ACTIVITY THREE: WATER QUALITY IN THE PAST

This PHYSICAL SCIENCES lesson looks at water quality, water-borne diseases and some simple ways of purifying water. This is followed by a case study on the water collecting ways of Nguni people.

READ THE FOLLOWING TO YOUR LEARNERS:

Water from rivers and dams is often not clean and may contain bacteria and dissolved substances, such as salts from the soil and gases from the air. Other contaminants include solid substances and debris, such as mud and refuse. Before we drink any water, we need to ensure that it is safe to drink and that solid substances and any bacteria has been removed.

Water often carries diseases that kill about 25 million people each year. The need to ensure clean adequate water supplies is one of the most urgent problems facing our country.

Some major water-borne diseases include:

- **Cholera** is an acute intestinal infection caused by the bacterium *Vibrio cholerae*. It causes watery diarrhoea and vomiting that can quickly lead to severe dehydration and death if treatment is not promptly given.

- **Typhoid Fever** is an acute illness associated with fever caused by the *Salmonellae Typhi* bacteria. The bacteria is deposited in water or food by a human carrier, and is then spread to other people in the area.

  Typhoid Fever is contracted by the ingestion of the bacteria in contaminated food or water. People with acute illness can contaminate the surrounding water supply through the stool, which contains a high concentration of the bacteria. Contamination of the water supply can, in turn, taint the food supply.

- **Bilharzia** is a human disease caused by parasitic worms called *Schistosomes.* Approximately 300 million people in the world are infected. Bilharzia is common in the tropics where ponds, streams and irrigation canals are home to bilharzia-transmitting snails. Parasite larvae develop in snails from which they infect humans, their ultimate host, in which they mature and reproduce.

  Within days after becoming infected, you may develop a rash or itchy skin. Fever, chills, coughing, and muscle aches can begin within 1-2 months of infection.

- **Gastroenteritis** is an infection of the guts (intestines). The severity can range from a mild tummy upset for a day or two with some mild diarrhoea, to severe diarrhoea and vomiting for several days or longer. Many viruses, bacteria, and other microbes (germs) can cause gastroenteritis. Food poisoning (infected food) causes some cases of gastroenteritis. Many different types of germs can cause food poisoning. Common examples are bacteria called campylobacter and salmonella. Water contaminated by bacteria or other germs is a common cause of gastroenteritis, particularly in countries with poor sanitation.

- **Dysentery** is an infection usually spread from person to person. It is caused by bacteria called "shigella". It causes inflammation of the bowel, which gives bloody diarrhoea, headaches, fever, nausea and sometimes vomiting and stomach cramps. These symptoms usually only last for a few days, and need no treatment other than rest and plenty to drink. After having dysentry, people may still carry the bacteria for a while, even though they feel better.

In South Africa, tap water is safe to drink as all the bacteria that may have been in it, are killed during the purification process. You should never drink water from rivers or dams without treating it first.

ASK THE LEARNERS:

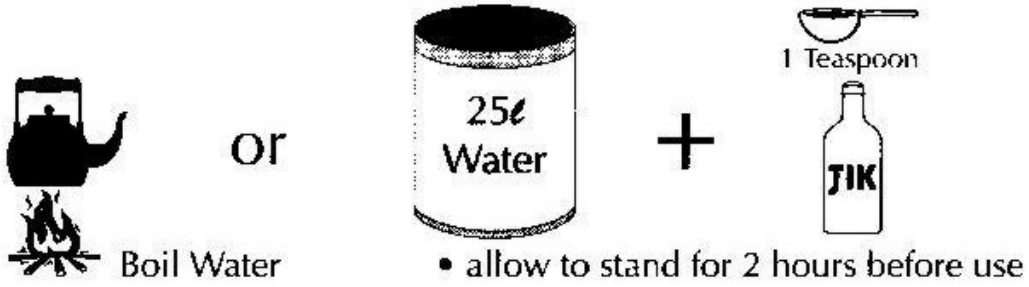
- Do they know of anyone who has had one of the diseases you have read about?
- Many water-borne diseases can be prevented through being careful about where water for drinking is collected and good hygiene practises. Where do the learners in the class get their drinking water? How can they be sure that it is clean and safe for drinking?
- What personal hygiene practises can your class adopt to prevent the spread of diseases *(such as washing hands before meals, when working with food, after going to the toilet, after changing babies' nappies).*

ASK THE LEARNERS:

Do any of you know of any simple way that you can clean (purify) your drinking water (especially if you are collecting it from a river or spring and are not sure that it is clean)?

- A simple way of purifying water is to add a teaspoon of jik to every 25 litres of water. Jik is very strong and kills all the bacteria, making it safe to drink.

- You can also boil the water, and that will kill any germs or bacteria that may be living in it. The water can be left to cool. It does not need to be drunk hot.



- What are other good hygiene practises?

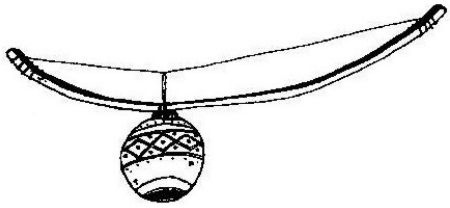
INDIGENOUS KNOWLEDGE AND WATER QUALITY

LEARNER ACTIVITY:
Read the case study below and then answer the questions that follow:

(In the story that follows, comments and scientific observations are in brackets and italised so that the learners can see the practical wisdom behind some water collection myths and techniques of the past).

