Non-standard lessons from the "tragedy of the commons"[1]

PETER J. TAYLOR

Though widely critiqued for its assumption that groups of individuals are incapable of self-organizing, Garrett Hardin's idea of the "tragedy of the commons" remains a very influential framework for environmental policymakers and activists alike. Introductory textbooks frequently present the tragedy as fact of life, while intermediate treatments of policymaking adopt threats to the commons as an organizing structure. The framework is both pervasive and insidious. Its simplicity is alluring, but its underlying claims about the limits of human stewardship of nature and capacity for "thinking outside the box," if accepted acritically, make it almost impossible to fathom how we might together devise systems of global environmental governance.

Peter Taylor, a professor in the Critical and Creative Thinking Program at the University of Massachusetts Boston, is an environmental and science educator who likes to illuminate established ideas from new angles. He helps his students understand hidden assumptions, especially where they concern people's "agency"—their ability to influence the practice of environmental research and politics. In this essay he begins with a report on his classroom simulation of the tragedy. His observations of students' responses to the simulation allow him to highlight the shortcomings of the idea and also to comment on the ways that people use simple models to address ecological and social complexity. In a second section he describes extensions appropriate for more advanced undergraduate and graduate classes. In the final section he spells out his vision of critical thinking and the productive role for ambiguity. You are welcome to read this section early on if you would like to know more in advance about where he is taking you. However, if you just let the ideas emerge as the chapter unfolds, your experience will more closely approximate the one Taylor intends for his students.

RESPONDING TO A SIMULATION OF THE TRAGEDY OF THE COMMONS

Garrett Hardin's (1968) idea of the "tragedy of the commons" (hereon simply the "tragedy") is widely invoked in discussions of conservation and natural resource management. In a hypothetical common pasture each herder in the community follows the same logic: "I will receive the benefit in the short run from increasing my herd by one animal; everyone will share any eventual cost of diminished pasture per animal; therefore I will add another animal to my herd." Overstocking and pasture degradation are thus inevitable. The same model has been applied to explain the degradation of a range of environmental and social resources, from the atmosphere to library books (Berkes et al. 1989).

I use a classroom simulation to introduce students to the tragedy, as do many teachers of environmental politics (e.g., Holle and Knell 1996, Mitchell 1997). I ask students to act as herders who are given the same amount of cattle and cash. Each year they have an opportunity to buy cows to add to their herd, and they receive income from the sale of milk and excess calves. I sum up everyone's purchases and calculate the income per cow everyone earns during the year from milk and calves. In the formula I use for this calculation the income declines once the combined herd on the common pasture exceeds some threshold and the pasture becomes overgrazed. I inform the herders of the per cow income and they do the arithmetic to update their tally of their own individual herd size and cash. The only other stipulation is that on my own I make no more rules. Herders have to decide whether they want additional rules and how to get them implemented in their community.[2]

Before reading further ask yourself what purchasing strategy you would use if participating in this simulation and what rules you would try to get implemented. Try this even if you are familiar with the idea of the tragedy. Some of you may be tempted to skip ahead to look for "the answer the teacher wants," so I will break the text at this point with a photo of actual herders who use a common rangeland in the West African country of Mali.

OK reader-herders—what did you come up with? Would you promote private ownership of the land so that individual herders factor the full costs into their decisions? Would your remedy be government control to "restrain people who find it irrational to restrain themselves" (McCay 1992, 189). These were Hardin's solutions. He claimed that, unless resources are privatized or there is government coercion, individual self-interest leads inevitably to the overexploitation and degradation of the resource. In contrast to Hardin, some of you might have proposed taking turns to use the pasture, with the length of each herder's "stint" determined by someone appointed by the community to monitor the state of the pasture. To this you might have added sanctions against overstinting, sanctions that would be enforced by the community as a whole or their authorized representatives. Such a strategy is in line with the growing body of social-environmental research since Hardin's essay that has been examining the management of actual non-privatized, common resources. The research literature now documents many cases in which people, communicating and working together in communities, successfully maintain local institutions for managing a resource held in common (Berkes et al. 1989, Ostrom 1990).

