Grade 8 Sample Lesson Plan: Pollution and Environmental Health Solutions

SOLs

- Describe pollutants found in water, soil, and air and their impact on body systems.
- Explain how humans and the environment are interdependent.
- Create environmental design solutions that promote physical and psychological health.

Objectives/Goals

- Students will apply knowledge of pollution and environmental health concerns to promote health.

Materials

- Internet access for research
- School social media resources
- Protective gloves for trash pickup
- Cameras/cell phones or other resources for environmental documentation

Procedure

Pollution

- Have students visit online webpages of the various agencies involved in environmental protection (e.g., see reference links to CDC, EPA, ASTDR, and DEQ) and work in groups to develop a series of healthy environment social media tweets and/or Facebook posts. Disseminate their responses through school social media accounts
    - o Raise awareness about various pollutants that affect the water, soil and air, their health effects on humans and ways humans can reduce pollution or the impact of pollution on human health.
- Spend one class session identifying sources of pollution on school facilities and school grounds as a group.
- Host an active "trash pick-up" session to pick up and recycle trash on the grounds ofthe school or adjacent communities.

Environmental Design

- Have students watch the CDC video on healthy community design https://www.youtube.com/watch?v=ll7Yv6L9rwE and review information from various websites of organizations involved in healthy community design (the references below may provide a starting point); then have students walk through their school and community to:
    - Take pictures and/or document areas (e.g., sanitation or water pollution; smoking, traffic or other air pollution, poor lighting, ruin or dilapidation, barriers to physical activity and nutrition) that could be improved through environmental redesign.
    - Consider ways of improving physical and psychological health in the school and community.
    - Propose design solutions to at least two of these areas that will promote physical and psychological health and present these in class and/or to school or community leaders.

Assessment Idea

- Evaluate quality of completion of social media and design assignments.
- Participation in "trash pick-up" session.

References

- Allergy and Asthma Foundation - http://fightthecauseofallergy.org
- APHA Healthy Community Design https://www.apha.org/topics-and- issues/environmental-health/healthy-community-design
- CDC Environmental Hazards and Health Effects https://www.cdc.gov/nceh/ehhe/
- CDC Healthy Community Design https://www.cdc.gov/features/healthycommunities/
- CDC Healthy Community Design https://www.youtube.com/watch?v=ll7Yv6L9rwE
- EPA Environmental Topics https://www.epa.gov/environmental-topics
- EPA Learning and Teaching about the Environment: https://www.epa.gov/students
- Global Asthma Report http://www.globalasthmareport.org/burden/causes.php
- Global Asthma Network http://www.globalasthmanetwork.org/patients/causes.php
- HealthyPeople.Gov Environment https://www.healthypeople.gov/2020/topics-objectives/topic/environmental-health
- NEA Environmental Lessons http://www.nea.org/tools/EnvironmentalEducationActivitiesAndResources.html
- NIEHS- Your Environment- Your Health: http://www.niehs.nih.gov/health/scied/teachers/
- WHO Environmental Health http://www.who.int/topics/environmental_health/en/

- ATSDR Health Effects of Exposure to Substances https://www.atsdr.cdc.gov/substances/ToxOrganSystems.asp
- Virginia Department of Environmental Quality (DEQ) http://www.deq.virginia.gov

Healthy Community Design

HEALTHY COMMUNITY DESIGN

Fact Sheet Series

The way we design and build our communities can affect our physical and mental health. This fact sheet explains healthy community design and its health benefits.

What Is Healthy Community Design?

Healthy community design is planning and designing communities that make it easier for people to live healthy lives. Healthy community design offers important benefits:

- Decreases dependence on the automobile by building homes, businesses, schools, churches and parks closer to each other so that people can more easily walk or bike between them.
- Provides opportunities for people to be physically active and socially engaged as part of their daily routine, improving the physical and mental health of its citizens.
- Allows persons, if they choose, to age in place and remain all their lives in a community that reflects their changing lifestyles and changing physical capabilities.
- Ensure access to affordable and healthy food, especially fruits and vegetables.

What Are the Health Benefits of Healthy Community Design?

Healthy community design can provide many advantages:

- Promote physical activity.
- Improve air quality.
- Lower risk of injuries.
- Improve healthy eating habits.
- Increase social connection and sense of community.
- Reduce contributions to climate change.

What Are Some Healthy Community Design Principles?

Healthy community design includes a variety of principles:

- Encourage mixed land use and greater land density to shorten distances between homes, workplaces, schools and recreation so people can walk or bike more easily to them.
- Provide good mass transit to reduce the dependence upon automobiles.
- Build good pedestrian and bicycle infrastructure, including sidewalks and bike paths that are safely removed from automobile traffic as well as good right of way laws and clear, easy-to-follow signage.
- Ensure affordable housing is available for people of all income levels.
- Create community centers where people can gather and mingle as part of their daily activities.
- Offer access to green space and parks.
- Create outlets for fresh fruits and vegetables, such as community gardens and farmers markets.

