
8.0 (MIDDLE SCHOOL) “GLOBAL WATER CRISIS” MINI-UNIT

National Curriculum Alignment:

(The following National Curriculum Standards are addressed by completing all of the activities associated with the Global Water Crisis mini-unit. See <http://www.educationworld.com/standards/national> for a corresponding key to standards)

NL-ENG.K-12.1

Reading for Perspective: Students read a wide range of print and non-print documents to build an understanding of texts, of themselves, and of the cultures of the United States and the world.

NL-ENG.K-12.3

Evaluation Strategies: Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts.

NL-ENG.K-12.4

Communication Skills: Students adjust their use of spoken, written, and visual language to communicate effectively with a variety of audiences and for different purposes.

NL-ENG.K-12.5

Communication Strategies: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

NL-ENG.K-12.6

Applying Knowledge: Students apply knowledge of language structure, language conventions, media techniques, figurative language, and genre to create, critique, and discuss print and non-print texts.

NL-ENG.K-12.7

Evaluating Data: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources to communicate their discoveries in ways that suit their purpose and audience.

NS.9-12.6

Science in Personal and Social Perspectives: Personal health/Populations, resources, and environments/Risks and benefits

NSS-G.K-12.2

Places and Regions: Understand the physical and human characteristics of places/ Understand that people create regions to interpret Earth's complexity/ Understand how culture and experience influence people's perceptions of places and regions.

NSS-G.K-12.3

Physical Systems: Understand the physical processes that shape the patterns of Earth's surface/ Understand the characteristics and spatial distribution of ecosystems on Earth's surface.

NSS-G.K-12.4

Human Systems: Understand the characteristics, distribution, and migration of human populations on Earth's surface/ Understand the characteristics, distribution, and complexity of Earth's cultural mosaics/ Understand the patterns and networks of economic interdependence on Earth's surface/ Understand the processes, patterns, and functions of human settlement/ Understand how the forces of cooperation and conflict among people influence the division and control of Earth's surface.

NSS-G.K-12.5

Environment and Society: Understand how human actions modify the physical environment/ Understand how physical systems affect human systems/ Understand the changes that occur in the meaning, use, distribution, and importance of resources.

NT.K-12.1

Basic Technology Operations and Concepts: Students demonstrate a sound understanding of the nature and operation of technology systems/ Students are proficient in the use of technology.

NT.K-12.2

Social, Ethical, and Human Issues: Students understand the ethical, cultural, and societal issues related to technology/ Students practice responsible use of technology systems, information, and software/Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.

NT.K-12.4

Technology Communications Tools: Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences/ Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

NT.K-12.5

Technology Research Tools: Students use technology to locate, evaluate and collect information from a variety of sources/ Students use technology tools to process data and report results/ Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.

- :: **Middle School**
- :: **Global Water Crisis**
- :: **Level of difficulty and duration:**

Objective:

Students will research water crisis conditions for one of the following five countries: Bangladesh, Ethiopia, Honduras, India, or Kenya and record findings on the Global Water Crisis International Comparison Group Activity graphic organizer. Students will then report their findings to the class, who will then record the remaining information for the other four countries on their activity charts.

Lesson:

Students will be assigned to research one of the following nations that have received aid from Water.org: Bangladesh, Ethiopia, Honduras, India, or Kenya. Students will individually visit (<http://water.org>). [Website instructions: From the main page click on world water crisis, then scroll down to the bottom of the page and click on Water Crisis in the Countries [we help], next under the left hand column heading "Where We Work" select the icon for the country you have been assigned to research.] Students will individually complete the activity chart for the country they have been assigned. Students will then work in groups of four or five to organize and present information on the country assigned to their group.

Materials:

Internet access, Global Water Crisis International Comparison Group Activity graphic organizer, pencils or pens, and presentation materials such as index cards, PowerPoint, or overhead transparencies.

