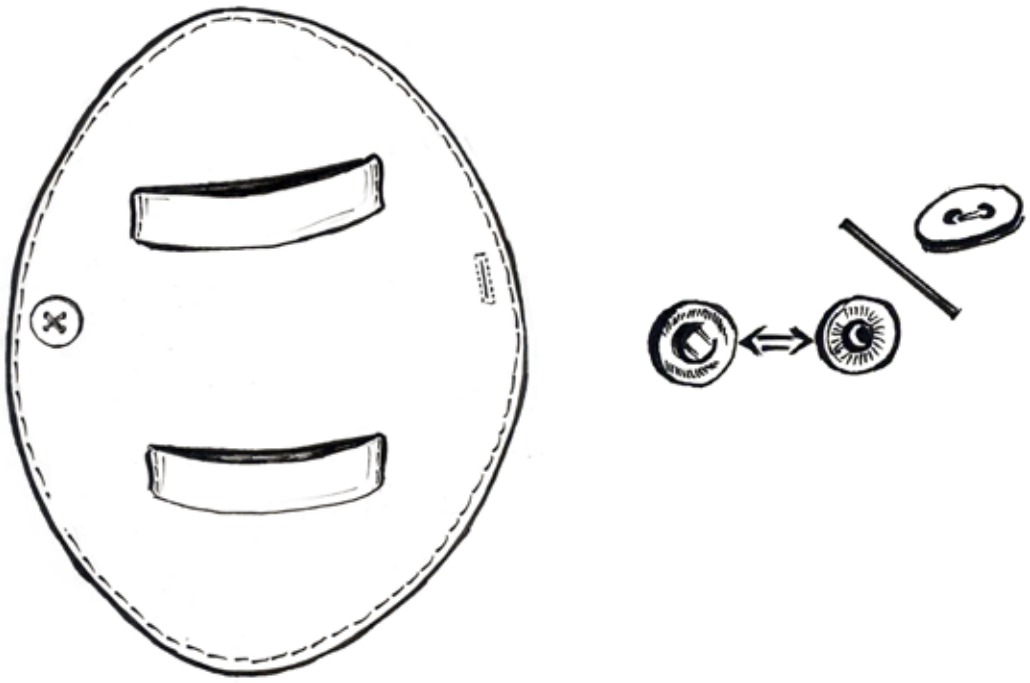


4. Sew around the whole circle again, sealing the hole.

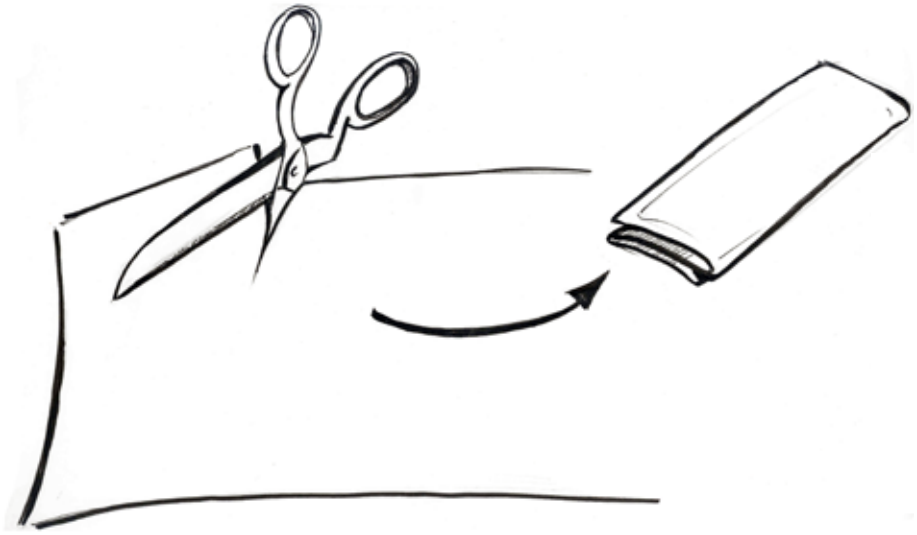


5. Measure and cut out the straps. They should be as long as the pad and about 2 fingerbreadths wide.

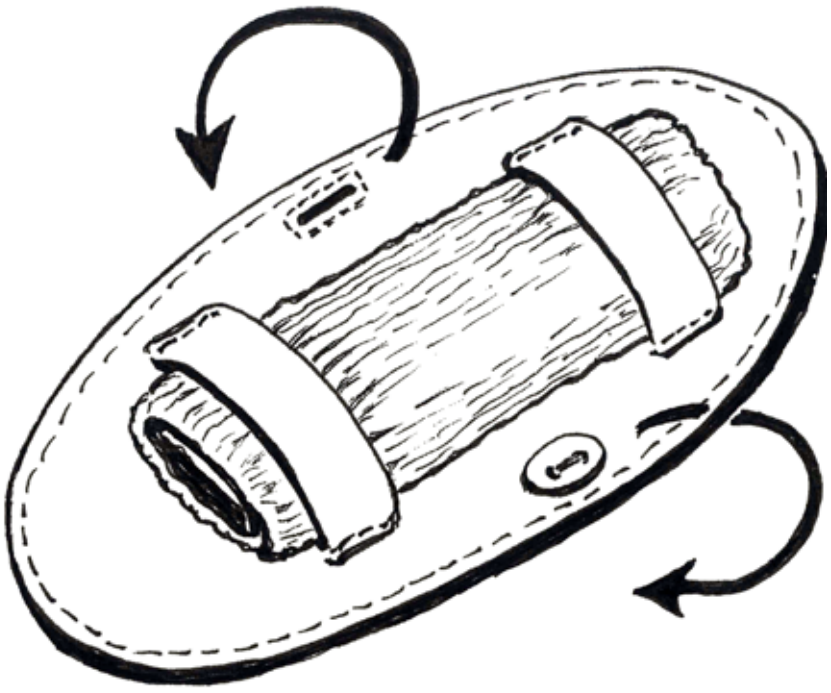
6. Fold the straps in half and sew along the edge, then turn it inside out. Cut it in half.



7. Attach straps and poppers or buttons. Putting the straps farther apart will reduce the risk of getting blood on them.



8. Cut a strip of absorbent material. The strip should be three times the width of the straps and almost as long as the support tissue. Fold it twice.



9. Insert the absorbent material under the straps. Your pad is ready!

Wash and dry your pads

1. Explain how to wash the pads.
   - If necessary, pre-soak them in cold water. Do not soak them in hot water, as this will make the blood clot in the fabric.
   - Soak them for 20 minutes in a household chlorine solution (one part to nine parts water) or soapy water, and rinse them well.

Woman washing the pads in soapy water

2. Explain how to dry the pads.
   - Dry them in the sun or iron them to kill bacteria.
   - It is important to completely dry them before using them again.
   - One option is to place them in the bottom of a basin or directly on top of a roof so that they cannot be seen from below.

Woman drying the pads in the sun

Stay healthy

1. Let one girl read this story to the class:
   "The day I started menstruating I was at school. It was break time, and I had gone to the toilet when I noticed blood on my pants. I was shocked and confused and thought that maybe something in my stomach had broken. I told a friend about the blood coming out. Luckily, she was already menstruating and was able to explain to me what happened. She gave me some tissue to use. I felt very embarrassed about not knowing more. For some months, I used the same tissue. But, it never stayed in place and I was always afraid of losing it. So, I had to ask my mother what to do. She showed me her pads and explained how I can make one myself. Since then I am very comfortable with my period."

2. Discuss with the girls the following topics.

How to manage your first period?	• Feel proud! Your body is developing into that of a young woman. • Don't be afraid. It can be scary to see the blood on your underwear, but it is normal and natural. • If you are at school, tell the matron, a female teacher or a fellow student. • Talk to other girls and women, such as your mother, your sister, the local nurse, an aunt, a female friend or another woman in your community.
How to keep yourself clean during your period?	• Every day (morning and evening if possible) wash the outer part of your genitals with water and eventually mild soap. • Keep unused cloths and pads clean (wrapped in tissue or a plastic bag) for further use. • Wash your hands before changing the pad • Pat the area dry with a cloth, and put a fresh cloth, pad, cotton or tissue on your underwear. • Always wipe from front to back after defecation. • Never douche/wash out the vagina with water.
How to manage the stomach pain from your period?	• You can put a bottle with hot water on your stomach area when you are resting. • Try to do some exercises and keep your body active. • You can take painkiller medicine every four to six hours on the most painful days. Important: pain killers should always be bought at a trusted source like a clinic or a health center!