Conclusion

Designing and building healthy communities can improve the quality of life for all people who live, work, worship, learn, and play within their borders—where every person is free to make choices amid a variety of healthy, available, accessible, and affordable options.

Resources

For more information, go to http://www.cdc.gov/healthyplaces.

E-mail: healthyplaces@cdc.gov
Web: http://www.cdc.gov/healthyplaces/

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Division of Emergency and Environmental Health Services

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WATER AND AIR POLLUTION

Along with amazing technological advances, the Industrial Revolution of the mid-19th century introduced new sources of air and water pollution. By the middle of the 20th century, the effects of these changes were beginning to be felt in countries around the world. In the 1960s, an environmental movement began to emerge that sought to stem the tide of pollutants flowing into the planet's ecosystems. Out of this movement came events like Earth Day, and legislative victories like the Clean Air Act (1970) and the Clean Water Act (1972).

In the latter part of the 13th century, in an effort to reduce air pollution, England's King Edward I threatened Londoners with harsh penalties if they didn't stop burning sea-coal. However, the king's regulations–and those of subsequent leaders–had little effect.

By the late 18th century and first part of the 19th century, coal came into large-scale use during the Industrial Revolution. The resulting smog and soot had serious health impacts on the residents of growing urban centers. In 1952, pollutants from factories and home fireplaces mixed with air condensation killed at least 4,000 people in London over the course of several days. A few years earlier, in 1948, severe industrial air pollution created a

deadly smog that asphyxiated 20 people in Donora, Pennsylvania, and made 7,000 more sick. Acid rain, first discovered in the 1850s, was another problem resulting from coal-powered plants. The release of human-produced sulfur and nitrogen compounds into the atmosphere negatively impacted plants, fish, soil, forests and some building materials.

Today, the leading cause of air pollution in the U.S. is motor vehicles, which were first mass-produced in the U.S. by Henry Ford in the early 20th century. Auto emissions also increase the amount of greenhouse gases in the atmosphere, which in turn contribute to global warming.

In 1963, in an effort to reduce air pollution, the U.S. Congress passed the Clean Air Act, legislation which has been amended and strengthened in the ensuing decades. However, in 2007, almost half (46 percent) of all Americans resided in counties with unhealthy levels of either ozone or particle pollution, according to the American Lung Association (ALA). Ozone, or smog, is described by the ALA as “an irritating, invisible gas that is formed most often by a reaction of sunlight and vapors emitted when fuel is burned by cars and trucks, factories, power plants and other sources. Ozone reacts chemically (“oxidizes”) with internal body tissues that it comes in contact with, such as those in the lung.” It irritates the respiratory tract and can lead to a number of health problems, including asthma attacks, chest pain and even death. The ALA defines particle pollution (formerly referred to as soot) as “the most dangerous, and deadly, of the widespread outdoor air pollutants.” Particle pollution is microscopic and derived from “a complex mixture that can include ash, soot, diesel exhaust, chemicals, metals, and aerosols. In the eastern U.S., many particles come from power plants that burn coal to produce electricity. In the western U.S., many come from diesel buses, trucks, and heavy equipment, as well as agriculture and wood burning,” according to the ALA. “Breathing particle pollution year-round can shorten life by one to three years. It

causes many other health effects, premature births to serious respiratory disorders, even when the particle levels are very low. It makes asthma worse and causes wheezing, coughing and respiratory irritation in anyone with sensitive airways. It also triggers heart attacks, strokes, irregular heartbeat, and premature death."

Just like air, water is under assault from numerous types of pollution. For centuries, humans unknowingly contaminated sources of drinking water with raw sewage, which led to diseases such as cholera and typhoid. According to a CNN report, one gram of human excrement contains approximately "10 million viruses, 1 million bacteria, 1,000 parasite cysts and 100 parasite eggs." Today, over 1 billion people worldwide lack access to safe water and every 15 seconds somewhere on the planet, a child dies from a water-related disease, according to WaterPartners International (www.water.org) .

Water pollution intensified with the advent of the Industrial Revolution, when factories began releasing pollutants directly into rivers and streams. In 1969, chemical waste released into Ohio's Cuyahoga River caused it to burst into flames and the waterway became a symbol of how industrial pollution was destroying America's natural resources. In 2007, CNN reported that "up to 500 million tons of heavy metals, solvents and toxic sludge slip into the global water supply every year. In the developing world [according to UNESCO] as much as 70 percent of industrial waste is just dumped untreated into the rivers and lakes. China is a perfect case in point. According to Greenpeace, around 70 percent of China's lakes and rivers are now polluted from industrial waste, leaving 300 million people 'forced to rely on polluted water supplies.'" Water sources are also contaminated by rain runoff from such things as oil-slick roads; construction, mining and dump sites; and livestock wastes from farm operations. Leaky septic tanks, pesticides and fertilizers are among the other sources that can contaminate

groundwater. Over half the American population (including the majority of those living in rural areas) relies on groundwater for drinking water, according to The Groundwater Foundation (www.groundwater.org), which also notes that the largest use for groundwater is crop irrigation.

