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Tragedy of the commons worksheet pdf

In order to continue enjoying our site, we ask that you confirm your identity as a human. Thank you very much for your cooperation. This lesson introduces students to the “Tragedy of the Commons,” an extended metaphor for problems of shared environmental or man-made resources that are overused and eventually depleted. In this metaphor, shared resources are compared to a common grazing pasture, or “commons,” on which any dairy farmer can graze as many cows as he/she wishes. If too many cows are added to the commons, they will overeat the grass in the pasture and the shared resource will become depleted – a disadvantage to everyone. In this lesson, students will be inspired to think about possible solutions to this problem. To get there, they will use basic math to frame the problem and will discover how useful this can be in considering consequences of various actions. Most importantly, they will become comfortable with the concept of problems of shared resources – and will learn to recognize, and seek out, examples all around them. An exposure to algebra 1 and basic functions is the only math prerequisite necessary. The lesson will take around 50 minutes to complete and the required materials for this lesson are paper and pens or pencils, as well as some sort of prize to provide the winning team with in the final activity. For all five activities, students are asked to work in groups of 4, but groups of 3 or 5 would also be okay. Students will work with their groups to discuss the logic behind the tragedy of the commons, to consider some options for preventing this tragedy and to examine examples of problems of shared resources that are relevant to them. They will also come up with functions that fit behavior described in the video, and be asked to think about the behavior of functions provided in the video and accompanying materials. This lesson has accompanying animations that allows students to explore the “Tragedy of the Common” problem in depth, most likely at home on a computer: For more information, visit: , BHSU Center for the Advancement of Math and Science Education This is actually a homework assignment that we talk about in class. But when we talk about it I discover how my students are thinking. So it also serves as a formative assessment that I use to find out whether students are clear about the characteristics of a commons. What learning is this evaluation activity designed to assess? Whether students recognize the characteristics of a commons. What is the nature of the teaching/learning situation for which your evaluation has been designed? I teach a physics course for non-science majors in a conservative and very rural state, and these students don't know much about resource or population issues. (They do know a lot about farming and ranching, though.) Once in class when I mentioned the tragedy of the commons, the entire class gave me a blank look. Nobody would admit to having heard about it before. So I created this assignment to let students read the story and be prepared to discuss it in class. What advice would you give others using this evaluation? Are there particular things about this evaluation that you would like to discuss with the workshop participants? Particular aspects on which you would like feedback? Please suggest improvements to the text and to the questions. I thought the tragedy of the commons was common knowledge. What does anyone else know about this? Evaluation Materials Download Activity 5 Teacher Guide, Handouts, Visuals (doc file) Concepts: Incentives Property rights Tragedy of the commons Content Standards: Standard 10: Institutions evolve in market economies to help individuals and groups accomplish their goals. . . . [One] kind of institution, clearly defined and well-enforced property rights, is essential to a market economy. Overview: The two short activities below set up tragedies of the commons – one in water (lemonade) and the other in fish (M&Ms). The debriefing guides students through analysis of the different incentives embodied in common and private ownership and helps them understand how the rules of the game shape people's behavior – and their use of valuable environmental amenities. Time Required: ½ class period for each alternative Activity Alternative 1: Lemonade Materials: large, opaque water jug (the size used by an athletic team) partially filled with lemonade, or several large bottles of soft drink, with the lids off, paper drinking cups of various sizes, more than the number of students in the class sign: Free Drinks: Thanks for Being Such a Great Class! Visual 1 Transparency or handout (1 per student) of assessment Procedures: Before the students enter the classroom: Fill the jug, tighten the lid, and tape on the sign before securing the jug to a bench or table so that students can't tip it or look inside to see how much liquid it contains. Make sure there are obviously more than enough cups. Or, open the soft drink bottles, and pour several different size glasses of soft drink. Place drinks and cups where students will see them as they enter the classroom. (If they don't see them on their own, encourage the first few students to take a drink, and then go on with normal pre-class preparations. The likely outcome is that the first students will pour themselves big drinks, using the largest cups, and the drinks will run out or become very small well before all students have a chance to fill their glasses.) Start class by asking: Why wasn't there enough for everyone? (Accept a variety of answers. Expect accusations that the first-takers were greedy, and defensive replies about not knowing how much there was. Who