Adapted from: House S. et al: Menstrual hygiene matters. 2012.

This lesson should be led by a female teacher or a nurse.

What did we learn today?

What products are available to protect you during menses?

How do you use them?

How can you stay healthy when you are menstruating?

How can you help your friends during menses?

Message to bring home

Explain to your sisters how to manage their period.

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Section V: WASH Artists & Gamers

Overview - WASH Artists & Gamers

Knowledge, attitudes and skills are ideally reinforced with artistic creative activities like drawings, songs, poems or puppet shows.

- Drawings and paintings are excellent tools excellent tools to use for discussions. There are many drawing topics that have to do with water, sanitation and hygiene, such as the water cycle or students using SODIS bottles. Combined with a key message they are ideally suited as reminders of good practice behaviours, such as hand washing with soap.

- Singing is an important form of communication because it can create an emotional access to a topic. It is possible to integrate existing songs into class instructions, and also to develop a song together with the children.

- Poems are expressions of pupil's artistic talent and a creative way for students to express their knowledge, as well as their attitudes towards WASH.

- Stage characters and puppets promote magic, adventures, ideas, knowledge, emotions and feelings. They help to anchor knowledge in a free, imaginative way.

Module A: Drawing & Painting

Drawing & Painting Ideas

Water & hygiene walk

Materials: Drawing/painting material

1. Walk around the school and show the children what the school has already undertaken to create a hygienic environment, for example, hand washing station, latrines, etc. Explain how they function and how they are adequately used. Also, point out the current problems at school, like open defecation or an unsafe water supply.

   Optional: Extend the water walk to the community. Show and tell the children about local water-related features (e.g., nearby river, frequent rainfall or cultural events with reference to the water). Point out the main local water and hygiene problems, for example, contaminated water sources, open defecation or garbage dumbs. Show them exemplary "clean" and "dirty" households.

2. Ask the children to draw something related to water and hygiene that they experienced during their walk.

3. Discuss the drawings with the children and hang them on the wall.

Woman taking unsafe water from a river

Paint WASH messages

Materials: Drawing/painting material

1. Show the children the WASH infrastructure at school, for example, the hand washing stations, latrines, safe water stations, etc. Explain how they function and how they are adequately used.

2. Let the children draw key messages on paper, stickers or other material to enhance good behaviours or to avoid bad behaviours, such as:
   - Always drink safe water!
   - Wash your hands always with soap!
   - Do not drink unsafe water!

3. Hang the eye-catching messages on or next to the WASH places.

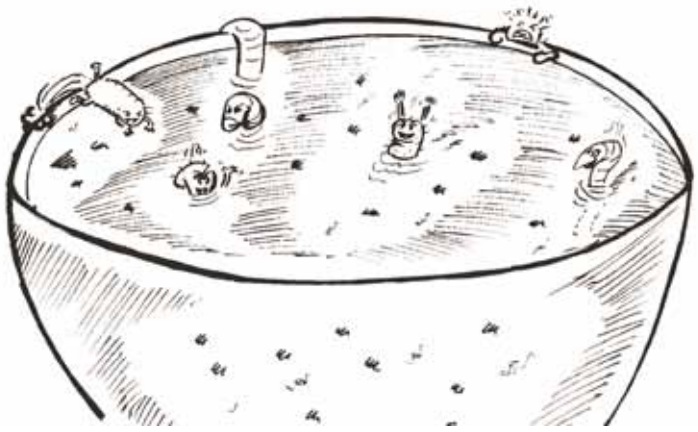
Unsafe water with pathogens

Materials: Drawing/painting material

1. Explain the difference between safe and unsafe water.
   - Water contains very small organisms like bacteria and viruses that are invisible to the human eye. Some of the small organisms pose a severe threat to human health as they cause different diseases with the following symptoms: vomiting, stomach pain or diarrhoea.
   - Turbid water is normally unsafe, but also clear water can be contaminated.
   - Safe water is free from disease-causing organisms and harmful chemical substances.

2. Let the children draw their vision of the small organisms that contaminate the water. Show them the image below as an example.

3. Discuss the drawings with the children and hang them on the wall.



A look into contaminated water

Module B: Plays & Puppet shows

Guidelines for Plays and Puppet Shows

- **Step 1: Introduce the project**
  The teacher explains the project idea, announces when and where they will present the play/ puppet show, organises groups and proposes different topics, like water contamination, water disinfection, hand washing, etc.

- **Step 2: Topic research**
  When choosing a topic, the group should think about the possibilities of integrating daily life at home and at school into the puppet show: What happens at home, at school, with friends? What are the dangers and problems? What will happen if the topic related problems cannot be solved?

- **Step 3: Write the script**
  Answer the following questions for creating the story:
  - What characters should be in the story?
  - How are the characters?
  - What will these characters do?

- **Step 4: Equip the characters**
  - Play: Search for stage props like clothes suitable for the different characters.
  - Puppet show: Almost any material can be used to build a puppet, for example boxes, cans, bottles, leaves and clothes. Suggestion: Look at your hands and make a drawing of them. Then, exchange your drawings with a friend and convert the drawings into characters, with eyes, a mouth, hair, glasses, etc. Cut out the drawings, glue it to a stick ... and we have a puppet! We can also build a stage, so that the spectators only see the puppets.

- **Step 5: Give life to the characters**
  It is good to leave space and time for improvisation.
  - Puppet show: To give life to our puppets, we conduct several exercises. In groups of three or four move the puppets in different ways: walk, move slowly, fly, crawl, crouch, embrace, fall forward, backward, sit, talk to the public, talk to the puppets, etc.
  - Play: Play-acting can focus more on choreography and gestures.

- **Step 6: Performance**
  The play can be performed in front of the school class, the students' families or community.

Module C: Games

The "Thunderstorm" Game

The "Thunderstorm" game is about running and singing. It can be played with chairs in the classroom or with stones in the schoolyard. The teacher prepares the game with several questions concerning the topic of a lesson. To keep pace with the game, it is recommended to ask questions that require short answers. For example: Tell me the name of a water treatment method? How many hours of sunlight does the SODIS method need?

- The children position their chairs or stones in a circle.
- The teacher removes a chair/stone and says "Start". The children start to sing a song and move in a circle to one side.
- The teacher says "Thunderstorm" to stop the running. All the children should try to sit on a chair or place a foot on a stone. The child without a chair/stone is allowed to stay in the game if he correctly answers the questions. If a child does not know the answer, he/she has to leave the circle, but must continue to lead the game.
- The child says when the next round starts and stops and also asks the question. He/she can ask anything about the lesson or receive a card with a question from the teacher. Children who are out of the circle stay in the classroom, singing the songs together with the other children still in the game.
- The child who remains last in the circle wins the game and a prize (e.g., a wish for a song).

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Section VI: WASH Experts

Module A: Water & Health

Introduction to Water & Health

Water is the basis of all life

Water is a chemical substance with the chemical formula H_2O. Its state can be liquid (water), solid (ice) or gaseous (steam). Water is vital for human health and a central element in cultures and religions all over the world. Without water people can survive only 3 – 4 days.

Water-related diseases are especially dangerous for children. They kill and make sick thousands of children every day worldwide.