Neither the lessons emerging from the "post-Hardin" research nor Hardin's conclusions are, however, the focus of the teaching described in this essay. Instead of the standard lessons I extend the simulation to lead students to discover fundamental shortcomings in the tragedy model and to explore more generally the ways that people use models to analyze ecological and social complexity. Given the ways that environmental politics are animated and channeled by simple models, for example, of ecosystem vulnerability and political interactions, I hope readers will be stimulated by these lines of inquiry and the non-standard lessons I draw.[3] By the end of the essay, you should have a sense more broadly of the approach I use to build skills for participating critically and creatively in debates about environmental, social, and scientific change.

Four Levels in Students' Responses

Recall my stipulation that student-herders have to work out for themselves whether they want additional rules and how to get them implemented in their community. From my experience, as the simulation progresses students begin to express objections and some attempt to mobilize fellow herders into adding or changing the rules. Usually the responses do not gel in time to prevent dire overgrazing and the herders' annual income drops almost to zero. (Overgrazing always occurs because I am also a herder and, although I do not tell anyone, I purchase as many cattle each year as allowed.) I then call time out to review what has happened. First, we observe the

group's combined income is much less than it was at an earlier point in the simulation. I then ask the students to plot their herd size and monetary wealth against axses I draw on the board. The initial equality among herders has given way to large disparities in wealth—the group has differentiated. I ask students to keep these observations in mind as we continue the simulation and negotiate what to do. In the lively discussions that ensue, certain voices count more than others. Herders who have the largest herds and greatest wealth can use their resources to exert disproportionate influence, not only on what propositions are accepted, but also on the procedures for making decisions. Students who had purchased few or no cattle—usually because they did not want to contribute to overgrazing—are poor and less influential. (Readers are welcome to take a break at this point to formulate the negotiating strategy you might use at this point in the simulation.)

The changes that the students seek during the simulation fall typically into four levels. (As you read, notice where your own initial approach to the simulation and the negotiating strategy, if you just formulated them, fit.) The students:
• a. want more realism or detail in the rules—to allow cattle to die, purchase prices to vary, herders to trade among themselves, income to vary with season, and so on. They seek such changes even though they do not prevent overgrazing.
• b. communicate about their actions, plans, and norms, e.g., "greedy herders should be shunned."
• c. allow exchanges with the outside world. For example, the simulation assumes that cattle can be bought from some unspecified place, and that milk and calves can be sold. Cattle themselves, then, could be sold in this outside market. Some students even propose to leave the game to become agriculturalists, traders, or urban workers.
• d. get involved in conflicts and negotiation among unequal parties, that is, in the politics of collective governance. Common proposals include: halve every herd; set a common upper limit on all herds; tax large herds; and privatize pasture. Instituting any proposal, however, turns out to be more difficult. The poor, conservationist-minded herders see the halving proposal as unfair to them, while the wealthy herders tend to use their muscle to resist proposals that level the playing field. If land is privatized, for example, the wealthy want it to be subdivided in proportion to current unequal herd sizes. Many students, when faced with the stratification of wealth and influence, want to begin again from the conditions of equality. As the teacher I insist on working from where they find themselves at that point. After all, a state of equality exists nowhere in the known world. Some students then invoke an outside government (see c) with power to impose such changes over the objections of the wealthy herders. Some of the wealthy herders are confident they can get the government to do their bidding.

Through their responses my students communicate with each other, make exchanges with the outside world, and negotiate conflict and cooperation among unequal parties. Broadly speaking, these are the aspects of social life that have emerged from post-Hardin research on actual common resources. The class simulation could stop there and focus on the lessons of this research.[4] I push on, however, so I can explore with students the meaning attached to simple models, such as the tragedy, and to model-making in the practice of science.

Two non-standard alternatives

At first sight the progression of students' responses (a->d) matches a standard interpretation of using models in science, namely, start simple and improve by incorporating more factors. In this light, the basic schema of Hardin's is an ideal model: Reality differs in details or in more significant ways. One can only learn about reality by starting with a simple model, comparing it with observations, adding postulates, and progressively improving it. Activists might see it in an equivalent way: The simple model draws attention to a problem—degradation of resources held in common—and stimulates people to get involved. And through such involvement they learn more about the complicating details and build experience in implementing policy. Let me, however, contrast this seemingly straightforward progression—from simple to more complex accounts—with two non-standard alternative views about the way the simple tragedy model shapes people's understanding of environmental politics.