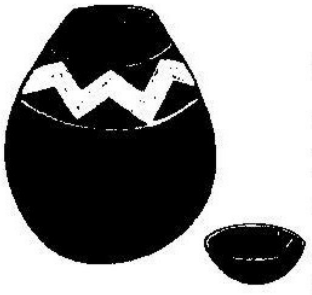
Before the time of the Zulu King, Shaka, sweet water was called "amanzi amnandi". Shaka's mother was called Nandi and it is said that because it was not considered respectful to use the queen mother's name in this way, Shaka referred to sweet water as "amanzi amtoti". *(This is how the town of Amanzimtoti, south of Durban, got its name).* Today both terms are used and many people of Nguni origin will sniff, smile and hold up "sweet" water, collected from a river, spring or well for their daily household needs. *(Water quality scientists today still have people smell and taste household water. Human senses give a refined indication of whether water is good and clean and fresh).*

Historically, water was usually collected in areas where people could hear it running over stones or dripping down rocks *(well oxygenated water supports natural biological cleansing processes).* If a spring was for human use, it was protected by a circle of rocks with a small outlet. Cattle drank elsewhere.



An area nearby was cleared and the site soon became a meeting place for young people. Young men would hang around these water collection sites, playing musical instruments and admiring the maidens who came to collect water. The girls would saunter along slowly and gracefully, singing and flirting. Water collecting was rarely seen as a tiring or boring chore because of the prospect of courtship!!

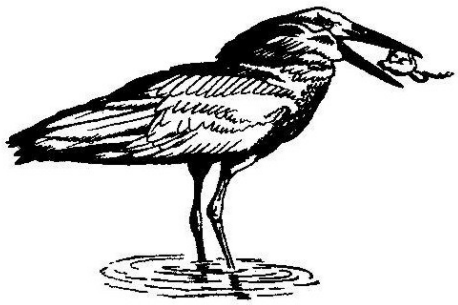
A water source would always be approached with care so as not to frighten crabs and other small water animals. When disturbed, their movement would stir up sediments and the collector would have to wait for the silt to settle. The surface film was brushed aside for "sweet water" to be collected. *(Sediments and surface films have higher bacteria numbers than the middle waters of pools and rivers. Today scientists take water samples below the surface film, taking care not to suck up sediments. In this way, scientists can get consistent and reliable measures of bacterial contamination).*

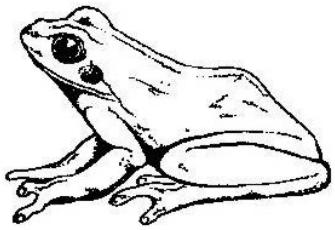


Clay pots were filled with water and covered with a collecting bowl, a piece of skin or a mat made from incema (*Juncas kraussii*) grass. The water would thus stay cool and fresh. *(Water evaporating through the sides of a porous clay pot cooled the contents. Most water bacteria cannot reproduce in cool, dark conditions. Some micro-organisms envelop themselves in a calcium secretion in the pores of clay pots. Scientists spoken to were uncertain about the detail of these issues but it is of note that, in earlier times, great care was taken to scour out a calcium-like scale in water pots. Also of note is that when the grass*

"lids" and head rings for carrying pots became old they were simply thrown away and new ones were woven. Discarded lids did not pollute the river like today's bottle tops and plastic waste).

There were many other customs and traditional practices surrounding water. Children were warned that urinating in a river would change them to the opposite sex! *(This myth was probably sufficiently frightening to prevent people urinating in streams and rivers. This would have limited a disease like bilharzia. The bilharzia parasite is passed on from human urine and faeces to small water snails. From these, its life cycle takes the disease back to people through river water).*





Nguni water collectors say that where there are frogs, one does not find sweet water. Frogs are eaten by hammerkops (*uthekwane*, the "lightning bird") and the prospect of collecting water while being watched by a "witch-bird" must have been terrifying in earlier times when spirits, myths and mystery had a more central place in everyday social life. Children were told that if they killed this bird or stole its eggs, their homes would go up in flames. *(Where there are frogs, one will usually find snakes. Both animals are feared by many people today, not least the children who were told the Nguni myths of witches and lightening to fill their hearts with terror. Today, scientific tests suggest that many frog species need "sweet water" if they are to live and reproduce successfully. There must be some doubt about the Nguni suggestion that frogs are an indication of water that is not fit for human consumption).*

It is also said that it was not advisable to collect water from a river after heavy rain at the start of the annual rainy season. Indigenous commonsense told people to put out pots to collect rain-water. River water would again be collected four days after the rains stopped and the water had cleared. *(Heavy rains wash human and animal wastes into rivers. There is thus a rapid increase in faecal bacteria and disease. In KwaZulu-Natal, health workers have to warn rural people not to collect river water after heavy rains as few remember the earlier Nguni practice of collecting rain-water only four days after the rains have stopped).*

Today human and livestock numbers have increased vastly, catchments have become degraded and rivers are often polluted dumping places. The best indigenous practices for the collection of "sweetwater" may not prevent people getting serious diseases from river water. Learning about historical water collection and storage practices can, however, develop a respect for early people and might also help our understanding of water quality issues.

QUESTIONS:

1. Have you collected water from a nearby river? What was the water used for? (If for drinking, how were you certain that it was safe to drink?)
2. What do you think 'well oxygenated water' means?
3. Why do scientists take water samples below the surface of the water?
4. Why did the Nguni scour their clay pots regularly?
5. Name the methods that the Nguni people used to reduce the contamination of their drinking water?
6. Do you think that these practices of collecting water are still relevant today?

Criteria to assess learners during this physical sciences lesson

Criteria	Outstanding	Meritorious	Satisfactory	Adequate	Partial	Inadequate
The learner contributed to discussions about water-borne diseases and personal hygiene practises						
The learner adequately answered all six questions at the end of the reading (written answers)						