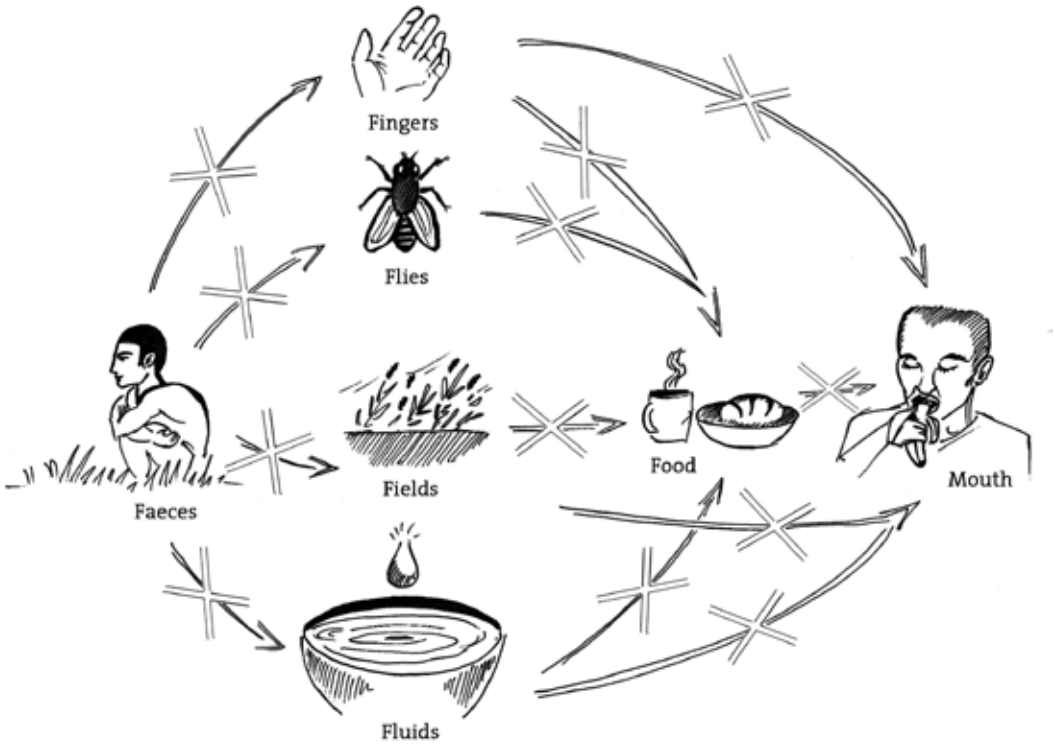
- 4 billion cases of diarrhoea occur annually, of which 88 % is attributable to unsafe water, as well as inadequate sanitation and hygiene.
- 1.8 million people die every year from diarrhoeal diseases, the vast majority are children under five.
- 443 million school days are annually lost due to water- and sanitation-related diseases.
- Almost one-tenth of the global disease burden could be prevented by improving water supply, hygiene and sanitation.[9]

[9] *WHO: Combating diseases at the household level. 2007.*

The faecel-oral mechanism

The faecal-oral mechanism, by which traces of faeces of an infected individual are transmitted to the mouth of a new host, is by far the most significant transmission mechanism. This mechanism works through a variety of routes – via fingers, flies (insects), fields, fluids, and food. Because of the use of so many “F-words” in English, it is often called the F-Diagram.

By interrupting these transmission routes, diarrhoeal and other water-borne diseases can be prevented. They are interrupted by improved water quality, hygiene and sanitation.



Disease transmission routes are interrupted by improving water quality, hygiene and sanitation

Diarrhoea

Diarrhoea is the most important public health problem directly related to water and sanitation. It causes people to lose liquid from their bodies and can result in death. Repeated episodes of diarrhoeal diseases make children more vulnerable to other diseases and malnutrition. It is transmitted via the faecel-oral mechanism.[6]

Faeces

Diarrhoea can be prevented by drinking safe water, washing hands properly and disposing faeces safely. If the measures are practised individually, the risk of contracting diarrhoea will be reduced as follows:

- Drink safe water: 39 %
- Wash hands properly with soap: 44 %
- Dispose faeces safely: 32 %[10]

Practised together, these behavioural measures will reduce the risk of contracting diarrhoea even further.

The stool of people with diarrhoea contains more water than normal and may also contain blood. Three or more watery stools in 24 hours are evidence of diarrhoea. People with diarrhoea should consume a lot of liquid (e.g., safe water, tea, breast milk) and food (e.g., soup, cooked cereals). Medical assistance is necessary if the diarrhoea is serious.

The Oral Rehydration Therapy (ORT) is a simple, cheap and effective treatment against dehydration caused by diarrhoea. ORT should begin at home with the use of available “home fluids” or a home-made “sugar and salt” solution given early during the diarrhoea episode to prevent dehydration. Once a child becomes dehydrated, however, ORT should be provided in the form of a balanced and complete standard mixture of glucose and salts.

A basic oral rehydration therapy solution is composed of:

- 30 ml of sugar
- 2.5 ml of salt; dissolved into
- 1 litre of disinfected water[11]

[10] *Fewtrell et al.: Water, sanitation, and hygiene interventions to reduce diarrhea in less developed countries. 2005.*
[11] *WHO: Oral rehydration salts. 2006.*

Module B: Water Contamination

Introduction to Water Contamination

Safe Water

Safe water is free from disease-causing organisms and does not contain harmful chemicals. Drinking water that is acceptable in appearance, taste and odour is important, however, it is not a criteria of safe water.[12]

Microbial water quality can vary rapidly and over a wide range. The greatest microbial risks are associated with human or animal faeces. Faeces can be a source of pathogenic bacteria, viruses, protozoa, and helminths.

- **Bacteria:** Though the vast majority of bacteria is harmless or even beneficial to humans, a few can cause diseases, like cholera and typhoid.

- **Viruses:** They can only grow and reproduce within a living host cell. They can cause, for example, hepatitis A and E.

- **Protozoa:** Protozoa are larger than bacteria or viruses. They need a living host to survive. Amoebic dysentery is the most common illness caused by protozoa.

- **Helminths:** Helminths are parasitic worms. They live in hosts before being passed on to people through the skin. Many types of worms can live for several years in human bodies. Roundworms, hookworms or guinea worms are helminths that cause illnesses.

Drinking water may contain numerous, mostly harmless chemicals. However, high concentrations of a few naturally occurring (e.g., fluoride, arsenic, uranium, and selenium) and man-made (e.g., fertilisers, pesticides) chemicals are of immediate health concern.

- **Naturally occurring chemicals:** Arsenic is an important drinking water contaminant, as it is one of the few substances known to cause cancer in humans when consumed in drinking water. Ingestion of excess fluoride can cause fluorosis that affects the teeth and bones.

- **Man-made chemicals:** Causes of man-made chemical contamination are agricultural and industrial activities, as well as waste disposal, urban runoff and fuel leakage from human settlements.

[12] *WHO: Guidelines for drinking-water quality. 2011.*

Water contamination at the source

Water can already be contaminated at the source. The risk of water contamination is very high, especially in surface water. Groundwater is usually much purer than surface water, but may be contaminated due to natural chemicals or human activities. Rainwater harvested from sheet or tile roofs is relatively pure, particularly, if the first water after a dry period is discarded or allowed to run off.

Improved drinking water sources are defined in terms of the type of technology and level of service. Improved water sources include household connections, public standpipes, boreholes, protected dug wells, protected springs, and rainwater collection.

Actions to protect water sources:

- regular cleaning of the area around the water source
- moving latrines away from and downstream of water sources (30 m)
- building fences to prevent animals from getting into open water sources
- lining wells to prevent surface water from contaminating the groundwater
- building proper drainage for wastewater around taps and wells[13]

Woman taking unsafe water from a river

[13] *CAWST: An introduction to household water treatment and safe storage. 2009.*

Water contamination during transport

Contamination occurs, for example, due to substandard water distribution systems, intermittent water pressure, illegal connections to the distribution system or during transport in buckets or other containers.

Unsafe water transport in an open vessel

Water contamination through inaccurate storage

The risk of recontamination through handling at the household level should be minimised by using containers with narrow openings and dispensing devices, such as taps or spigots. Improved containers protect stored household water from microbial contaminants via contact with hands, dippers and other objects contaminated by faeces.

More detailed information on the appropriate vessels and correct handling of the stored water can be found in the chapter section “WASH Engineers”.

Unsafe water storage containers

Storage in appropriate vessels

Since ancient times, people have stored water in containers made of different materials (e.g., wood, copper or animal hide). Today, fabricated materials made of aluminum or plastic are also available in many parts of the world.

