Spillover Game

Spillover is when an infection (or pathogen) in a particular animal population moves into a new species of animals. This can happen between wild animal populations, between wild animals and domestic animals, and between animals and people. If wild animal populations have enough space in nature that they don't come in contact with humans, then spillover between animals and humans is unlikely. However, if wild animal populations are altered by human activity, especially if it brings wildlife into increased contact with humans, we are at greater risk of spillover events, which can impact the whole world.

Objectives:

Students will be able to:

- Use a gameboard to model infection or pathogen transmission in changing animal populations.
- Discuss what might cause animal populations to shrink or be threatened.

Materials:

- Supplemental Teacher Notes
- Spillover Game Directions
- Spillover Game Board 1
- Spillover Game Board 2
- Six-sided Die or Virtual Dice Roller

Process:

1. Introduce the idea of spillover events to students. An infection or pathogen that transitions or passes from animals to humans and makes us sick is called a zoonotic disease. Students are likely already familiar with this concept due to their experience with the global pandemic COVID-19. Ask students what they think makes spillover events more or less likely.
    a) *Note 1* If you are using COVID-19 as an example of zoonotic disease, be sensitive when discussing it as students may have lost a loved one to the disease.
    b) *Note 2* Be mindful when talking about cultural differences in what people eat or how they interact with wildlife. Note for students that it is not any particular group's fault that spillover events take place, but that they are normal events that have happened many times in human history.
    c) For more information about spillover events, refer to the Supplemental Teacher Notes.
2. Tell students that they will now use a gameboard to explore how diseases can move in an animal population.
3. Students will conduct this simulation in pairs if possible. Distribute Game Board 1 and a 6-sided die or virtual dice roller to each pair of students.
    a) If this activity is being conducted virtually, consider sharing the game board with the whole class in the form of a Jamboard or other online whiteboard. This could allow students to interact with the board and circle the animals that get sick in a virtual setting.
4. Before students start, tell them that the game board represents human and animal populations that live near each other. In this case, the animal's habitat has remained unaffected by human actions.

5. Read the Spillover Game Directions with the students. Within the pairs, decide which partner will roll the die, and which will circle the animals that get sick. Tell students to play through the game one time.
6. Once all students have conducted the simulation, ask the class what they noticed about how the disease moved through the population.
    a) Which animals were most likely to get sick? Which were least likely?
    b) Why do you think some animals are less likely to get sick than others?
    c) Did it seem likely or unlikely that humans would get sick?
7. Now ask students what they know about how human actions might negatively affect animal populations. What are some ways that animals or their habitat can be affected by humans?
    a) Possible answers include cutting down forests to make space for homes, logging, mining, pollution that affects waterways, overhunting or overfishing, using habitats for cropland or as space for domestic animals, etc.
    b) *Note* Be careful not to disparage cultural practices such as hunting wild animals for food. Be sensitive to differences of background within your student population.
8. Tell students you will now conduct a simulation on a new game board. Allow them to keep their die, and distribute Game Board 2.
    a) Similarly to board 1, this board can be displayed in a remote teaching setting using a digital whiteboard such as Jamboard.
9. Tell students that this new board represents a situation where the animal populations have been impacted by industrial logging near where people and animals are living. The logging activity has caused some of the animal populations to leave (woodpeckers), while new animals moved into the area (crows).
10. Before students conduct the simulation, ask them what they think will happen. Is the disease more or less likely to spill into the human population?
11. Ask students to conduct the simulation, circling the animals and people that get the disease.
12. Ask students what they found once they have discussed the second simulation. Ask students what their finding means about how we can stay healthy as a global population. What should humans do for animals to make sure animals and people stay healthy?
    a) Note: there is a chance that students will not see a difference between the two game boards, since this activity involves the probability of rolling a die. Mixing up discussion groups or discussing in a large group can increase the chance that there are students involved in the discussion that did see a difference in the two scenarios, and make it easier to get the point across. Alternatively, you can use this as a teachable moment. Disease spread is probabilistic - just because you come into contact with someone that is sick does not guarantee that you will become sick. The chance of human infection increases in the second scenario, but it does not guarantee illness.
    b) For more information about conservation efforts to maintain healthy ecosystems, refer to the Supplemental Teacher Notes.
13. Tell students to write a summary explanation for whether disease transmission becomes easier or harder when the places animals live are disrupted by humans.