Optional Activity:

Students may work in groups to discuss the major water, health and sanitation issues of their assigned country and make 2-3 recommendations for improvement of water and sanitation conditions.

Water-Awareness Portfolio Entry:

Which one of the four countries that the class reported on would you most like to live in? Which of the countries would you least like to live in? Why?

Possible discussion question:

Why does more than one-third of the world's population not have access to clean water?

Country Facts

Capital: Dhaka

Median age: 22.5 years

Access to improved water source: 74%

Below poverty line: 45%

Population: 150,448,339

Infant mortality: 59.12 deaths/1,000 live births

Access to improved sanitation: 39%

Adult literacy: 43.1%

Bangladesh is located in South Asia on the Bay of Bengal between India and Myanmar. It is mostly flat alluvial plain with hills in the southeast. Bangladesh became an independent nation in 1971 when it seceded from West Pakistan.

Each year during the summer monsoon season about one third of Bangladesh floods. These floods often force people from their homes, and hinder the economic development of the country. Preventable diseases, largely the results of poverty and overcrowding, remain highly prevalent and are the main killer of the 72 children out of 1,000 who die before their fifth birthday.

Water Crisis in Bangladesh

Bangladesh has made commendable progress in supply of safe water to its people. However, gross disparity in coverage exists across the country. Latrine usage is very poor across the country, averaging only 16% in the rural areas. Diarrheal diseases constitute a major health problem in Bangladesh, killing over 100,000 children each year. Thousands of episodes of diarrhea occur in children and adults each day. Diarrheal diseases have close biological and socio-economic links to the problems of malnutrition, poor maternal health, high fertility, and child survival.

In the late 1970s, approximately four million wells were drilled to replace the traditional contaminated surface water sources. The projects made significant headway and mortality due to water-related diseases had declined. However, in 1993, high arsenic concentrations were discovered in the groundwater of several wells in western Bangladesh. Long-term intake of high concentrations of arsenic from drinking water gives rise to a number of health problems, particularly skin disorders. Internal cancers have also been linked with arsenic in drinking water.

Although the arsenic crisis on an individual level is concerning, the more acute impacts are seen on the community as a whole. In Bangladesh, many wells containing arsenic were closed without considering the possible immediate adverse effects of such interventions, particularly the increase in diarrheal illnesses. Once a well is painted red, signifying the water contains arsenic concentrations above the national standard, community members are no longer supposed to use it. However, when a well is closed, the community must seek other sources for drinking water, usually returning to the traditional unprotected water sources such as ponds or ditches, or walking to distant wells that do not contain arsenic. While reducing the effects of chronic arsenic exposure, such practices dramatically increase the risk of acute bacteriological contamination, leading to greater outbreaks of water-related diseases. These diseases especially affect children who are much more vulnerable to diarrheal diseases. The resulting impact of this dilemma has been a spike in child mortality.

Urban Crisis

The size of the urban population is increasing at alarming rates. The poor people from the rural areas continue to migrate to the urban areas in with the hope of being able to earn larger wages to support their families. Many of these people find shelter in the Dhaka's slum communities. These squatter communities are the most densely populated areas in the country. The enormous quantity of people living in such close quarters causes people living in these slums to have some of the worst health in the country. Most people in these slums live on less than US \$2 a day, and many live on less than US \$1 a day. Acute poverty, overcrowding, poor housing, and unhealthy disposal of waste all play major roles in the water and sanitation crisis in the urban areas of Bangladesh.

Ethiopia is a landlocked country in the eastern Horn of Africa. It is slightly less than twice the size of Texas. The average temperature throughout much of the country is about 60° Fahrenheit. However, the northern part of the country along the Sudanese border can be much hotter. There are nearly 80 languages spoken in Ethiopia, but the most common are Amharic, Tigrinya, and Oromigna.

The need for water and sanitation in Ethiopia is severe. Only 22% of the population has access to an improved water supply, and only 13% of the population has access to adequate sanitation services. In rural areas, these numbers drop even further.