In 1972, Congress passed the Clean Water Act to reduce water pollution. Various pieces of anti-pollution legislation have followed since that time and today the U.S. has relatively clean, safe drinking water compared with much of the world. However, water pollution is still a problem. In 2006, the Environmental News Service (ENS) reported that “more than 62 percent of industrial and municipal facilities across the country discharged more pollution into U.S. waterways than their Clean Water Act permits allowed between July 2003 and December 2004.” The ENS also noted that over 40 percent of American waterways were unsafe for swimming and fishing. Additionally, water resources face an ongoing threat from man-made environmental disasters such as the 1989 Exxon Valdez oil spill, during which approximately 11 million gallons of crude oil were accidentally dumped into the sea off Alaska’s Prince William Sound. The disaster, which created a 3,000-square-mile oil slick, instantly killed hundreds of thousands of birds, fish and other wildlife and devastated the area for years afterward.

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What is Environmental Health? 8th Grade Lesson Plan

Maryland Core Learning Goals: *Goal 6: Environmental Science, Expectation 6.3*
6.3 The student will analyze the relationships between humans and the earth's resources.

Core Objectives: In a 30 to 50-minute lesson, instructor will introduce 8th grade students to Environmental Health and familiarize them with how environmental conditions are linked to human health. Key concepts include environmental hazards, sources of environmental exposures, exposure pathways, acute and chronic conditions and the Maryland Environmental Public Health Tracking program (M-EPHT).

Options are provided to modify and/or extend the module based on time available, as well as student interests and abilities.

Following the lesson, students should be able to:

- Define environmental health
- Recognize that the health of the environment is connected to the health of people
- Understand how substances in the environment can get into the human body through inhalation, absorption and ingestion (exposure pathways)
- Appreciate the need for data on environmental and health indicators

Additional Objective: Use the Maryland Environmental Public Health Tracking Program website to explore environmental health data, as well as discuss uses of this data to advance our understanding of the relationship of environmental conditions to human health.

Vocabulary:

Core: Environmental health, environmental hazard, chronic and acute conditions, exposure pathways, , inhalation, absorption, ingestion, surveillance
Additional: epidemiology, demographics, socioeconomic status, environmental health tracking, environmental justice, Maryland Department of Health and Mental Hygiene, Maryland Department of Environmental Protection, Environmental Protection Agency, Centers for Disease Control and Prevention, Maryland Environmental Health Tracking Program

Materials

- *What is Environmental Health?* PowerPoint presentation

- Maryland Environmental Public Health Tracking Network Site (M-EPHTN) http://ideha.dhmh.maryland.gov/OEHFP/EH/tracking/SitePages/Home.aspx and computers with Internet access for students to explore the site. *Note: depending on teacher's preference and computer availability, the lesson can be adapted for use with one computer projected for the class to see or multiple computers for small group or individual student work.*

- Handouts: vocabulary sheet and slide notes page

- **Videos:**
  - CDC Introduction to the National Environmental Public Health Tracking Network: Working Toward a Healthier Planet for Healthier People (1 min. 44 secs.): http://www.youtube.com/watch?v=J42CLZH1NlE&feature=related
  - Maryland Environmental Health Careers site with video interviews of professionals in the state working in various environmental health roles: http://experts.thinkport.org/envirohealth/default.aspx

ENGAGE

Pre-assessment and Introduction

Assess students' knowledge on how the environment impacts human health with questions, discussion, and/or student activity. Ask students to share or write down some examples of the environment impacting health. Examples could include the Gulf Oil spill, the earthquake/tsunami/nuclear disaster in Japan, or another timely example from the local, national, regional or international level that the students may be familiar with). The short video from the Centers for Disease Control and Prevention's Tracking Network is another resource for introducing the topic to students.

Students may likely be familiar with environmental issues such as recycling, the Chesapeake Bay or endangered species. The focus of this lesson expands beyond these environmental concepts to how environmental conditions impact human health. The environment can impact human health as a result of a one-time (acute) event such as a natural disaster, an unplanned event such as an oil spill, or from longer-term (chronic) exposures that may be more difficult to notice and link directly to an environmental condition (i.e., asthma and air quality, cancer and chemicals).

EXPLORE

Introduce environmental health issues associated with the environment, explain how substances in the environment can enter the human body (exposure pathways), as well as the need for and use of environmental data. Using the materials and additional resources provided, teachers should intersperse a short lecture with class discussion and student activities as the instructor desires and time allows.