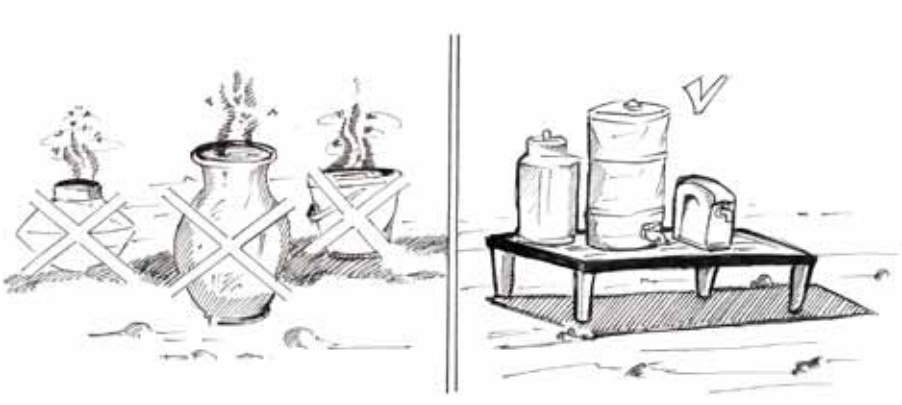
SODIS water is ideally stored directly in the PET bottle used for its treatment. For other disinfection methods, several locally available and usually low-cost vessels can be used (buckets, pots, jerry cans, barrels, used beverage containers, flexible bags, and flagons).

However, only some of these containers, particularly, jerry cans, some plastic beverage containers and some flexible vessels are suitable for safe water storage. The five key factors influencing the impact of storage vessels on safe water are listed in the section “WASH Engineers”.

Safe water handling practices

Several hygiene practices should be considered to keep the water safe:

- Use a specific container to collect and store untreated water
- Use a different container to store treated water
- Never use the same container for treated and untreated water
- Frequently clean the storage container with a chlorine solution/soap/detergent
- Pour treated water from the container instead of scooping it out
- Drink treated water as soon as possible
- Store treated water off the ground in a shady place in the home, away from small children and animals[14]



Bad and good storage containers

[14] *CAWST: An introduction to household water treatment and safe storage. 2009.*

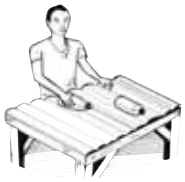
Module C: Water Treatment

Introduction to Household Water Treatment and Safe Storage (HWTS)

Household Water Treatment and Safe Storage (HWTS)

This chapter presents the common Household Water Treatment and Safe Storage (HWTS) technologies: solar water disinfection, chlorination, boiling and filtration. According to a systematic review by the World Health Organisation (WHO), household water treatment and safe storage is associated with a 39 % reduction in diarrhoeal disease morbidity.[15]

- **Solar water disinfection**
  Solar water disinfection is an effective method using solar radiation to disinfect water in PET bottles.



- **Chlorination**
  Chemical disinfection with chlorine effectively destroys and inactivates pathogens.

- **Boiling**
  Boiling water is a simple, very effective, but often expensive method to treat water.

- **Filtration**
  Different filtration systems, such as slow sand, ceramic or membrane filters, are used for water treatment. Their effectiveness at removing different chemical or microbial contamination depends on the filter material.

The abbreviation HWTS underlines the importance given to safe storage in water treatment. More detailed information on appropriate vessels and correct handling of stored water can be found in Module B “Water contamination”.

[15] *Fewtrell et al.: Water, sanitation, and hygiene interventions to reduce diarrhea in less developed countries. 2005.*

Choice of HWTS technology

The choice of the most appropriate HWTS technology depends on various criteria, such as water quality at the source or cultural preferences. A combination of the different systems may be necessary to entirely remove microbial and chemical contamination. Criteria to consider when choosing a HWTS technology are:

- Effectiveness, e.g., provision of good water quality and quantity
- Appropriateness, e.g., locally available, operation and maintenance, lifespan
- Acceptability, e.g., aesthetical aspect, social status
- Cost, e.g., initial purchase, operation and maintenance, education[16]

Water turbidity

If the water is highly turbid, pretreatment is a prerequisite to make solar water disinfection, chlorination and filtration effective.

- **Cloth filtration**
  A common and easy method to reduce water turbidity is to filter it through a locally available cloth (e.g., cotton). The filtration capacity of cloths vary widely. The cloth filters the water adequately if the dirt does not pass through the cloth. However, the cloth should not be too thick, otherwise water filtering will take a very long time.

- **Sand filtration**
  Pouring water from a transport container into a container filled with sand and gravel is a simple and rapid pretreatment method. A drawback of this method are the materials required (containers and spigot).

- **Coagulation and Flocculation**
  These processes agglomerate suspended solids together into larger bodies so that physical filtration processes can more easily remove them. Aluminum sulfates (alum) are an example of efficient flocculants.

- **Storage and settlement**
  Storing the water long enough for particulates to settle to the bottom of a container is the cheapest and simplest water pretreatment option, but is not very effective.

[16] *CAWST: An introduction to household water treatment and safe storage. 2009.*

Boiling

Boiling water

Boiling water or heat treatment is the most traditional water treatment method. It is effective against the full range of microbial pathogens and can be employed irrespective of water turbidity or dissolved constituents in the water.

However, the cost and time used in procuring fuel, the potential indoor air pollution caused by the smoke, associated respiratory infections, the increased risk of fire, and questions related to the environmental sustainability of boiling water have led to the development and dissemination of other alternatives.

At sea level, the boiling point is reached at 100 °C. Due to decreased air pressure, the boiling point is lower at higher altitudes (e.g., 96.7°C at 1 000 m , 93,4°C at 2 000 m). Even heating to 60 °C for a few minutes will kill or deactivate most pathogens. However, WHO and others recommend bringing water to a rolling boil for one minute. This is mainly to have a visual indication that a high temperature has been achieved. Afterwards, the water should be cooled, stored in the same vessel and covered with a lid to minimise the risk of recontamination.

Advantages

- Common treatment method
- Complete disinfection if applied with sufficient temperature and time
- Can be combined with cooking and making tea

Drawbacks

- Expensive (fuel, fire wood, gas, etc.)
- Time consuming (someone should watch during the boiling process, long cooling time)
- Not effective against chemical contamination
- Boiled water tastes flat

Filtration

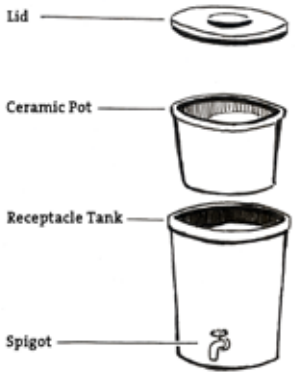
A number of processes occur during filtration, including mechanical straining, absorption of suspended matter and chemicals, as well as biochemical processes. Depending on the size, type and depth of the filter media, as well as on the flow rate and physical properties of the raw water, filters can remove suspended solids, pathogens, certain chemicals, tastes, and odours.

Ceramic filter

Water is filtered through a candle or pot made of porous material, usually unglazed ceramic. The ceramic filters' effectiveness depends on the size of the pores in the clay.

To use the ceramic filters, people fill the top receptacle or the ceramic filter with water that flows through the ceramic filter into a water storage receptacle.

The treated and stored water is accessed via a spigot on the water storage receptacle.



Elements of a ceramic filter

Advantages

- Proven reduction of bacteria and protozoa
- Neither chemicals, nor fossil fuel is required
- Simple installation and operation
- Turbidity removed
- No change in water taste or odour

Drawbacks

- Low effectiveness against viruses
- Fragile candles and pots, fissures and cracks may lead to reduced removal of pathogens
- Lack of residual protection (risk of recontamination)
- Regular cleaning of the filter and receptacle is necessary
- Not applicable with extremely turbid water

BioSand filter

The BioSand filter is a technological adaptation of the century old slow sand filtration process and is suitable for home use. In slow sand filtration, the water flows slowly (flow velocity of 100 - 200 l/m²/h) downwards through a bed of fine sand.

BioSand filter

The most widely used version is a concrete container approximately 90 cm high and 30 cm wide filled with sand.

The water level is maintained at 5 - 6 cm above the sand layer by adjusting the height of the outlet pipe. This maintains the water level always above the sand and leads to the formation of a biologically active layer called “Schmutzdecke” (dirt cover).

A perforated plate on top of the sand prevents disruption of the bioactive layer when water is added to the system.

