**Fishing for the Future
adapted from Facingthefuture.org & The Science Teacher**

**Overview:**

Through a fishing simulation, students model several consecutive seasons of a commercial fishery and explore how technology, population growth, and sustainable practices impact fish catch and fisheries management.

**Objectives:**

Experience the “tragedy of the commons” as it relates to fishing resources. Consider social, environmental, and economic impacts of overfishing. Identify sustainable fishing practices.

**Materials:**

Plain M&Ms, Peanut M&Ms, Small cups, Serving bowls, Spoons, Straws, Timer

**Background**:

Garrett Hardin coined the phrase “tragedy of the commons” in 1968. Hardin describes cows grazing on a common land. Since there is no direct cost to using the land, individual ranchers are motivated to add to their herds in order to increase their personal wealth. But each adde animal damages the pasture a small, perhaps imperceptible, amount. Ultimately, this gradual degradation destroys the commons. Each rancher acting alone is behaving in an appropriate, rational manner, yet the sum total of all the ranchers’ actions destroys the resource for them all.

**Procedure:**

**Game #1: Free Recreational Harvest**

1. Each group will start with 20 plain and 10 peanut M&Ms. Peanut M&Ms represent the most valuable (and largest) fish such as tuna or swordfish. Plain M&Ms are the next most-valuable such as cod or salmon.

2. *The teacher will say “start fishing” to begin your first fishing season.*Using the straw, students must hold their hands behind their backs and “fish” (suck the M&M to the straw) and deposit them into their boat. \*\*The straw is your fishing rod, the bowl of M&Ms is your ocean, and the cup is your boat\*\*

3. Record your data in your fishing log.

3. The remaining fish represent the breeding population. For every fish left, add another fish. (so if you have 5 peanut M&Ms left, put another 5 in your “ocean”)

4. During the second fishing season, students may use their hands on the straws to represent “new technology”. Record all data in your fishing log.

5. Continue the game until you have had 6 fishing seasons. Record all data in your fishing log.

**Game #2: Managing the Commercial Fishing Industry**

1. Set your ocean up with 20 plain and 10 peanut M&Ms.

2. Each group will be given a slip of paper containing a management tool

3. Your group will fish through 6 seasons (each season is 15 seconds). You still have your “new technology”. Make sure to record all data in your fishing log.

**Fishing Log: Game #1**

**Ocean Group \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Fishers \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Record your group’s catch and fish left in ocean after each season.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Season |  | Catch |  | Fish left in ocean |
|  | High Value | Medium Value | Total Catch |  |
| 1 |  |  |  |  |
| 2 |  |  |  |  |

Write a brief description of the status/health of your fishery: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Season |  | Catch |  | Fish left in ocean |
|  | High Value | Medium Value | Total Catch |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |

Discuss changes in fishing practices or regulations. Are any fisheries (ocean groups) in trouble? What

did they do and how did that impact your fishery? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Season |  | Catch |  | Fish left in ocean |
|  | High Value | Medium Value | Total Catch |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |

Write a brief description of the health of your fishery now: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Fishing Regulation:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Record your group’s catch and fish left in ocean after each season.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Season |  | Catch |  | Fish left in ocean |
|  | High Value | Medium Value | Total Catch |  |
| 1 |  |  |  |  |
| 2 |  |  |  |  |

Write a brief description of the status/health of your fishery: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- | --- |
| Season |  | Catch |  | Fish left in ocean |
|  | High Value | Medium Value | Total Catch |  |
| 3 |  |  |  |  |
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Discuss changes in fishing practices or regulations. Are any fisheries (ocean groups) in trouble? What

did they do and how did that impact your fishery? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- | --- |
| Season |  | Catch |  | Fish left in ocean |
|  | High Value | Medium Value | Total Catch |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |

Write a brief description of the health of your fishery now: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Analysis Questions:

1. In game #1, what happened to the fisheries populations over time?

2. In game #1, how could we have harvested sustainably? How many fish could each group have taken per season and maintained the total population at a constant number?

3. In game #1, how did you feel when other fishers joined your ocean group?

4. In game #2, which management tool was most effective? Why?

5. In game #2, would you be able to implement your tool in the same manner in real life? Why or why not?

6. How did this activity illustrate a “tragedy of the commons”? Specifically, what was the common property resource and why? What were the costs and benefits to each fisherman?

7. What happens to a resource when you have infinite population growth, growing technology, and a finite resource?