A Simplified Epidemic Experiment

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The novel Coronavirus COVID-19 has made people worldwide more aware of the nature of infectious diseases. We're learning about the importance of *social distancing* to help suppress transmission of disease. We're learning that *flattening the curve* helps to slow down the spread of a virus and lowers the peak in the number of infections. The result is a reduction in the number of people needing hospitalization as well as stress on medical staff.

This lesson has been designed to provide middle school students with an experiment for which ***Evo simulates a simplified epidemic***. Students analyze the data and determine the average number of people who get the disease before it dies out. Here is a description of the nature of this simplified epidemic:

An infectious disease has a one-day infectious period. After that day, the patient has become immune. Imagine ten hermits, numbered 1 through 10, who live on an ocean island. By their very nature, these hermits live in seclusion. However, if one contracts this disease, he seeks help by visiting another random hermit during his infectious period. In the event that the visited hermit has not had the disease, he catches it and is infectious the next day.

Assume that one of the ten hermits has the disease today, and the rest of the hermits have not had it.

Use the accompanying OzoBlockly program and associated Ozomap to carry out an experiment that will allow you to determine the average number of hermits who get the disease.

Working with the OzoBlockly Program

After loading the provided OzoBlockly program *Hermit Epidemic.ozocode* into Evo, place Evo on the accompanying Ozomap. A small version of the Ozomap with typical collected data appears in Figure 1. A full-page version suitable for use with Evo can be found in the file *Hermit Epidemic Ozomap.pdf*.

With Evo on the start location circle and facing the direction shown by the arrow, Evo is turned on and the program is started.

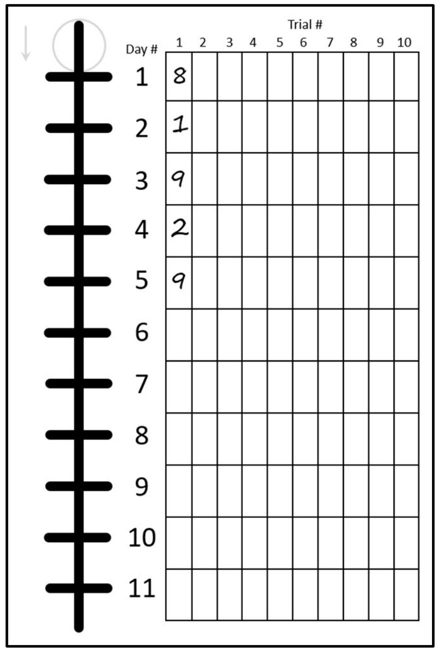

Figure 1

Evo moves to the *Day 1* intersection, stops, and speaks the random number of the hermit who is initially infected with the disease. In this example, Evo indicates that hermit #8 is infected. The student records this number in the *Day 1* location for trial #1 of the experiment. Hermit #8 will be infectious tomorrow.

Evo then moves to the *Day 2* intersection and speaks the random number of the hermit who hermit #8 has been in contact with for help. Hermit #1 is the hermit who has randomly been selected. The student records this number in the *Day 2* location. Hermit #8 will be immune tomorrow, and Hermit #1 will be infectious tomorrow.

This process continues until a randomly selected hermit who is immune is selected. In the example, this occurs on Day 5 when hermit 9 is randomly selected by hermit #2. Since hermit #9 was infected earlier on Day 3, hermit #9 is immune. Since a sick hermit has visited an immune hermit, the disease dies out! To indicate that the disease has died out, Evo will do a disco animation and then turn off.

In the example of trial #1, a total of four hermits (8, 1, 9, and 2) were infected by the disease. The student continues in a similar manner with trials 2 through 10. Averaging the results of the ten trials will provide an average for the number of hermits who get the disease. Students should view the accompanying video for an example of a typical trial from an experiment.