



TRAGEDY OF THE COMMONS SIMULATION

STUDENT LAB TEMPLATE A

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Abstract

This activity allows students to explore the "tragedy of the commons," in which common usage of a limited, potentially renewable resource invariably leads to its exploitation. In this simulation, students imagine that they are fishermen sharing access to a common fishing pond. The fish are Hershey's Kisses. Two different stages of the simulation are performed. In the first, students are not allowed to communicate, and each fisher has no knowledge of how many fish have been taken before them. In the second, students are allowed to strategize, plan, and learn from their experiences. In this way, the ability (or not) to communicate is the independent variable, and the size of the resource over time is the dependent variable. At the end of this simulation, students should have an understanding of what leads to the "tragedy of the commons" and what can be done to prevent it.

Objectives

- Understand the conditions that lead to a "tragedy of the commons"
- Learn strategies that prevent the destruction of a common resource
- Apply these strategies to global environmental issues and suggest solutions

Introduction

The purpose of this simulation is to explore how resources are used and exploited when they are available to multiple parties. When Garrett Hardin (1968) first proposed this concept, he used the example of the traditional "commons" in New England towns to signify a public resource available for private gain. In this case, the commons was used for grazing the townspeople's livestock. He demonstrated the idea that a small increase in use of the resource (e.g., one extra cow) provides a great benefit to an individual, while the cost of that additional use (decreased grass supply) is shared by all. Therefore, each user has an incentive to use (and exploit) the resource to the greatest of his or her ability. Ultimately, there is a decrease in yield for both the group and the individual.

This idea has been adapted to explain the pattern of overuse of many common, limited resources. For example, the exploitation of wild populations (e.g., overfishing), the abuse of public lands (e.g., overgrazing on federal lands), and population growth can all be evaluated using this principle. Even a clean school campus (and the treatment of it by trash-leaving students) can be explained by the tragedy of the commons.

Fortunately, there are strategies that can be employed to ensure the long-term survival of a resource in spite of the natural tendency toward exploitation. Several are explored in this activity. These are incentives, privatization, communication, and education. With these solutions in hand, strategies can be devised to help protect common resources in the environment and work toward sustainable resource use.

Background Resource

Hardin, Garrett. "The Tragedy of the Commons." *Science* 162 (1968): 1243-48.

Materials

For each group of four

- Hershey's Kisses
- Plastic spoon
- 400 ml beakers
- Fabric sleeve

Procedure

Part 1:

Divide yourselves into groups of four. Imagine this scenario. Each person represents the head of a starving family, which requires food. The only food source for these four families is a small fishing hole, which can accommodate 16 fish. Fortunately, after each round of fishing by the four family heads, each remaining fish is able to spontaneously reproduce and make one new fish (i.e., four fish become eight, to a maximum of 16). Each person is allowed to take as many or few fish as you want, but if you take only one fish, your family will starve.

In this simulation, our pond is a beaker, and our fish are Hershey's Kisses. Fish are caught using plastic spoons. Each fishing round will last for one minute. You should rotate your fishing order every round so that everyone has a chance to go first. At the end of every round, the number of remaining Kisses will be doubled to simulate reproduction. The simulation will continue for three rounds. The pond will be covered with a fabric sleeve, so that it is not possible to tell how many fish have been taken before you fish. No talking is allowed in this part.

Part 2:

In this part, you will have access to two ponds, one common and one private. The rules for the commons pond are the same as before. However, talking and strategizing is allowed in this part. The cloth sleeve will be removed so that you will know exactly how many fish are in the ponds at all times and how quickly the fish will reproduce. The carrying capacity for the commons ponds is 16 and for the private ponds is four. You must remove at least one fish from each pond each round. As before, you may catch as many fish as you would like from both ponds during each round.

Data

1. All data should be recorded in the following tables.

Part 1: Commons pond

Round #	# of fish at beginning of round	# of fish taken by 1st fisher	# of fish taken by 2nd fisher	# of fish taken by 3rd fisher	# of fish taken by 4th fisher	Total fish left at end of round
1						
2						
3						
TOTAL	XXXX					XXXXXX

Part 2: Commons pond

Round #	# of fish at beginning of round	# of fish taken by 1st fisher	# of fish taken by 2nd fisher	# of fish taken by 3rd fisher	# of fish taken by 4th fisher	Total fish left at end of round
1						
2						
3						
TOTAL	XXXX					XXXXXX

Part 2: Private pond

Round #	# of fish at beginning of round	# of fish taken this round	# of fish at end of round
1			
2			
3			
TOTAL	XXXXX		XXXXX

2. Calculate the total number of fish caught by each person.

Analysis

In your analysis, you should evaluate the results and answer the following questions.

- What happened to the common resource in part 1? Why?
- Did you get different results for the pond in part 2? Why?
- Explain the rationale for your fishing technique in each part.
- If you cooperated with other fishers, what was the result of that cooperation?
- Did you use different fishing strategies in the commons pond and the private pond?
- Why does common usage lead to exploitation?
- What would be the ideal way to manage the commons pond?
- How would this simulation have been different if you didn't know the students in your group?
- What are the strategies that help to prevent the "tragedy of the commons"?
- If a new student had joined your group in the middle of part 2, how would that have affected your strategy and the use of the resource?
- Why is the private pond easier to manage for long-term success?

Conclusion

Briefly summarize the results of this simulation and discuss the implications of this simulation on the management of common resources in the environment. What other resource management examples can you think of where this topic is relevant? What would you suggest in these situations?