

A GUIDE TO DEVELOPING ONE HEALTH LESSONS FOR K-12

WHAT IS ONE HEALTH AND WHY IT'S A GOOD IDEA FOR OUR KIDS

One Health is an integrated concept of health and well-being that combines knowledge and input from many different stakeholders to attain *optimal* health for people, domestic and wild animals, plant life, and the environment (see www.onehealthcommission.org/en/why_one_health/what_is_one_health/).

One Health is about more than “health” however and is meaningful for everyone. It’s about developing a relationship with our world that leads to a more sustainable, empathetic and healthy existence for all. One Health can provide the organizing framework for a curriculum that teaches young people how to look beyond immediate results and ask complex questions while seeking a deeper understanding of integrated problem solving. This approach preserves the *health of an entire system*, resulting in a more sustainable existence. One Health-themed lessons and perspectives train young minds to look more deeply into the causes of social challenges, to gain an appreciation for those that are different from themselves (diversity) and accept that a broad spectrum of people and things have value and something to contribute.

BASIC VALUES REINFORCED THROUGH ONE HEALTH MESSAGING

The basic values that underpin the One Health concept are easily generalizable and can help to cultivate compassionate, empathetic and humane citizens and support a healthy outlook for the future. The primary value of health and well-being for *everyone* and *everything* establishes a baseline from which to build a more equitable and sustainable world. In a recent survey of One Health professionals, the following basic values were emphasized:

personal responsibility and respect for natural systems and planetary health; corporate, political and societal responsibility; equity and social justice; and viewing nature as equally important as humanity. Following the medical profession’s fundamental concept of “first do no harm”, the One Health approach seeks to prevent negative consequences, rather than merely reacting hastily to emergencies which often lead to unintended negative outcomes. One Health supports the risk management strategy known as the Precautionary Principle, which states that we should be cautious about taking actions when the ultimate impact is disputed or unknown.



CHECKLIST OF WHAT SHOULD BE INCLUDED IN A ONE HEALTH LESSON

- ✓ **One Health considers human, animal, and environmental components** for any problem or situation. The primary focus or problem can reside in one of these three domains, but it is critical to consider contributing factors and health impacts on the other two when formulating solutions to those challenges.

In the classroom, students can assess and consider solutions to many real-world problems that span all three domains, for example pollution, food security, and infectious disease threats.
- ✓ **Problem solving stresses the benefits of collaborative team work.** In order to address inputs and outcomes of complex problems effectively, expertise is needed from many different perspectives, including human and veterinary medicine, engineering, biology and environmental science. In addition, *all* problems involving people also include a social context that may be defined by issues such as equity, diversity, demographics, geography, economics, and politics. Furthermore, the social life of animals should be considered in problems involving animals should also consider their own social context. A problem can be science-based but require

human social organization and often behavior change to produce effective solution and thus require expertise of social scientists as well.

- ✓ **Scope and consequences.** An example scenario examines the problem of people pouring unwanted chemicals down the drain or throwing plastic into a river as a means of disposing it. The river carries it away from sight and they think the problem is solved –people remain healthy (for the time being). A One Health approach would consider a broader scope and consequences of this scenario for other people, animals and the environment, starting with people downstream suffering directly from polluted water and becoming ill. Do the original people causing the pollution care about them (equity, justice)? Fish in the river suffer and die or are unhealthy, and may become scarce or even disappear. People dependent on fish for food may suffer illness from eating contaminated fish (e.g. mercury), or may not be able to find any fish to eat if the fish die leading to food insecurity and possibly loss of livelihood. Further downstream the river washes into the ocean and the pollutants or plastics begin to mix in the ocean taking a toll. But are the people at the beginning of this chain aware of any of this, it's far away and underwater? The results are that corals die from sunscreen chemicals, chemicals are found in marine life, cause disease and affect other peoples' health, plastic is ingested by all kinds of marine life, and even ends up as microplastic in salt mined from the sea as fashionable sea salt.

What kind of actions might help the person at the beginning of this cascade understand the impacts of their behavior?

- ✓ **Cradle to grave** thinking: people can learn to open their eyes and consider where their “stuff” (including their food) comes from and where it goes after they throw it away – sometimes simple actions can return to harm our communities in the long run, in addition to animals and the environment. Or they may fail to realize that although their personal contribution is miniscule, when combined with everyone else's, the results can be catastrophic. Consequently, everyone has a responsibility for their contribution. (e.g. littering recycling, waste management and personal choices)

Simple cradle to grave exercises can be conducted in the classroom on common items such as pens and pencils, where students understand what materials are in these items, how they are made, what happens when they are discarded and the health risks posed by this process.

- ✓ **Taking the long view.** Thinking long term in the face of an outbreak or emergency can be challenging. Our policies are often very short term and can lead to unintended consequences or unanticipated problems years later, simply because we are not asked to think this far ahead, or the people making the policy are only rewarded for outcomes in a short finite time frame.

Urgent issues are most susceptible to this problem, such as during disaster response (hurricanes, earthquakes) where human conditions are considered in isolation and animal and environmental domains are left out of decision making.

LEARNING OBJECTIVES THAT CAN BE MET THROUGH A ONE HEALTH THEMED EXERCISE

- Students recognize and appreciate the relationship between their own health and well-being and that of animals and the environment around them (interdependency).
- Students can identify the impacts of their actions on the health and well-being of animals and the environment both globally and locally (responsibility, leadership).
- Students learn to work with others in gathering information and creating solutions to complex challenges (collaboration, team-building, leadership).
- Students learn to listen and appreciate others' concerns (empathy).
- Students learn to seek out multiple sources of information including traditional and non-traditional media and social or community sources (interdisciplinary thinking, inquiry).

- Students embrace the challenges of complex systems and learn how to respond with complex solutions (systems thinking, interdisciplinary thinking).
- Students build a foundation of evidence for decision making but learn to accept that answers are not often final and can be challenged as new discoveries and more evidence accumulates (evidence based problem-solving, inquiry, uncertainty).
- Students use critical thinking to develop prevention strategies that will avoid short-term solutions and missteps that might exacerbate a problem in the long term. (prevention, precautionary principle).
- Students learn about biodiversity and the importance of all species on earth (systems thinking, interdisciplinary holistic thinking)

USING THE ONE HEALTH ORGANIZING FRAMEWORK TO MEET U.S. EDUCATION STANDARDS

The One Health organizing framework supports many of the Next Generation Science Standards (NGSS) and can easily be included in developing curriculum that meets state and Common Core requirements. An overview of the NGSS can be found online at <https://www.nextgenscience.org/>.

Here are links to standards that apply to One Health-themed curricula and lessons:

- *K-5* See [individual grade standards](#) for topics such as Earth’s Systems; Earth and Human Activity; From Molecules to Organisms; Ecosystems: Interactions, Energy, and Dynamics; Biological Evolution.
- *Middle School Grade Band (6-8)*: [Earth and Human Activity](#), [Ecosystems: Interactions, Energy, and Dynamics](#) (Ecosystems services, biodiversity), [Earth’s Systems](#) (relevant for climate and water issues), [Engineering Design](#) (contains relevant skills for OneHealth related topics), [From Molecules to Organisms](#) (bioaccumulation, effects of contaminants, stressors that disrupt physiology and behavior - e.g. light pollution), [Biological Evolution: Unity and Diversity \(domesticated animals, costs/benefits of domestication\)](#)
- *High School Grade Band (9-12)*: [Human Sustainability, Engineering Design, Earth and Human Activity, Ecosystems: Interactions, Energy, and Dynamics](#) (wildlife conservation and infectious disease dynamics), [Biological Evolution: Unity and Diversity](#) (primarily biodiversity, but also antibiotic resistance - heredity standards could tie into antibiotic resistance too), [Earth’s Systems](#) (relevant for climate and water issues), [From Molecules to Organisms: Structures and Processes](#) (relevant to food use/availability, effects of contaminants on humans, plants, and wildlife)

Other standards that could be used with a One Health framework:

[National Council of Teachers of Mathematics](#)

[National Council for the Social Studies](#)

[National Council of Teachers of English](#)

APPLICATION OF A ONE HEALTH THEME ACROSS K-12

Theme = Antimicrobial Resistance

K-5 Lessons centered on our relationship to the microbial world, including good and bad aspects. Introduction to microbiome.

Middle School Lessons build on K-5 understanding to develop the idea of how microbes cause disease, how transmission occurs and various prevention or management strategies.

High School Lessons explore human actions that lead to outbreaks of microbial diseases and the threat from antimicrobial resistance, including animal and environmental components.

SUGGESTED THEMES THAT STUDENTS CAN EXPLORE AND LESSONS CAN BE BUILT AROUND.

- Documenting and building awareness for how their lives are connected to animals and the environment
- What it means to be “healthy” for people, animals, and the environment
- Causes/drivers of disease emergence – pick a disease – e.g. Ebola, Nipah Virus, Zika virus, West Nile virus, malaria
- Vector borne diseases – how vectors spread disease and what influences their success, managing vectors and the environment (pesticide risks, disturbing insect ecosystems and trophic cascades)
- The bounty of biodiversity and how it protects health
- Rapid human development leading to unexpected disease emergence – e.g. effects of deforestation on outbreaks of Nipah virus and malaria; relationship of host biodiversity and Lyme disease; industrial agriculture and Avian Influenza; global travel and disease spread; and impacts of invasive species such as domestic cats.
- Cradle to grave research on common items used by people in their daily lives.
- Climate change and its many impacts on the health of humans, animals and the environment.
- Ocean health and what can be done to protect it, the impact of coral bleaching or plastic in the ocean
- Human/animal physiology and microbiome effects on health and well-being
- Immune systems and how vaccines work – e.g. rabies vaccines for people, dogs, and wildlife and how they are used to prevent illness in all three

STRUCTURING THE EXERCISE

- Problem-based – present a problem (what brings it to our attention) and try to solve it – divide students into groups representing different stakeholders. Make sure that students don’t just focus on people, but that some students represent animals (domestic and wild) and other students represent the broader environment. Have each group research the problem from their stakeholder perspective – this can be done in stages. Have groups come together and present their findings. Then have each group modify their findings based on what they have learned from the other groups OR (if a small group) have students develop one or more solutions or answers that take the perspectives of all stakeholders into account.
- Problem-based, cross disciplinary – Use the One Health theme to develop cross-cutting units that involve multiple classes working on an issue at the same time from different angles – e.g. social studies, math, science, English
- Research-based (topical) – what happens when...e.g. Have students research a topic and make a presentation or poster that includes different perspectives and then lead a class discussion.
- Project based activities – Competitions for recycling. Environmental monitoring (temperature, rainfall, air, water) linked to disease dynamics; Cradle to grave exercises for materials in the classroom, home or community

BASIC REFERENCES AND RESOURCES FROM THE ONE HEALTH COMMISSION

See references, lesson plans, scenarios/case studies, and links at our website

www.onehealthcommission.org/en/resources_services/one_health_educational_resources/

This guide was prepared by a US-focused subgroup of the One Health Commission’s One Health Education Task Force. July 2018 Version.