Water Crisis in Ethiopia

In rural areas, women and children walk up to six hours to collect water. Most people collect water from shallow, unprotected ponds which they share with animals. Other people collect water from shallow wells. Both these sources are subject to contamination as rain water washes waste from surrounding areas into the source. They then carry the large clay jugs of water back to their villages. These jugs can weigh up to 40 pounds! Often, young children are left home by themselves or with a slightly older sibling while their mother and older siblings collect water and their father works tends to animals or tries to earn money at a job outside the house.

Drought

In the last 20 years, Ethiopia has experienced recurring droughts followed by food shortages and famines. Poverty is accentuated during the droughts. Staple foods, like cabbage, experience sharp increases in prices, while families find that they must sell their cattle for half what they would get in a non-drought year. Along with limited food supply, during times of drought, water-related diseases are rampant. Surface water sources such as springs and ponds dry up. What limited water sources remain become heavily contaminated by environmental waste, such as human and animal excreta which is washed in when the limited rains do come. The stagnant water serves as a breeding place for mosquitoes.

In addition to being at risk for contracting diseases through drinking water, there is another risk. In times of drought, it is common for there not to be enough water available to bathe regularly. As a result, community members, especially children, suffer from scabies and eye infections. During these times, in an effort to conserve water, hand washing after defecation or before eating is rarely practiced.

Poverty continues to affect the child mortality rate in Ethiopia. There are many factors that contribute to the high child mortality rate. Diarrheal and water-related diseases are among the principle causes of death in young children. Pneumonia, vaccine-preventable diseases (especially measles), malaria, tuberculosis, and malnutrition are also among the top killers of this age group.

Country Facts

Capital: New Dehli

Median age: 24.8 years

Access to improved water source: 86%

Below poverty line: 25%

Population: 1,129,866,154

Infant mortality: 34.61 deaths/1,000 live births

Access to improved sanitation: 33%

Adult literacy: 61%

India boasts the world's second largest population with more than 1 billion people. Its population is more than 3.5 times the size of that of the United States. However, India is only one-third of the physical size of the US.

The population is incredibly diverse. Hindi is the national language, but there are 14 other official languages. India's schools teach 58 languages and its national newspapers are published in 87 languages. The predominant religion is Hindu (81.3%), but 12% of the population is Muslim, and other religions such as Sikhism, Christianity, Buddhism, Jainism, and Zoroastrianism are also practiced. Much of India's art reflects the country's religious ties and includes colorful masks, intricate sculpture, and lively dance.

Poverty is a chief concern in India. Although overall poverty in India has decreased in the last 50 years, more than 25% of India's population still lives on less than two dollars a day. There is an ever-widening gap between poor people and those who are better off. Health has also improved in India, however, 34% of India's children under age five are malnourished, and maternal deaths account for nearly 25% of the world's child-birth-related deaths.

Water Crisis in India

India's huge and growing population is putting a severe strain on all of the country's natural resources. Most water sources are contaminated by sewage and agricultural runoff. India has made progress in the supply of safe water to its people, but gross disparity in coverage exists across the country. Although access to drinking water has improved, the World Bank estimates that 21% of communicable diseases in India are related to unsafe water. In India, diarrhea alone causes more than 1,600 deaths daily—the same as if eight 200-person jumbo-jets crashed to the ground each day. Hygiene practices also continue to be a problem in India. Latrine usage is extremely poor in rural areas of the country; only 14% of the rural population has access to a latrine. Hand washing is also very low, increasing the spread of disease. In order to decrease the amount of disease spread through drinking-water, latrine usage and hygiene must be improved simultaneously.