Alternative 1: This concerns systems, by which I mean natural units that have clearly defined boundaries and coherent, internally driven dynamics. Examples of phenomena that some people think of as systems include lake ecosystems, the earth's climate, national economies—and resources subject to the tragedy. The systemness of ecological and social complexity can be problematized in four ways, which correspond to the four levels (a->d) at which students sought change during the class simulation:
• a. Instead of viewing the system as composed of individuals the nature of whose interactions are given at the outset, consider the system's dynamics to be mutable.
• b. View social embeddedness, not individuality, as primary. Instead of Hardin's atomized individuals, think about the networks of social support in which people are raised and in which they then operate as adults. These networks make communication—even through people's silence—unavoidable.

The withdrawal of social connections within such networks becomes an effective sanction.

    • c. Consider the permeability of any boundaries that are drawn.

    • d. Analyze the paths that individuals can pursue, including their responses to developments "outside" the system, in terms of the interactions among unequal individuals subject to further differentiation as a result of economic, social and political dynamics.

    Student strategies in the classroom simulation bring out the significance of c and d. My students tend to maintain the distinction between inside and outside, in that they assume some outside governing power to which they appeal to implement policies against overgrazing. What happens, however, to the government policies they propose? Conservationist measures and votes of equal weight tend to be resisted by wealthy herders. They may accept privatization, but usually not unless land allocation is proportional to current herd sizes, which gives them more land. In other words, potential outside influences are refracted through internal features of the herding "system," in particular, inequality among individuals. Attention to inequality and dynamics that cross boundaries can lead to a qualitatively different perspective on what has been going on and what can be done. This lesson comes through more strongly after I—as the teacher—disallow requests to return to the pre-game equality.[5]

    Now some readers might accept that environmental change involves differentiated and changing political dynamics, but still want to maintain the standard interpretation of the use of models in science and politics. You might construe the steps from one level to the next (a->b->c->d), through which the system of equivalent units is broken open to expose more complex dynamics, as an instance of the process in which the simple model is progressively improved upon. Read that way, simple models remain a valuable, perhaps even necessary, first step for scientific inquiry or for formulating policy or action proposals. This is where the second alternative to standard interpretations comes into play; this does not allow the use of simple models to be so simply rationalized.

    <u>Alternative 2</u>: Instead of thinking about models as representing aspects of the world —sometimes approximately, sometimes more faithfully—we can also consider the rhetorical effects of models. Rhetoric refers to ways that an audience is influenced by the framing of a case as much as by its substance.[6] To expose the rhetorical effects of science means not to accept literally what scientists say they are doing, namely, proposing simple models as first approximations to reality. The rhetorical effects of the tragedy or of post-Hardin research include the following:

    • Simpling: Sometimes sweeping claims are first made for the general applicability of some simple model, but then postulates are successively added to address the discrepancy between the model and observations. This can be interpreted as "simpling":

    Like sampling, "simpling" is a technique for reducing the complexity of reality to manageable size. Unlike sampling, "simpling" does not keep in view the relation between its own scope and the scope of the reality with which it deals... <u>It then secures a sense of progress by progressively readmitting what it has first denied</u>. "Simpling"... is unfortunately easily confused with genuine simplification by valid generalization. (Hymes 1974, 18; my emphasis)[7]

    • Reinforcing foundational assumptions: In Hardin's presentation of the tragedy, as in most of economics, selfishness is seen as a fundamental characteristic of humans, and this determines the dynamics of the system. The tragedy then becomes a result of the "immutable logic of self-interest" (Picardi and Seifert 1976). The belief that the ideal-type dynamics of the simple model are fundamental or foundational tends to be reinforced by the process of tinkering with the model to produce numerous different variants for different situations (see simpling above). Moreover, the idea that self-interest is human nature is reflected in the very name "tragedy," which classically was something bad that happens to mortals despite their best intentions; it took the gods to prevent it. Ironically, many of Hardin's opponents reinforce this view of human nature when they argue that use of non-privately held resources can be governed satisfactorily, provided appropriate social sanctions or regulations are in place <u>to counteract individual selfishness</u> (Berkes et al. 1989).