After pouring water into the BioSand filter, it is purified by the following four processes:

- mechanical trapping (sediments, cysts and worms get trapped between the sand grains)
- adsorption or attachment (viruses are adsorbed or become attached to the sand grains)
- predation (microorganisms consume pathogens found in the water)
- natural death (pathogens die because of food scarcity, short life span)[17]

Advantages

- Proven removal of protozoa and about 90 % of the bacteria
- Removal of turbidity, some iron, manganese and arsenic
- One-time installation with few maintenance requirements, durable and robust
- Easy to use

Drawbacks

- Low effectiveness against viruses
- Lack of residual protection (risk of recontamination)
- Difficult to transport
- High initial costs
- Continuous use of the filter is required
- Difficult to use with highly turbid water

[17] *Lantagne et al.: Household water treatment and safe storage options in developing countries. 2005.*

Membrane filter

Gravity Driven Membrane (GDM) filtration removes all types of pathogens by ultrafiltration. Most ultrafiltration membranes have pores, which are smaller than the size of bacteria and viruses. Water filtered through these membranes is microbiologically safe. GDM filtration works with flux stabilisation. Pressure necessary to press water through the membranes is generated by gravity created by differences in water levels between two storage tanks. As a feed, natural water (river, spring, well or rainwater) can be used without pre- or posttreatment. GDM filtration is particularly suitable for the treatment of turbid water.

Neither pumps nor chemical cleaning or backflushing are necessary. Thus, no maintenance is required for long-term operation. A 40 – 60 cm water column is sufficient to operate the system using 0.5 m^2 of membrane to produce at least 50 litres of safe drinking water per day.

Advantages

- Easy to operate
- No electricity required
- No need to backwash or clean the filter
- No recurring costs (e.g. chemicals)
- Effective against bacteria and viruses
- Applicable on highly turbid water

Drawbacks

- Still under development
- Equipment not always available
- Relatively expensive

Module C: Water Treatment

Solar Water Disinfection

The SODIS method is very easy to apply; all it requires is sunlight and PET bottles. A transparent colourless PET bottle is cleaned with soap. The bottle is then filled with water and placed in full sunlight from morning to evening (at least six hours). The UV-A rays of the sun kill germs. After this exposure period, the water is disinfected and can be consumed.

Water that has been polluted with chemicals (poisons, fertilisers, industrial waste) must not be used. The chemical composition of the water remains unchanged.

Please find more information about the SODIS method on the website: www.sodis.ch.

Advantages and drawbacks of the SODIS method

Advantages
- Simple application
- Proven reduction of bacteria and viruses
- No change in water taste
- Low cost

Drawbacks
- Requires relatively clear water
- Dependence on climatic conditions
- Long-term treatment (sixhours to two days)
- Treatment of limited water volume
- Requires a large supply of bottles
- Not effective against chemical contamination

Step 1: Wash the bottle well with soap

The bottles used for the SODIS method must be transparent and colourless. PET bottles are ideal because they are light, do not break easily and are readily available in many regions. They are usually labelled with the symbol  . Scientific studies have confirmed repeatedly that when the SODIS method is applied correctly, the use of PET bottles causes no danger to health. Glass bottles can also be used.

Besides the ageing process of the bottle material, scratches on its surface will also reduce penetration of UV-A light. Heavily scratched bottles (after about six months of daily use) should be replaced. As UV radiation is reduced with increasing water depth, the bottles must not hold more than three litres.

Good bottles: transparent, unscratched, not bigger than three litres

Bad bottles: heavily scratched, damaged

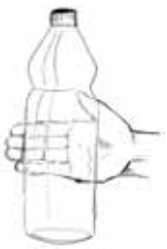
Bad bottles: coloured

Step 2: Fill the bottle with water

The SODIS method requires relatively clear water of less than 30 NTU (Nephelometric Turbidity Units). If the water is very turbid, the effectiveness of the method is reduced. There are two simple tests to find out, if the water is too turbid for the SODIS method.

- **Water turbidity test with newspaper**
  Place the filled bottle upright on top of a newspaper headline. Look down through the bottle opening. If the letters of the headline are readable, the water can be used for the SODIS method. If the letters are not readable, the water must be pretreated.

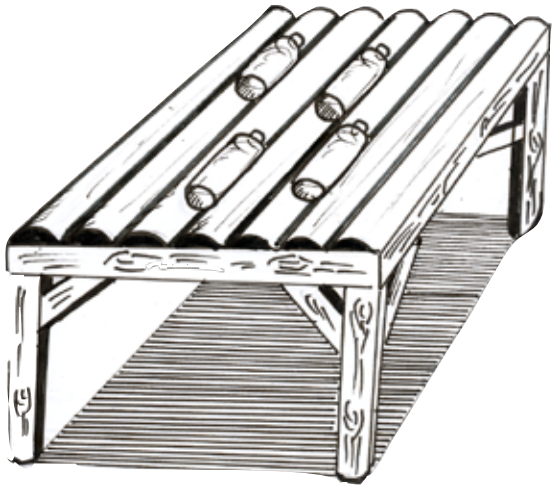
- **Water turbidity test with fingers**
  Place the filled bottle upright and put your hand behind the bottle. Look through the bottle and count the fingers. If you can count all the fingers behind the bottle, the water can be used for the SODIS method. If you cannot count all the fingers, the water must be pretreated.



Step 3: Expose the bottles to the sun from morning to evening

Since warm water expands, do not fill the bottle to the top. Lay the bottles horizontally on a clean and unshaded surface in the sun for the entire treatment time.

If possible, lay the bottles on a reflective surface, like a sheet of corrugated iron. The reflection and higher temperature will speed up the disinfection process. However, this is not essential for its application. The bottles can be placed on any surface, such as wood, concrete or clay brick.



SODIS table with corrugated iron

The method does not work satisfactorily during days with continuous rainfall. Also, cloudiness affects the strength of solar radiation and, thus, the effectiveness of the SODIS method.

Rule of thumb: If less than half of the sky is clouded over, placing the bottles from morning to evening (at least six hours) will be sufficient to disinfect the water. If more than half of the sky is covered with clouds, the bottle must be placed in the sun for two consecutive days. The method does not work satisfactorily during days with continuous rainfall.

Step 4: Store or drink the safe water

The water can be stored for several days if the bottle is kept unopened after treatment and stored in a cool, dark place. The treated water should be drunk directly from the bottle, or poured into a clean cup or glass immediately before it is consumed.

Module C: Water Treatment

Chlorination with Mini-WATA

Chlorination

Chlorine is the most commonly used disinfectant worldwide. It can be found in different forms such as tablets, powder granules and liquid concentrated solutions. Chlorine can also be locally produced.

Chlorination is an effective method capable of killing 99% of germs. Before treating with chlorine, the water must be clear. It is left for 30 minutes in water to allow for reaction with the germs. After treatment with chlorine, the presence of residual chlorine protects from recontamination.

Chlorine flask

Advantages and drawbacks of chlorination

Advantages

- Common treatment method
- Proven reduction of bacteria and viruses
- Easy to use
- Residual chlorine prevents recontamination
- Low cost
- Rapid treatment (30 minutes)
- Treats large water volumes

Drawbacks

- Requires relatively clear water
- Alters taste and odour of water
- Not effective against chemical contamination
- Lower protection from some organisms (cryptosporidium)
- Concentrated chlorine solutions require careful handling
- Dosage is considered as a main challenge
- Not always available locally

Mini-WATA

The Mini-WATA is a small device that produces liquid chlorine at 6 g/l. It requires only clear water, salt, an external power source and works according to a process called electrolysis. The Mini-WATA fits snugly into a small plastic water bottle of 0.5 litre. It produces 0.5 litre of chlorine, enough to treat up to 2 000 litres of water.

The Mini-WATA can be coupled with a photovoltaic panel of a minimum of 10 watts. It is furnished with clips for a solar panel. If you have access to electricity, the Mini-WATA is supplied with a transformer that can be simply plugged into the network (110 V or 220 V).

Mini-WATA and a 0.5-litre water bottle

Advantages

- Simple and robust
- Easy to use: requires only clear water, kitchen salt and any source of electric current
- Low cost: cost of chlorine produced is cheaper than that found at the market
- Independent from external suppliers
- Production at source avoids transport and storage issues
- Quality control check with WataTest and WataBlue

There are currently two different Mini-WATA devices in use. The first generation produces 0.5 litres of concentrated chlorine in five hours, the second generation produces 0.5 litres of concentrated chlorine in three hours. Beside the chlorine production time, both devices follow exactly the same procedure.