Country Facts

Capital: Nairobi

Median age: 18.6 years

Access to improved water source: 61%

Below poverty line: 50%

Population: 36,913,721

Infant mortality: 57.44 deaths/1,000 live births

Access to improved sanitation: 43%

Adult literacy: 85.1%

Kenya is located in East Africa. It borders the Indian Ocean and Somalia on the east, Ethiopia and Sudan on the north, Uganda and Lake Victoria on the west, and Tanzania to the south. Kenya's eastern low plains rise to central highlands bisected by the Great Rift Valley in the west.

Over 50 percent of Kenyans are living below the poverty line. The HIV/AIDS pandemic has compounded the deteriorating health standards and resulted in growing destitution, and unprecedented levels of poverty.

Water Crisis in Kenya

The water crisis in Kenya is disrupting social and economic activities throughout the country. Unfortunately, the current wave of droughts and water shortages in Kenya and the rest of East Africa is only expected to continue.

The water crisis is due not only to the wave of droughts, but also to poor management of the water supply, under-investment, unfair allocation of water, rampant deforestation, pollution of water supplies by untreated sewage, and a huge population explosion (thirty-fold increase since 1900).

Kenya is limited by an annual renewable fresh water supply of only 647 cubic meters per capita, and is classified as a water scarce country. Only 61 percent of the rural population has access to an improved drinking water source, and the time-intensive pursuit of water collection often prevents women from taking up income generating activities, or in the case of girls, prevents them from attending school.

Nyanza Province

Much of Nyanza Province, where Water.org is working, is semi-arid and is subject to severe drought. Most people obtain their drinking water from Lake Victoria, seasonal rivers and streams, and hand-dug wells, all of which are contaminated sources. Women and children walk up to six kilometers each day to haul water, a task that takes up to three hours. Water is not only contaminated at its source but also from the way it is transported and stored. Few households boil their water.

Country Facts

Capital: Tegucigalpa

Median age: 19.7 years

Access to improved water source: 87%

Below poverty line: 53%

Population: 7,483,763

Infant mortality: 25.21 deaths/1,000 live births

Access to improved sanitation: 69%

Adult literacy: 80%

Honduras is the knee of Central America, bordered to the south by Nicaragua and El Salvador and to the west by Guatemala. In the rural regions, nearly 63% of the population is considered extremely poor, living on less than a dollar a day.

Families often work as subsistence farmers—growing only what they can use to feed their own families, and leaving very little money for other purchases.

Water Crisis in Honduras

In 1998 Honduras was devastated by Hurricane Mitch. The tiny country was the hardest hit by Mitch's rampage. Mitch was followed by three days of rain that caused landslides and floods, burying towns and killing thousands of people. Many of the rural communities were devastated. The hurricane caused \$58 million in damages and left 75% of the country without safe drinking water.

Reconstruction efforts are continuing. However, until they are complete, in these areas families are forced to rely on contaminated water supplies, and the prevalence of waterborne diseases like cholera is increasing. Mosquitoes that carry malaria and dengue fever are also a problem.

Beyond the issues of health, poor access to water supplies causes overall development to stagnate. Many women and children in the rural areas of Honduras spend up to six hours each day simply fetching water and carrying it home on their heads.

GLOBAL WATER CRISIS SURVEY-GROUP ACTIVITY CHART

Information	India	Ethiopia	Kenya	Bangladesh	Honduras
Description of physical location/ geography					
Description of water crisis					
Relevant statistical information					
Problems specific to the country/ region					
Recommendations					

GLOBAL WATER CRISIS “WATER COMMONS” LAB

Most of the world’s valuable resources, water included, are treated as “commons” where individuals, corporations and governments have the right to freely consume them and return their wastes. A “tragedy of the water commons” occurs when one person’s/institution’s wastes affects another person’s/institution’s access to safe, clean drinking water.

Pre-Activity Questions:

- 1:: Where does the tap water in your home come from?
- 2:: Where does your family’s used water go?
- 3:: What possible pollutants may enter the water “commons” from your home?