EXPLAIN

Provide an overview of why it is valuable to understand environmental health conditions and exposure pathways and how this can help us improve human health. This may be a good opportunity for small group discussion about ways the environment impacts the students' health and specific ways that substances in the environment can get into their bodies. What are specific actions they can do to avoid harmful environmental exposures? What types of laws and rules could be enacted by the government, their school, and their community to help protect their health?

ELABORATE

Discuss the importance of learning more about the environment and having data on environmental and human health conditions. How can having this information make a difference to improve environment and health conditions? If time allows, students can explore environmental health careers and hear directly from environmental health professionals at the website for environmental health careers provided in the videos section above.

If the instructor desires, this activity could serve as a springboard to invite environmental health professionals to present to the class or at a school career day about their work and future environmental health career opportunities.

If time allows, students can also peruse the Maryland Environmental Public Health Tracking (M-EPHT) website, in particular the maps and queries section. Giving students time to navigate the M-EPHT site (perhaps in pursuit of a specific piece of information, for example using the maps section of the site to identify asthma rates for their county in a particular year) can help them develop their own questions about the website and the value of the information available.

EVALUATE

Evaluation options:

- Respond to several brief constructed response (BCR) questions.

  Examples:

  - Define environmental health and provide at least two specific examples of environment and health connections.
  - Identify at least two environmental health topics you are concerned about and explain why?
  - What are at least two activities that you or the government, your school or community can do to help protect the environment and their health?

- Compose a short essay relating information learned about environmental health and how it can impact your health.

Individual or Group Project Options:

- Write a letter to the governor or a state or local representative, discussing a specific environmental health and suggest actions or request support (funding/attention/more research) to address the problem.

- Develop an environmental health education campaign (perhaps in the form of a video, poster, PowerPoint presentation, or brochure) about the environment and its connections to human health.

- Prepare a response to an environmental health case study question (some examples are provided in the Resources and References section but may need to be modified by the instructor based on time, as well as class interest and ability.).

Building on the concepts from the lesson, formulate questions to identify potential causes of the problem and a list of suggested actions.

- Create an environmental health profile of their county or state (using the M-EPHT website and other resources listed). Describe current environmental health conditions, presenting hypotheses of what things in the environment might impact the community's health, as well as suggestions to help protect the residents' health.

Resources and References:

Maryland Environmental Public Health Tracking Program (M-EPHT):
http://ideha.dhmh.maryland.gov/OEHFP/EH/tracking/SitePages/Home.aspx

Centers for Disease Control and Prevention (CDC) National Environmental Public Health Tracking Program:
http://www.cdc.gov/nceh/tracking/

CDC Introduction to the National Environmental Public Health Tracking Network: Working Toward a Healthier Planet for Healthier People (1 min. 44 secs.):
http://www.youtube.com/watch?v=J42CLZH1NlE&feature=related
U.S. Department of Health and Human Services (DHHS) – Healthy People 2020 Determinants of Health: http://www.healthypeople.gov/2020/about/DOHAbout.aspx

U.S. Environmental Protection Agency (EPA) Teaching Resources
http://www.epa.gov/teachers/health.htm

EPA My Environment Query Tool:
http://www.epa.gov/myenvironment/

EPA Environmental Justice :
http://www.epa.gov/environmentaljustice/index.html

U.S. Department of Health and Human Services Office of Minority Health
http://minorityhealth.hhs.gov/templates/content.aspx?ID=3559

Robert Wood Johnson Foundation: Poverty's High Cost of Health
http://www.rwjf.org/pr/product.jsp?id=49868

Maryland Environmental Health Career Website:
Meet the Experts: Environmental Health Professionals:
http://experts.thinkport.org/envirohealth/default.aspx

National Institute of Environmental Health Sciences (NIEHS) Curricular Material:
http://www.niehs.nih.gov/health/scied/teachers/curricular/index.cfm

Enviro Health Connections: Curriculum Resources:
http://www.thinkport.org/CLASSROOM/CONNECTIONS/general/other.tp

Additional materials for possible evaluation activities:

More introductory level:
Learn about Chemicals Around Your House:
http://www.epa.gov/kidshometour/

Natural Resources Defense Council's Green Squad: Kids Taking Action for Safer, Greener Schools:
http://www.nrdc.org/greensquad/

More advanced level:

Environmental Health Hazards, Toxic or Not:
http://peer.tamu.edu/curriculum_modules/Environ_Hazard/index.htm

Dioxin Contaminated Chicken: An Environmental Health Disaster Scenario
http://www.bu.edu/bahec/index.html

Oregon State Environmental Health Sciences Center:
http://ehsc.oregonstate.edu/downloadactivities