

SUBJECT: Science
GRADE: 8
DATE:
DURATION: 60 minutes
TOPIC: Water purification
ATTAINMENT TARGETS: <ul style="list-style-type: none"> • Apply scientific knowledge and processes to the solution of real world problems • Demonstrate positive interpersonal skills in order to foster good working relationships. • Demonstrate an understanding of the processes involved in water purification
BENCHMARKS: <ul style="list-style-type: none"> • Demonstrate concern for the preservation of natural resources. • Demonstrate concern for man's impact on the environment. • Analyse several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
LEARNING OBJECTIVES: <ul style="list-style-type: none"> • Investigate three common methods of water purification • Create a simple water purification device • Value individual effort and team work through 'hands-on' activities • Show interest in the outcomes of investigations by completing tasks • Use correct apparatus/ equipment in measuring • Recognise the importance of water and the need to protect it
KEY SKILLS: manipulate, communicate, collaborate, create, think critically – analyse, evaluate, solve problems
KEY VOCABULARY: purification, filtration, chlorination, suspended materials, aeration, contaminants, distillation,
MATERIALS/RESOURCES: Video, beakers, filter funnel, activated charcoal, filter paper, 2L soda bottles, knife/ scissors, thin cloth/ cheese cloth, fine sand, coarse sand, computer, internet access, cartridge paper, markers, fine gravel, coarse gravel, glass, bucket, test tube rack, test tubes, dropper pipettes, 2L dirty water sample, plastic drinking cups, rubber band, cotton wool, masking tape, ink, food colouring, plastic spoons, printed materials
CONTENT OUTLINE: Water is crucial to survival on Earth. Water becomes unsafe for use when oil, dirt, untreated sewage and rubbish and contaminants such as pesticides are released into it. These contaminants can be removed by filtration and sedimentation while microorganisms can be destroyed by boiling and adding chlorine. A combination of these processes is used in water treatment systems.
PRIOR LEARNING: Check that students can: <ol style="list-style-type: none"> 1. Explain the processes in the water cycle 2. State some uses and importance of water 3. Identify some basic properties of water (e.g. solvent in chemical reactions)

LEARNING OUTCOME: Students who demonstrate understanding can:

1. Investigate three common methods of water purification
2. Appreciate the role water plays in maintaining life
3. Construct a simple device for obtaining clean water

ASSESSMENT CRITERIA:

- Main steps in the purification correctly identified
- Purification apparatus works as intended

PROCEDURES/ACTIVITIES

Engage - *How can I get students interested in this?* (7 min)

- Students' attention will be drawn to a sample of dirty water. Questions such as, "Would you drink this water?", "Is this water clean?", "How can I make it clean?" will be asked. The water will be filtered through a cloth. Students will again be asked if they would drink this water and why? The topic of water purification will be introduced. OR Students will view a video on "Water availability and safety" then discuss what can make water unsafe and methods of getting clean water
(<https://www.youtube.com/watch?v=mVTahkpVabw>)
(<https://www.youtube.com/watch?v=VhKnIx7vjZc>)
- *Teacher leads discussion, notes responses and gives instructions to students. The need to protect water resources and how this can be achieved will be discussed.*

Explore - *What tasks/questions can I offer to help students puzzle through this?* Use of a simple investigation. (10 min)

- In groups, students will use their scientific research skills (Internet research) to determine the methods used to purify water. They will be guided by the following questions:
- Whole Class: What is used to determine the purity of water?; What methods are used to purify water? What methods would be suitable in a household?
- Advanced group: What are the main steps and processes involved in water treatment/ purification?; How do water purifiers work?
- *Teacher observes group activities and offers guidance as needed.*

Explain - *How can I help students make sense of their observations?* Class presentation and discussions. (13 min)

- From the research done each group will present their answers to the class. The class will determine if the answers are appropriate and may offer additional information from their own research.
- Students with learning challenges: Use a teacher-prepared graphic organizer and fill in main methods to purify water/ OR Draw a water purification method.
- Whole Class: Construct a schematic to show the steps/ stages involved in water treatment/ purification.

- Advanced group: At each stage, they will indicate what chemical process or reaction is involved.
- *Teacher notes students' responses on the board, offers clarifications and additional information and instructs students to peer-assess schematics drawn.*

Elaborate - *How can my students apply their new knowledge to other situations?* Application of what they learned. (20 min)

- In groups, students will plan and design a low budget method (using low cost every day materials) to purify water for a developing country that has little access to fresh water. Students will explain the design being used and the specific method (process) in purification that is being applied. The designs presented from each group will be discussed. Students will suggest how their method is expected to work. Improvements for each design will be provided by the class. Testing of each design will be completed as a homework activity and presented in the next class.
- *Teacher instructs students to use the Design Rubric to assess the designs as they are presented. Misconceptions will be clarified by teacher.*

Evaluate - *How can I help my students self-evaluate and reflect on the teaching and learning, and how can I evaluate the students learning of concepts and skills.* Assessment (10 min)

- Students will self-assess by using a checklist to affirm how they use and conserve their water resources.
- Brief class discussion to ascertain students' prior knowledge.
- Schematic showing water purification processes will be peer-assessed by students.
- The designs presented from each group will be discussed and scored using the Engineering Design Rubric attached.
- An Exit Slip will be given to each student at the end of class to guide teaching and learning for the next class.

EXTENDED LEARNING: Students will investigate the methods used to obtain bottled water by noting the methods (such as ozonolysis, reverse osmosis) that is written on the different brands.

LINKS TO OTHER SUBJECTS:

- Geography, Biology, Resource and Technology, Mathematics, HFLE, History

POST-LESSON REFLECTION:
