

# DISCOVERING ONE HEALTH

## LESSON SLIDE NOTES for AGES 8-10

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### Slide 1:

This lesson addresses:

**U.S. Next Generation Science Standards: (these are addressed throughout the lesson but highlighted slides are listed)**

NGSS Standards: Grade 3: LS: Interdependent Relationships & Ecosystems (slides 8-13)

NGSS Standards: Grade 6: ESS3.C: Human Impacts on Earth Systems (slides 8-13)

**United Nations Sustainable Development Goals: (these are addressed throughout the lesson but highlighted slides are listed)**

Good Health and Well-being (slide 7, 30)

Quality Education (slides 1-33)

Clean Water and Sanitation (slides 8-13)

Affordable and Clean Energy (slides 8-13- deforestation)

Sustainable Cities and Communities (slides 8-13- deforestation)

Responsible Consumption and Production (slides 8-13- deforestation)

Climate Action (slides 8-13)

Life on Land (slides 8-13)

Partnerships for the Goals (slides 3, 7, 29-31)

### **Overview:**

Have you ever thought about how disease outbreaks start? A germ finds the ideal environment and runs out of control! The germ may jump between species and onto you. How can we prevent this? How can we protect ourselves now and in the future? Find out more with *Discovering One Health!*

### **Lesson Objectives:**

1. Students will understand that the health of people is dependent on the health of animals and the environment (slides 8-33)
2. Students will understand the need for vaccines (slides 7, 30)
3. Students will better understand the importance of protecting our environment (slides 8-14)
4. Students will better understand disease transmission and mutations (slides 15-27)
5. Students will see what health professionals are currently combating (slide 30)
6. Students will understand the importance of good communication between different professions (slides 7 and 29-31)

**Slide 2:**

Each keyword has an individual slide with its definition in the following 5 slides

**Slide 3:**

**Emphasize** here that veterinarians can work closely with (human) doctors and environmental health scientists to efficiently improve the health of the animals, people and the environment at the same time.

Please also note that this slide reviews the One Health **concept**. (The students will learn about the One Health approach later in the lesson.) Also note here that some people in 2022 call this connection “Planetary Health”. “Planetary Health” has traditionally emphasized the interaction between the environment and people’s health but advocates of “Planetary Health” are starting to include the effect of animals’ health on the planet. More information about Planetary Health can be found at: <https://www.planetaryhealthalliance.org/planetary-health>

Definition from the United States CDC website

(<https://www.cdc.gov/media/releases/2019/s0506-zoonotic-diseases-shared.html>) covers the Approach part of the definition which will be discussed later in the lesson:

One Health is an approach that recognizes the connection between people, animals, plants, and their shared environment and calls for experts in human, animal, and environmental health to work together to achieve the best health outcomes for all.

**Slide 4:**

(Note: This slide requires slideshow view. If you are not already using this method of review, it is best to start now.)

**Ask** how many species are in each picture. Note that there are more than 3 species in the top picture because plants have different species.

**Tip for teachers:**

A good way to explain this slide is:

“Two cats can make kittens and two dogs can make puppies. Can a cat and a dog together have babies? No- because they are different species.”

**Slide 5:**

**Emphasize** that these diseases jump to people.

**Ask** how many species are represented on this slide (answer: 5 because humans are a type of animal species)

**Tip for teachers:**

Emphasize the “zoo” in zoonotic. **Ask** how many species are in the zoo? (A lot.) Let’s name some! (Make sure that they say people who are visiting the zoo- drive home the point that human is a type of animal.)

**Slide 6:**

**Emphasize** here that viruses and bacteria and parasites and even cells inside people and animals can mutate (ex. some people-like this cat-have an extra toe or two!).

A good tip here is to have all the students **repeat the phrase: “Mutation is Change”**. This phrase can be repeated throughout the class. (Later on, the students learn that a mutation can strengthen or weaken a virus’ ability to infect a cell and replicate. Sometimes a mutation does not make much of a difference, it is just a benign change. Other times, the difference is important.)

**Slide 7:**

Vaccines are meant to strengthen a body to fight an upcoming germ. Note that a person (or animal) who gets a vaccine does not become invincible against that particular germ/microbe (which the vaccine is developed to fight). A person or animal can still get sick from the germ but, often, not nearly as sick as a person or animal that never received that vaccine.

Review that:

- ***An important point should be made to avoid confusion:*** a vaccine is NOT a medication. A vaccine is given BEFORE somebody gets exposed to a germ (ex. virus or bacteria) and a medication (ex. antiviral drug or an antibiotic) is only given AFTER somebody gets sick from that germ.
- Both **veterinarians and (human) doctors** and researchers constantly work together to develop vaccines.
- Medications can be developed from **plants**, microbes and other items found in the environment.  
→ Example: Penicillin <https://www.kidsdiscover.com/quick-reads/penicillin-found-functional-fungus/>
- Specialists who work with the environment, people and animals are all **working together** to make people better protected against diseases. They must communicate efficiently so that they do not waste any time. This is **the One Health approach!**

**Tip for teachers:** use an example from a veterinarian’s point of view—

A dog that receives a vaccine (ex. the rabies vaccine) will not be as sick from the germ it was designed to fight against (ex. the rabies virus) compared to a dog that does NOT get the vaccine. The same general principal is true for people.

(If the students ask, for the rabies example- the unvaccinated dog would likely die from the disease IF it gets infected by the rabies virus—and the dog could bite people and spread it- because it is a zoonotic disease).

**Slide 8:**

**Ask** the students: “what are the three parts of One Health?” (Answer: human health, animal health, and environmental health)

**Say** that this is a picture of a busy and **healthy** forest. The animals are evenly spread out and there is no stress to any of the animals. The trees look healthy too.

(The teacher can discuss that clean water also plays a role in this forest ecosystem. This slide covers UN Sustainable Development Goals of “Clean Water and Sanitation” and “Life on Land”.)

**Slide 9:**

**Ask** the students:

1. “Why are there less trees?” (Either from deforestation due to people or because of climate change which makes life for those plants more difficult in that area of the world.)
2. “Where are the animals going when there are less trees?” (They are starting to crowd together in a smaller area. They are more stressed because they have more competition for food/shelter and have less space to live in. Some animals are even leaving the forest to find food and are now near people).

(The teacher can discuss that water quality also plays a role in this changing ecosystem. If animals drink dirty water that is contaminated by either people or animals then they can get sick. Besides deforestation, the teacher can discuss how Climate Change can alter natural habitats and lead to animals (including insects) move into new territories. This slide would then cover the UN Sustainable Development Goals of “Climate Action”, “Affordable and Clean Energy”, “Sustainable Cities and Communities”, “Responsible Consumption and Production”, “Clean Water and Sanitation” and “Life on Land”.)

**Slide 10:**

**Ask** the students:

1. “What changes do you see with this slide compared to the previous slide?” (there are more people, less trees, more animals near people). Note that there are no actual changes to the number of animals between the slides.
2. “What is a zoonotic disease?” Review that, in this slide, there are more people in the area where animals have been living. **This is an area where zoonotic diseases can easily “spill over” and spread** between animals and people.

(The teacher can discuss that water quality also plays a role in this changing ecosystem. If animals drink dirty water that is contaminated by either people or animals then they can get sick. Besides deforestation, the teacher can discuss how Climate Change can alter natural habitats and lead to animals (including insects) move into new territories. This slide would then cover the UN Sustainable Development Goals of “Climate Action”, “Affordable and Clean

Energy”, “Sustainable Cities and Communities”, “Responsible Consumption and Production”, “Clean Water and Sanitation” and “Life on Land”.)

**Slide 11:**

**Review** that the birds are either leaving the smaller forest or they are dying because of the increased competition for food and shelter (trees).

Climate change can further shrink an animal’s habitat and lead to species extinction by changing what plants grow in the area or make the temperature unsuitable for life for that (animal or plant) species. Climate change affects animals, people and plants in this way.

(This slide addresses UN Sustainable Development Goal: “Climate Action”)

**Slide 12:**

Compare and contrast this slide with the previous slide. Slowly go back-and-forth several times.

**Ask** students if they can name the 5 changes between the two slides. (The answers are in the “notes” section of the next slide.)

**Slide 13:**

Teacher answers:

No more birds– because too much competition for food and shelter (due to habitat loss)

Less trees– because either people are chopping them down or because some birds are responsible for eating fruits and dispersing seeds and they can serve as pollinators

More mice– because other types of birds eat mice and when there are no longer these birds in the forest, the mouse population increases

More foxes- when the mouse population increases, there are more mice for foxes to eat

More animals in human areas- because the animals have no other choice (their home is gone or it is easier for them to survive/find food near people). **Emphasize that this situation can increase the spread of zoonotic diseases.**

**Slide 14:**

**Review** terms zoonotic and mutation (on the next two slides)

**Slide 15:**

**Review** quickly: This is a disease that can jump between different species and into people.

**Slide 16:**

**Review** quickly.

**Slide 17:**

**Explain** that:

A model is like play-pretend. It sometimes helps scientists guess the future so that we can stay healthy (ex. scientists create models that try to guess that 'x' amount of people will be sick from a virus, therefore we all need to practice social distancing for 'y' amount of time).

**Slide 18:**

**Review** that "mutation is change". **Ask** for 2-3 volunteers to quickly read this bold sentence five times.

This tongue-twister serves as a model for a type of mutation- the simplest kind of mutations called "point mutations".

**Slide 19:**

**Explain** that another way viruses can mutate is by mixing in an animal (ex. a pig, bat). Review that this "animal" could also be a person!

The first animal example here is a pig. This is because swine flu (an influenza virus) occurred after a pig combined different viruses inside of itself. (A pig can mix bird, human and pig viruses! <https://www.ncbi.nlm.nih.gov/pubmed/19565018>)

The second animal example here is a bat. **Ask** the students if a bat is responsible for something like this, what can be done about it? (Some students here say to keep your distance—which is the correct answer-- and other students say to kill the bats. As a response to that second answer, the next slide is presented- saying that bats are VERY important for the ecosystem!)

For the teacher: this slide models a style of mutation called genetic reassortment (and, more specifically, "antigenic shift"). Through "genetic reassortment", a new virus can be made.

**Slide 20:**

In the previous slide, a bat was the second example. Keep in mind bats are very important- they eat insects and they are pollinators and disperse seeds.

For more information on this topic:

General information: <https://www.bats.org.uk/about-bats/why-bats-matter>

PDF for bats that live in caves (and mentions White-Nose Syndrome):

<https://www.fs.fed.us/biology/resources/pubs/tes/wns-brochure8310.pdf>

**Slide 21:**

(This activity models another way a virus can mutate, called genetic reassortment.)

**Slide 22:**

This activity models genetic reassortment.

The students will eventually be filling in blanks in a similar sentence. The next slide demonstrates an example of what the students will eventually do themselves.

**Slide 23:**

**Review** that the red sentence is like the red virus. The blue sentence is like the blue virus. What happens when we combine these two sentences together to make a mutated sentence? (see next slide)

**Slide 24:**

**Review** the example of the mutated sentences.

**Slide 25:**

**Ask** the students to use the chat box and write the entire sentence with the blanks filled in (ideally, the new words are written in CAPITAL LETTERS). Have the students submit their entry to “everybody” in the chat.

If the chat box is not possible, then the students can submit answers by speaking.

**Tip:** The suggested time for students is 3 minutes but this can be adjusted based on the group.

**Slide 26:**

Once everybody has typed the entire sentence with the blanks filled in (ideally, in CAPITAL LETTERS), the teacher can **demonstrate** how to combine two student sentences together to make a strange mutated sentence.

**Ask** the students after creating the mutated (combined) sentence, if the mutation strengthened or weakened the original sentences’ messages (or simply made the sentence very strange).

**Ask** for 1-2 student volunteers to combine other sentences found in the chat box to make a newly mutated sentence.

**Review:** this sentence activity is another model of how a mutation can happen in a virus or in a cell. Sometimes, mutations change a virus to become stronger or weaker.

**Slide 27:**

Sum up what the two activities demonstrate and relate them back to mutation in viruses.

**Review** that 1) Mutations can happen by accident like in the tongue-twister activity, and 2) Viruses can combine to make a new virus like in the sentence mutation activity. Mutations can make something weaker, stronger, or just a bit weird.

**Slide 28:**

Give students a chance to ask questions here.

**Slide 29:**

**Tip:** Spend up to 3 minutes on this slide.

**The One Health approach:** teamwork between people of different backgrounds, strengths and disciplines to prevent and solve health problems.

**Remind** students that the earlier slide reviewed the One Health **concept** and this current slide reviews the One Health **Approach**. Also note here that some people in 2023 who call this connection “Planetary Health”. “Planetary Health” has traditionally emphasized the interaction between the environment and people’s health but advocates of “Planetary Health” are starting to include the effect of animals’ health on the planet. More information about Planetary Health can be found at: <https://www.planetaryhealthalliance.org/planetary-health>

Also, in 2023, more One Health advocates are talking about the approach (rather than the concept) when they say the words “One Health”.

Definition from the United States’ CDC website

(<https://www.cdc.gov/media/releases/2019/s0506-zoonotic-diseases-shared.html>) covers the

Approach part of the definition: “**One Health** is an approach that recognizes the connection between people, animals, plants, and their shared environment and calls for experts in human, animal, and environmental health to work together to achieve the best health outcomes for all.”

**Slide 30:**

**Ask:** what are the three parts of One Health?

**For the first point- Emphasize** that people from different backgrounds, disciplines and strengths can work together to prevent and solve health problems that affect people, animals and the environment. This teamwork is often referred to as the One Health approach. This type of teamwork can lead to the creation of vaccines and much more!

**For the second point- Emphasize** that people are often taking up the space where wild animals once lived. Because of the smaller natural habitat for animals, they are being forced out of the forest/natural habitat to scavenge for food and survive. **Review** that people have germs that can spread to animals and animals can have germs that spread to people and other animals.

**For the last point-** If students think that planting trees is the only way to rebuild a forest, **review** that decreasing paper usage can lead to less deforestation. If people demand less from the environment, Nature can heal itself with time.

- Example of decreasing paper usage: use a reusable cloth bag when shopping instead of getting a new paper bag each time.



**Slide 31:**

**Ask:** what other types of people are important to fix big health problems like a disease outbreak or the loss of biodiversity (decreased variety of different species in an area)? (Any of the student answers will be correct. **Ensure** the students understand that people outside of the typical health sciences are needed to protect communities from One Health problems like loss of biodiversity or climate change or contaminated water or contaminated air or deforestation or antimicrobial resistance. Here are some answers and the reasons for them:)

1. Physicians (human doctors) and nurses- they treat sick people
2. Veterinarians- they understand germs that can come from animals and spread to people (**review** the term: zoonotic disease)
3. Ecologists – they study the interaction between animals and their environment
4. Sociologists- they understand why people make certain decisions
5. Politicians- they create laws to protect the environment, people, animals, plants and more
6. Economists- they help businesses stay open and help livelihoods/income/well-being of families
7. Researchers- they help develop vaccines (ex biochemists)- **ask** the students what other type of researchers can help solve other health problems
8. Teachers- they help spread awareness and knowledge to protect more people
9. Engineers- (software, mechanical, etc.)- software engineers can design websites or applications to provide health-focused resources for communities; mechanical engineers to design equipment that is carbon neutral or carbon negative to combat climate change

**Slide 32:**

**CONTEST:**

**Ask:** Who can make the BEST 1–2-minute play that uses all of the new terms from this lesson?

**Note:** This can be done during the lesson (time-permitting) or as homework.

**Slide 33:**

**2-minute survey for teacher to complete:** <https://forms.gle/rvie1WTAMEZ1e4W7A>

**Other One Health online activities for students:**

Game for students to better understand microbes and zoonotic diseases:

[http://webadventures.rice.edu/ed/Teacher-Resources/\\_games/MedMyst-Original/\\_301/Game-Overview.html](http://webadventures.rice.edu/ed/Teacher-Resources/_games/MedMyst-Original/_301/Game-Overview.html)

Interactive comic book that shows how a veterinarian can help detect a new virus in New York City.

(Loosely based on real life events with West Nile Virus in New York City in 1999):

<https://nysci.org/school/resources/transmissions-gone-viral/>

TEDx talk from veterinarian during the West Nile Virus outbreak is here:  
<https://www.youtube.com/watch?v=qm8NnL582uc> (duration of 15:16)—would be appropriate for older students ( $\geq 15$  years old)

**Online One Health material that can be used in person or online**

Reviews how to live safely with bats around and was developed for communities in Africa:  
<https://ucdavis.box.com/v/livingsafelywithbats-flipbook>

**Further information about how the environment and animals play into human health:**

<https://ensia.com/features/covid-19-coronavirus-biodiversity-planetary-health-zoonoses/>

**Follow-up material for the curious adult:**

<https://www.avma.org/javma-news/2020-04-15/can-veterinarians-prevent-next-pandemic>

<https://www.newyorker.com/science/elements/from-bats-to-human-lungs-the-evolution-of-a-coronavirus>

[https://www.theguardian.com/world/2020/mar/25/coronavirus-nature-is-sending-us-a-message-says-un-environment-chief?CMP=share\\_btn\\_fb](https://www.theguardian.com/world/2020/mar/25/coronavirus-nature-is-sending-us-a-message-says-un-environment-chief?CMP=share_btn_fb)