This lesson provides information for the first Mini-WATA generation, producing chlorine in five hours. If you conduct the scientific practice with a Mini-WATA of the newer generation, please replace the chlorine production time accordingly. Please check the website www.antenna.ch/en/research/safe-water/wata-devices for further information about WATA-devices.

Five steps are needed to produce concentrated chlorine with the Mini-WATA and to treat the water. The steps are documented in detail in the Mini-WATA user guides, which are listed in the module “Water treatment with WATA Technology” in the section “WASH Scientists”.

Step 1: Produce chlorine

Please find step-by-step information in the user guides “Mini-WATA” and “Mini-WATA - Use with solar power supply”.

- **Maintenance**
  Rinse the Mini-WATA with clear water after each use. Do not use soap. Dip it in a solution of water and vinegar or lemon for one night when there is too much white deposit on it. Do not let it run for more than ten hours in a row. Clean the solar panel with a cloth and water to remove dust.

Clean Mini-WATA in a solution of water and lemon or vinegar

Clean solar panel with water and a cloth

- **Security**
  Chlorine production is safe if you stick to the following rules:
  - Do not inhale the concentrate over a long period
  - Work in a well ventilated area
  - Never use a metallic container during the procedure
  - Do not drink the concentrated solution (it is not toxic, but it will taste very bad)
  - Do not spill it on your clothes as it is a bleach

- **Shelflife of chlorine**
  Use active chlorine within 24 hours of its production. The concentration of active chlorine decreases with time. High temperature affect the stability of chlorine. You should measure its concentration with WataTest before proceeding to treat water.

- **Rain**
  During rainy periods, the solar panel will not have enough energy to make the Mini-WATA work. Stop production, store all the materials in a proper place and start again when it is sunny. The process of chlorine production can be restarted. If you produce for two hours one day, the next day three hours will be sufficient to obtain the total of five hours needed.

Step 2: Test the chlorine concentration with WataTest

Please find step-by-step information in the user guide “WataTest reagent kit”.

- **Importance of WataTest**
  Mini-WATA reliably produces 0.5 litre of chlorine at 6 g/l after five hours. However, the concentration may vary due to initial water quality, dosage and quality of salt, electrical supply quality, reaction time, and environment. It is, thus, important to check the chlorine concentration after each production. WataTest is a non toxic reagent used to check the chlorine concentration produced.

- **Adapting**
  If the strength is below 5 g/l, connect the Mini-WATA to the solar panel or the grid and continue the process. If it is 5.5 g/l or higer than 6 g/l, add chlorine to it according to the table:

Chlorine concentration in g/l	Amount of chlorine to be added (20 litres)
5.5	5.50 ml
6	5.00 ml
6.5	4.60 ml
7	4.28 ml

- **Chlorine storage and labelling**
  After each production, store chlorine in an opaque plastic container and label it with the concentration of chlorine obtained and date of production and expiry date. Place the container in a cool place away from sunlight.

Step 3: Treat water by adding chlorine

Please find step-by-step information in the user guide “Use of active chlorine concentrate”.

- **Water treatment with chlorine**
  The quantity of chlorine concentrate necessary for water treatment depends on the initial water quality. For water of average quality, 0.25 ml of chlorine produced with Mini-WATA is needed for every litre of water to be treated.

- **Adapting**
  Adapt the amount of chlorine to be added to water according to the locally available vessels.

- **Turbidity**
  For effective disinfection, water must be clear with low turbidity (less than 5 Nephelo-metric Turbidity Units).

Cloth filtration for turbid water

Step 4: Test free residual chlorine with WataBlue

Please find step-by-step information in the user guide “WataBlue reagent kit”.

- **Chlorine demand**
  The amount of chlorine needed to eliminate the germs in the water is called the chlorine demand. Chlorine demand depends on the source and quality of the water: the dirtier the water, the more chlorine is needed.

- **Free residual chlorine**
  The amount of chlorine left over after 30 minutes is called free residual chlorine. The correct amount of residual chlorine shows that the water is treated and can be drunk. Water is protected from recontamination. Measure it after every treatment with chlorine. The ideal concentration of free residual chlorine in water is between 0.5 ppm to 1 ppm (parts per million).

- **Testing for free residual chlorine using WataBlue**
  WataBlue, a non toxic reagent, is one of several methods to measure free residual chlorine in water treated with chlorine.

- **Storage of water**
  The treated water should be stored in a clean and closed container.

Step 5: Store or drink the safe water

The water is now ready for consumption. Chlorine prevents recontamination. Properly stored, the water stays safe.

Module D: Hygiene

Introduction to Hygiene

Health benefits from water and sanitation programmes will not be fully realised unless hygiene behaviour is promoted and achieved.

Hygiene is a set of personal and environmental practices performed for the preservation of health.

- **Personal hygiene practices**
  Good personal hygiene practices include hand washing, washing hair, brushing teeth, bathing and washing the whole body regularly.

- **Environmental hygiene practices**
  Hygiene also includes environmental practices like cleaning one's surrounding, food storage in covered containers, washing and cooking food, water source protection.

Hand washing with soap

Hand washing with soap is the single most important hygiene measure to prevent the spreading of pathogens. Using soap in hand washing is essential, because it breaks down the grease and dirt that carry most germs. Washing hands with water alone is significantly less effective than washing hands with soap. Proper hand washing takes at least 20 seconds.

An easy way to learn proper hand washing is the 3 x 3 method.[18]

The three times when we should wash our hands are:
- Before cooking or preparing food
- Before eating or before feeding children
- After defecating and after changing or cleaning babies

The three steps to wash our hands are:
- Wash both hands with water and soap/ash/detergent
- Rub the front and back of your hands and in between your fingers at least three times
- Dry hands

Washing hands with soap

[18] *CAWST: An introduction to household water treatment and safe storage. 2009.*

Module D: Hygiene

Menstrual Hygiene

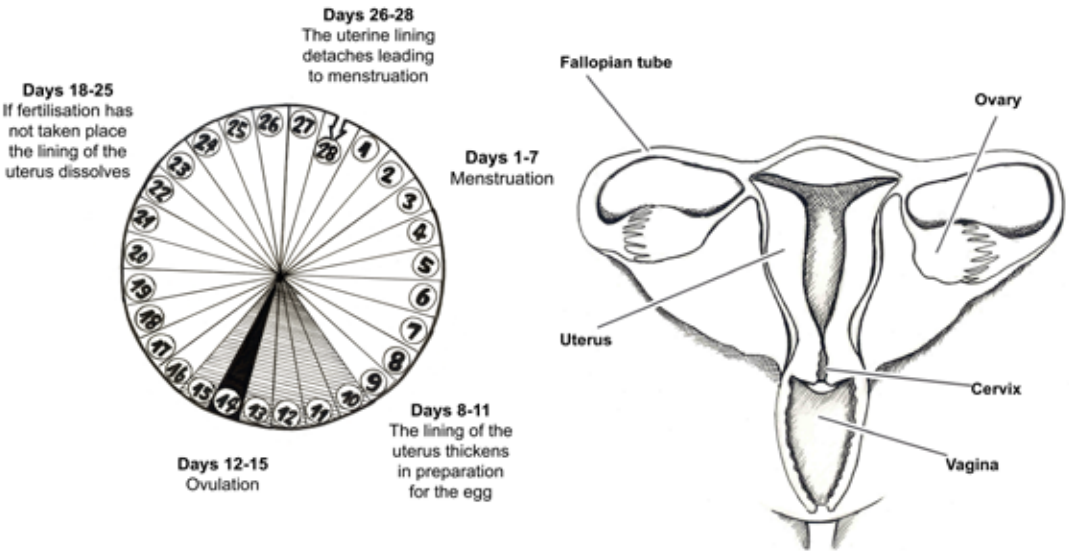
What is menstruation?

Puberty

During puberty, girls experience physical changes like growing breasts and wider hips. Typically, this is also the time when the first period starts. From then on, a girl can become pregnant. Also, boys experience physical changes. Their voices become lower, muscles start to grow, they get facial hair and their genitals become larger. Boys and girls will experience hair growth under the arms and in the genital area. Both will also have emotional changes.