Materials:

- One aluminum pie pan per group
- Regular M&M’s
- Peanut M&M’s
- One spoon for each person
- One plastic/paper cup for each person

Procedure:

1. Your group will start at the first station in the river (upstream). Put 100 regular M&M’s in the pie pan. These represent the clean water from the river.
2. All group members must close their eyes or wear blindfolds. The teacher will carefully time the collection of “water” within a 30-second time frame.
3. Using the spoon as your pail, collect as many M&M’s as you can, keeping your eyes closed (no cheaters!), and place them in the cup.
4. After the 30 seconds is up, count how many M&M’s are left in the pan. Once this number is counted, subtract it from 100, and put that number of peanut M&M’s in the pan. The peanut M&M’s will represent the polluted water. Record the information in the chart.
5. Repeat steps 2-4 for each station in the river, or until no “water” is left.

Station	Clean Water	Polluted Water
1		
2		
3		
4		
5		
6		

Questions:

1:: How many stations did your group make it through before the resource ran out?

2:: How does the pollution from the stations upstream affect stations located downstream?

3:: What was the ratio of clean water to polluted water for each station? (Ratio = number of regular M&M's to number of peanut M&M's)

4:: What is meant by the phrase, "We all live downstream"?

5:: Research existing protections for freshwater sources at the local, national and international level. Report findings to your class.

GLOBAL WATER CRISIS BASIC FACTS SHEET

- Less than 1% of the world's fresh water (or about 0.007% of all water on earth) is readily accessible for direct human use.
- A person can live weeks without food, but only about three days without water.
- The interventions with the greatest impact on national development and public health are the provision of safe drinking water and the proper disposal of human waste.
- Water-related diseases are one of the leading causes of disease and death in the world. At any given time, half of the world's hospital beds are occupied by patients suffering from a water-related disease.
- Close to half of all people in developing countries suffer from a health problem caused by water and sanitation deficits.
- 2.6 billion people in the world lack access to proper sanitation resources.
- A person needs 4 to 5 gallons of water per day to survive.
- The average American individual uses 100 to 176 gallons of water each day.
- The average African family uses about 5 gallons of water each day.
- Millions of women and children spend several hours a day collecting water from distant, often polluted sources.
- Water systems fail at a rate of 50% or higher.
- Every \$1 spent on water and sanitation creates on average another \$8 in costs averted and productivity gained.
- Almost two in three people lacking access to clean water live on less \$2 a day.
- Poor people who are likely to live in slum areas often pay 5-10 times more for per liter of water than wealthy people living in the same city.
- Every 15 seconds, a child dies from a water-related disease.
- At any given time, half of the world's hospital beds are occupied by patients suffering from a water-related disease.
- 1.8 million children die each year from diarrhea – 4,900 deaths each day.
- Human health improvements are influenced not only by the use of clean water, but also by personal hygiene habits and the use of sanitation facilities.

Reading for Comprehension Questions

- 1:: Approximately how many people on the planet lack access to a safe supply of drinking water?
- 2:: At about what percentage rate do water system projects fail?
- 3:: What crisis claims more lives than any war?
- 4:: How much water does a person need each day to survive?
- 5:: What is the average amount of gallons of water used per day by an American individual?
- 6:: What is the average amount of gallons of water used per day by an African family?
- 7:: Worldwide, how many children die from water-related diseases each day?
- 8:: Which interventions have the greatest overall impact on national development and public health?
- 9:: What percent of the world's fresh water is readily accessible for direct human use?
- 10:: How much more are poor people living in slum areas likely to pay for water than wealthy people living in the same city.

Answers:

- 1:: 2.6 billion**
- 2:: 50%**
- 3:: Water-related diseases**
- 4:: 4 to 5 gallons**
- 5:: 100 to 176 gallons**
- 6:: 5 gallons**
- 7:: 4,900**
- 8:: providing safe drinking water and properly disposing of human waste**
- 9:: less than 1%**
- 10:: 5-10 times more**