owns the drinks? (It's not clear. At one point the teacher owned it, but the sign indicates that it was given to the class.) Why did the drink run out before everyone got some? (There was no incentive to save any or to wait until later, and there was an incentive to get a large drink now for fear there wouldn't be any left later. Because of the sign, everyone believed she or he had a right to the drink, and no one person or group acted to protect or ration the drinks.) Teacher note: With small classes or with a strong leader, the drinks may get apportioned more equitably. In the event that everyone did get a drink, ask students why they think there was enough. (Nobel Laureate Elinor Ostrom's work suggests that in with small groups with repeated face-to-face interactions and social pressure may overcome the tragedy of the commons. Ask students to consider what might have happened if they had gone into a guest lecture where they didn't know anyone and felt unlikely to run into any of the people in the future.) Did any people take more than they drank? Why? (In all probability, several people did. There was no penalty for taking too much. Also, there was a reasonable expectation that there wouldn't be any left if you wanted some later. Better to take it now, even if you weren't sure you'd drink it all.) Activity Alternative 2: M&Ms Materials: large (gallon or quart-sized), clear zip-lock bag filled with M&Ms or other small candies (Count and record number of candies ahead of time.) Procedures: Display the (pre-counted) bag of M&Ms where it's clearly visible to all students. Explain the rules: No talking; you may not consult with other people. “Claim” any number of M&Ms by writing the number and your initials on a scrap of paper. I will collect all the claims and you will receive the number of M&Ms you claimed IF the total claimed does not exceed the total number of M&Ms in the bag. Also, if the claims do NOT exceed the # in the bag, the following prizes will be awarded: \$20 for the largest claim \$15 for the 2nd largest claim \$10 for the 3rd largest claim Debriefing Questions: What was your thinking in making your “claim”? Why did the total claim exceed the total number of M&Ms? How did the rules of the game encourage this outcome? Who owned the bag of M&Ms? How could you establish ownership of M&Ms? By making a claim. Suppose the M&Ms in the bag are fish in an ocean fishery. The decline of fisheries world-wide is a significant problem. Use the following questions to help students use their experience in the M&Ms game to understanding the tragedy of the commons in ocean fisheries. Who owns the ocean fishery? How does a fisherman establish ownership (property right) to fish? Suppose the fishermen know that the fish stock is declining and the fishery will collapse. How will they change their behavior? What is the cost to each fisherman of conserving? How could we change the rules of the game to provide incentives for conservation? Closure Display Visual 1. Discuss each situation noted there as an example of the tragedy of the commons. Each example involves a case where the thing in question is not individually owned. Stress the idea that when a resource is not owned, nobody has a clear incentive to protect it. Explain that the antidote to the tragedy of the commons is to provide clearly defined (know who owns it), enforceable (owned property protected by law), and transferable (profits from the resource, or the resource, itself, can be bought and sold) property rights. There are many ways to define property rights in circumstances in which property ownership is not obvious. First, a government can assume ownership and thus restrict use—as in admission to national parks. Second, government can assume a monitoring role, as it does with air and water pollution or fishing. Third, private ownership can be assigned. A private owner will profit from the resource and thus have an incentive to protect it. Review the key points of the lesson. Ask: What is the tragedy of the commons? (Resources owned in common tend to be overused.) How would a specification of ownership of the drinks in class have made a difference in who got what and how much? (If the teacher had owned the drinks, then the teacher might have monitored the students when they took drinks, ensuring everyone got some. If a student(s) had owned the drinks, the outcome might have been the same. Or student(s) might have sold drinks to other students. Either way, the quantity taken by each student would have been monitored. Explain why the hallways in schools tend to be littered at the end of the school day. (No one seems to own the hallways. Students are tempted to treat them as long wastebaskets.) In discussing students' responses, remind them that the analysis they have used here would also apply to water. Then move on to the assessment. Assessment Beach shorelines in Oregon are public property — in other words, they are owned in common. Periodically, beach clean-up days are organized and citizen groups are urged to volunteer. Why is that public service effort necessary? A nearby private lake owned by a group of fishermen has absolutely no trash floating in the water or littering the beach. Suppose that following an earthquake that destroyed the water system of a large city, producers of bottled water contributed a convoy of trucks full of water to the citizens of the city. Predict what would happen, how people in the city would behave, if the water was a common resource. Predict what would happen and how people would behave if the water was given to a local fast-food restaurant to sell, under the condition that the owner donate 95% of the money to charity.

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