The menstrual cycle

At the beginning of the cycle, tissue and blood start to line the walls of the uterus for fertilisation. After 12 to 15 days, an egg is released (ovulation) and moves into the uterus through the fallopian tubes. If the egg is not fertilised, the lining of the uterus is shed through the vagina along with blood. The average blood loss during menstruation is 35 ml with 10–80 ml considered normal.



The menstrual cycle

Local beliefs and taboos

In most societies, people do not use the words menstruation or period, but instead use other words. To make children more comfortable speaking about the subject, it can be useful to start by collecting the names they use when talking about menstruation. If the boys and girls have difficulties to talk about menses even in small groups, anonymously write down their statements. Collect and present them. If discussing the statements in the whole class is not possible, one alternative would be to continue working in separate groups, and then to present the statements of the groups. Another option would be to present ten statements commonly found in the community and discuss them with the students.

The following table presents a collection of commonly encountered myths and taboos about menses. Local myths might vary.[19]

Believes	True/ False	Facts
Menstruating girls are unclean	False	Menstruation is a sign of health and normal development. Menstrual blood is the same as blood from anywhere else in the body and is usually sterile. Girls should always maintain good hygiene throughout their menstrual periods.
Taking a bath/shower/washing the body during menstruation causes infection, infertility, etc.	False	Taking a bath/shower/washing the body during menstruation is necessary. It prevents a girls from getting infections. However, the practice of 'douching' (forcing water inside the vagina in order to clean it) can make pelvic infections more likely.
Menstruating women and girls should not eat certain foods (e.g., yoghurt, vegetables, cold water, sour food)	False	Menstruating girls can eat all food. However, they need to eat foods that contain iron to replace iron losses during bleeding. Also, eating fresh fruit and foods high in calcium can help keep them healthy and alleviate some symptoms of premenstrual syndrome.
Old menstrual cloths should be buried in the ground because evil spirits will be attracted to the blood/they can be used for witchcraft, etc.	False	It is not essential to bury old menstrual cloths in the ground. They can also be burned or disposed of by other means.
A touch from a menstruating girl or woman will cause a plant to become dry, milk to curdle, food to become poisonous, a mirror to lose its brightness, a cow to become infertile, etc.	False	This has no effect on plants, milk, food, mirrors, cows, etc.
A woman or girl should eat or sleep separately during her menstrual period	False	There is no reason why a woman or girl should eat or sleep separately during her menstrual period.
Having pain is not natural. If a girl has pain during her menses, she must be sick or doing something wrong.	False	Having pain during the menses is natural. Some girls have more pain, some girls less.

[19] *House S. et al: Menstrual hygiene matters. 2012.*

Module E: Sanitation

Introduction to Sanitation

Sanitation generally refers to the provision of facilities and services for the safe disposal of human urine and faeces. It also includes the maintenance of hygienic conditions through services, such as garbage collection and wastewater disposal.

Proper use of toilet or latrine

Proper use of a toilet or latrine comprises four steps:

- **Safe disposal of faeces**
  Make sure that all faeces are disposed of in the pit.

- **Hygienic anal cleansing**
  If there is no water available in the toilet, children can carry a bucket of water to the toilet. If paper or other materials are thrown into the pit, they could rapidly fill it or lead to regular clogging of the pipes. If they are collected separately, they have to be disposed/burned carefully.

- **Toilet cleaning**
  Leave the toilet in a clean condition. Clean it with water or a broom if necessary. If chlorine is available, the slab of the toilets can be disinfected with chlorine solution.

- **Wash hands with soap**
  The moment after defecating is a critical time for hand washing.
  - Wash both hands with water and soap/ash/detergent
  - Rub the front and back of your hands and in between your fingers at least three times
  - Dry hands

Compendium of Sanitation Systems and Technologies

The main information about sanitation technologies is integrated in the “Compendium of Sanitation Systems and Technologies”. Though it primarily addresses engineers and planners dealing with infrastructure delivery, the technology sheets also allow non-experts to understand the main advantages and limitations of different technologies.

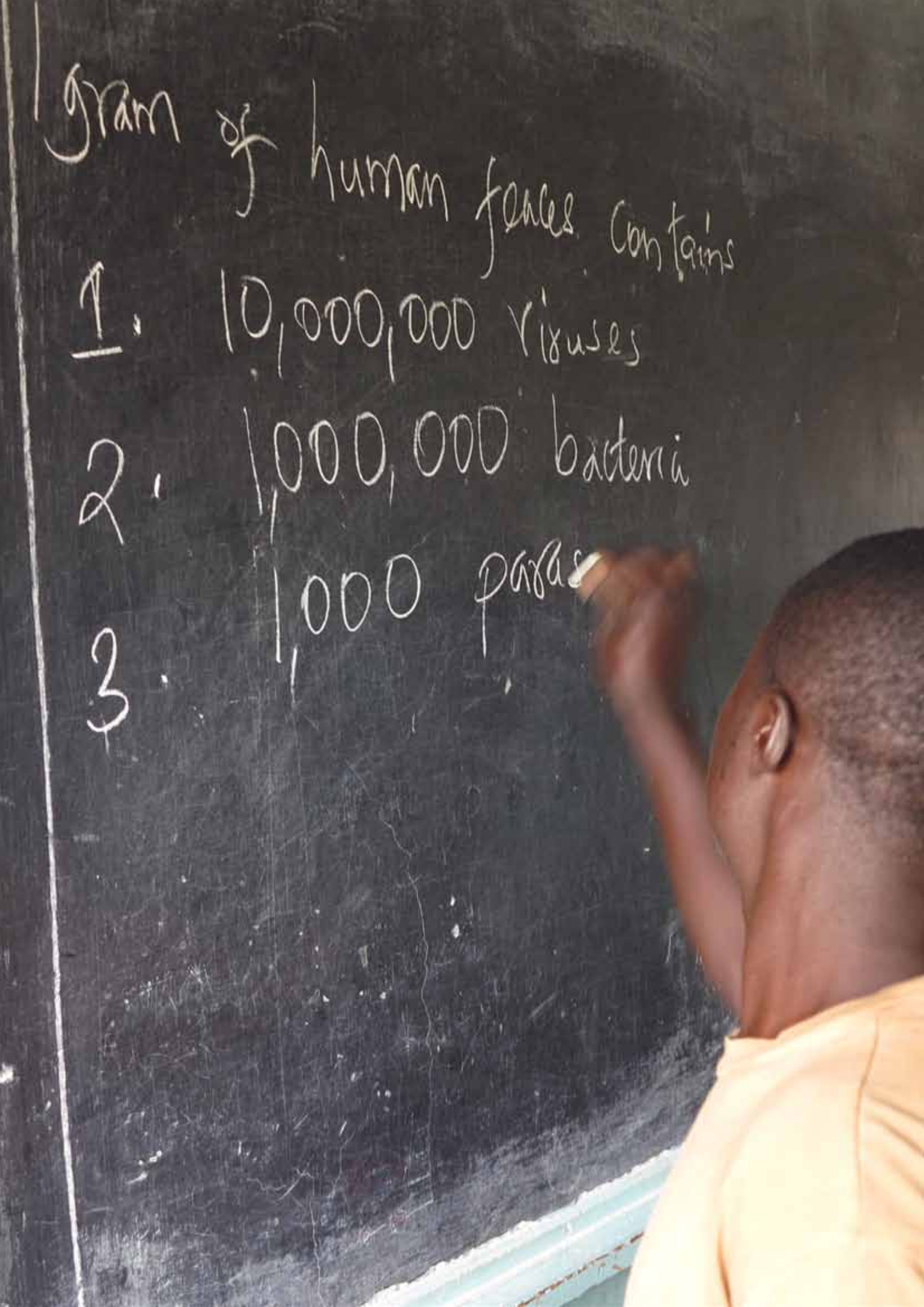
This publication can be downloaded in English, French and Spanish:
www.eawag.ch/forschung/sandec/publikationen/compendium_e.

For specific information about menstrual hygiene friendly toilets, please consult the guidelines in “Menstrual hygiene matters”.[20]

[20] *Tilley E. et al.: Compendium of Sanitation Systems and Technologies. 2008.*
House S. et al: Menstrual hygiene matters. 2012.

1 gram of human feces contains

1. 10,000,000 viruses
2. 1,000,000 bacteria
3. 1,000 para



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Section VII: WASH Managers

Overview - WASH Managers

This section defines responsibilities for WASH activities, provides templates for efficient monitoring and gives some ideas for WASH events. It also highlights the importance of a good interaction between the school and the students' families.

- Preventing disease is only effective if children drink safe water and live hygienic at school and at home.
- Children are in general highly motivated to improve conditions and practices at home and in their communities and can, thus, be excellent catalysts for positive change.
- School events (e.g., family days) and children's assignments (e.g., simple surveys in their homes, neighbourhoods and community) are excellent opportunities to raise awareness and initiate community projects
- Schools need the assistance of parents, local administrations and organisations to establish and sustain good facilities.[21]

WASH Promoter

[21] *IRC: Towards Effective Programming for WASH in Schools. 2007.*

Module A: WASH Responsibilities at School

WASH Positions at School

WASH Manager

The WASH Manager is the responsible person at school for everything related to water, sanitaton and hygiene in the school. This position can be filled by the school director, administrative staff or a motivated teacher.

The activities of the WASH Manager are:

- Plan, monitor and evaluate the WASH activities
- Supervise the activities of the WASH Club
- Advise teachers in conducting the WASH School Lessons
- Maintain and supervise the use of the infrastructure
- Encourage interactions between parents – teachers, school – community

WASH Promoter

After completing all WASH School Lessons, the children have acquired the skills to act as change agents in the community.

As WASH Promoter they ...

- understand the links between water, hygiene and health
- can handle the Safe Water School infrastructure properly
- can disinfect water and store it safely
- can live hygienically
- are willing to apply their skills at school and at home
- are willing to help their families, friends and the community

Focal Point for Girls

One female teacher becomes the focal point for menstrual hygiene and girls questions in general. This focal point is a person responsible to answer questions and manages the stock of sanitary protection material for emergencies. It is important that every girl at school knows who is their focal point.

Module A: WASH Responsibilities at School

WASH Clubs & Associations

WASH Club

A WASH Club is a school health club consisting of one or more teachers and a group of children (numbers depend on class and school size). The members of the club are responsible for the operation and maintenance of WASH infrastructure and act as change agents among their peers and their families. The club should be comprised of a representative group of the school (age, gender, socio-economic background, religious or ethnic groups).

The club's activities include:

- Operation and maintenance of the Safe Water School infrastructure:
  - Water Treatment Station: treat the water to supply the school with safe water and keep the station clean.
  - Hand Washing Station: fill the bottles or the tank with safe water every morning and, if needed, once more during the day. Check if there is soap at hand.
  - Safe Water Station: assure that there is enough safe water stored every morning and keep the Safe Water Station clean.
  - Toilet/Latrine: Check every day if the toilet/latrine is clean and organise the cleaning of it. If there is a bucket for menstrual hygiene pads, empty it (e.g., into an incinerator, pit, urban waste collection system, etc.) and clean it with chlorine.

- Support children in the use of WASH infrastructure and encourage them to adopt good behaviour at school and at home.

- Organise activities (e.g., games, exhibitions, competitions) on WASH topics.

WASH Girls Club

For larger schools, we suggest organizing a WASH Girls Club. This is a school health club consisting of one female teacher and a group of girls (the numbers depend on class and school size). Participation is on a voluntary basis and the club must not exclude any girl wishing to participate, no matter her age, socio-economic background, religion or ethnic group. On a regular basis (e.g., every two months), the club organizes group meetings/information events for girls or pad making sessions.

In smaller schools it is also possible to train WASH Club members as ambassadors for girls questions. Then, they are in charge of organizing separate sessions for girls only.

Parent-Teacher Association

An efficient and sustainable interaction between parents and teachers benefits the community and the school equally.

The Parent-Teacher Association can contribute to increase the impact of the Safe Water School in the community and to obtain the support of the families for WASH activites at school.

The WASH activities of the Parent-Teacher Association include:

- Supporting the maintenance of school facilities
- Supporting the provision of consumables, such as PET bottles or soap
- Promoting local improvements in school water supply, sanitation and hygiene
- Raising funds and helping to plan improvements with school directors and teachers
- Organising activities on the topics of water, hygiene and health

Workshop for community members

Module B: Monitoring Tools

SODIS Logbook

Date	Responsible (Name)	Start time	End time	Number of bottles	Quantity produced	Problems encountered

Module B: Monitoring Tools

Logbook for Chlorine Production

Date	Responsible Name	Start time	End time	Quantity produced	Chlorine Concentration	Problems encountered

Module C: WASH Events

Ideas for WASH Events

WASH Ceremony

- Walk through the school area and show the children the WASH improvements made and the remaining problems. Emphasise the importance of their new WASH knowledge, attitudes and skills.

- Inform the children that they are WASH Promoters now and that they play an important role in the community.

- A WASH Promoter:
  - understands the links between water, hygiene and health
  - can properly handle WASH infrastructure
  - can disinfect water and store it safely
  - can live hygienically
  - is willing to apply his/her WASH skills at school and at home

Girls day

- Once every year (e.g., on the women's day), the school can organize a special day for the girls. Activities done are for girls only and can include:
  - Providing general information about menstrual hygiene to younger girls at school
  - Group discussions to answer questions regarding menstrual hygiene and about other topics, such as sexuality in general or how to say no
  - A pad making session
  - Providing sanitary protection material for emergencies

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Appendix

Online resources

There is good and informative literature available about WASH in schools. We provide a list of selected documents with links to them on www.sodis.ch/safewaterschool.

References

- Caritas Switzerland/Caritas Luxembourg: Children's Hygiene and Sanitation Training. A Practical Facilitation Handbook for Pupils from Grade 1 to 3. Switzerland, 2009.
- CAWST: An introduction to household water treatment and safe storage. Calgary, 2009.
- CAWST: Biosand filter manual. Design, construction, installation, operation and maintenance. Calgary, 2010.
- Fewtrell L. et al.: Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: a systematic review and meta-analysis. Aberystwyth, 2005.
- Fundación SODIS: Manual. Escuela para la salud. Cochabamba, 2005.
- House S. et al: Menstrual hygiene matters. A resource for improving menstrual hygiene around the world. London, 2012.
- International Federation of Red Cross and Red Crescent Societies: Household water treatment and safe storage in emergencies. A field manual for Red Cross/Red Crescent personnel and volunteers. Geneva, 2008.
- IRC International Water and Sanitation Centre: Life Skills-Based Hygiene Education: A guidance document on concepts, development and experiences with life skills-based hygiene education in school sanitation and hygiene education programmes. Delft, 2004.
- IRC International Water and Sanitation Centre: Towards Effective Programming for WASH in Schools: A manual on scaling up programmes for water, sanitation and hygiene in schools. Delft, 2007.
- Kanyemba A.: Growing up at school. A guide to menstrual management for school girls. Pretoria, 2011.
- Lantagne D. et al.: Household water treatment and safe storage options in developing Countries: A Review of Current Implementation Practices. Wahington D.C., 2005.
- Wilson-Smith E.: Menstrual Hygiene Project. Training Resource. London, 2013.
- Sandec: Training tool for capacity development in the sector of water and environmental health. Duebendorf, 2008.
- Sobsey M. et al.: Managing Water in the Home: Accelerated Health Gains from Improved Water Supply. Geneva, 2002.
- Tilley E. et al.: Compendium of Sanitation Systems and Technologies. Duebendorf, 2008.
- University of Twente: How to make a Tippy Tap. Twente, 2008.
- USAID: Wash-friendly schools. Basic guide for school directors, teachers, students and administrators. Washington D.C., 2010.
- WHO: Combating diseases at the household level. Geneva, 2007.
- WHO: Domestic Water Quantity, Service Level and Health. Geneva, 2003.
- WHO: Guidelines for drinking-water quality. 4th ed.. Geneva, 2011.
- WHO: Oral rehydration salts. Production of the new ORS. Geneva, 2006.

The Safe Water School Manual combines school lessons in water, sanitation and hygiene (WASH) with scientific experiments, games and art activities.

As the concrete goals of a Safe Water School vary from country to country, region to region, and from school to school, this manual can be used according to the requirements and wishes of each school.

Please choose the modules that are most useful for you and create your own manual!