    • Privileging the powerful: The categories and relations in the model of the tragedy of the commons can be interpreted as favoring certain political positions and processes. In the actual world privatization often cements the current claims of unequal individuals. To speak of common resources in terms of the tragedy, which posits interactions among equal individuals, is to distract attention from the special interests of those with greater claims. The tragedy model thus makes it easier for powerful interests to get their way, a result evident in the concessions made in the early 1990s to secure the United States' ratification of the Law of the Sea. The concessions ensured that existing seabed claims of US corporations could not be reallocated to the world community (Broad 1994).

    • Rendering the special typical: When illustrating problems of managing resources held in common, critics of Hardin's model tend to focus on special situations, such as those in which the resource and its users are somewhat autonomous from the influence of the government, markets or industries (Ostrom 1990). With the accumulation of studies of such situations, however, they no longer appear special, but are employed to support more general claims. Inquiry that seeks, instead, to define how the situations arise as special cases of more general processes goes to the back-burner.

Let me summarize the contrasts between standard interpretations and the two alternatives. Although the conventional strategies in science give priority—in method, theoretical development, and aesthetics—to simple principles that are held to lie behind complex appearances, new thinking can be opened up when we consider the complexity lying behind models that merely appear simple. Hardin and others analyze environmental phenomena as simple, coherent systems, but we can ask how the analysis would differ if phenomena were not assumed to be system-like. Analyses that presume the systemness of phenomena are intended to be accounts of reality, but we can ask whether special circumstances have been selected for study and we can examine the rhetorical work done in making the phenomena appear system-like. In particular, models can be interpreted in terms of the worldviews and political positions that the models favor, or, more generally, in terms of the actions or interventions that flow from the models.

FROM SIMULATION TO RESEARCH

The two alternatives open up lines of inquiry not well addressed by the post-Hardin research mentioned earlier. Although institutions of collective governance are emphasized in this research, less attention is given to the significance of inequality, permeable boundaries, and the processes whereby institutions of collective governance arise and evolve. Interpretation of ways that the social context shapes research and debates about common resources is also underdeveloped (but see Peters 1987, Agrawal 1998).

I believe that inquiry into non-systemness and rhetorical interpretation are important to explore with students who intend to undertake socio-environmental research. When I lead seminars with advanced undergraduates or graduate students in disciplines such as geography, anthropology, and development sociology, I follow the simulation class with further discussion of commons research.[8] Let me review the kinds of material I introduce, which amplifies the contrasts and lessons that emerged from the simulation. This material is necessarily specific and specialized; readers whose interest is in teaching general, introductory environmental politics classes may choose to skip or skim the following section.

Pastoralism embedded in intersecting processes

Although Hardin illustrated his thesis with a scenario of herding on a common pasture, his example was purely hypothetical—no actual or historical cases were given. However, over the last 25 years the ecology and economics of nomadic pastoralists have been intensively studied. (Nomadic pastoralists are herders who live in semi-arid climates where rainfall is variable, unpredictable and spatially patchy, and who spend at least part of their year roaming in search of patches of watered pasture; Galaty and Johnson 1990). This research began with an environmental determinist outlook. Range degradation and desertification were attributed to pastoralists allowing grazing beyond the environment's supposed carrying capacity. Models reduced nomadic pastoralism to a plant-herbivore system or an instance of the tragedy of the commons (Taylor and García Barrios 1995). Policy embodied that picture: for a decade in the 70s and early 80s the goal of development projects was to produce fundamental changes in pastoral practices, through, for example, privatization of pasture, stock reduction and large-scale ranching schemes. These projects generally failed; the increased research effort that came with the international attention led belatedly to the perspective that herders respond skillfully and sensitively to their variable and uncertain semi-arid environments, provided the herders can remain mobile, maintain species diversity in their herds, and apply their local ethnosciences of range management (McCabe and Ellis 1987; Horowitz and Little 1987).

The emerging picture that can be contrasted with environmental determinism is of on-going transformations of the economies and ecologies of nomadic pastoralist groups. This picture highlights different factors that are implicated—to different degrees in different locations—in past transformations, e.g., taxation, establishment of military control, imposition of borders, and other aspects of colonial and post-colonial administration. Similarly, in more recent changes are implicated further severe droughts, extension of agricultural areas, privatization of access to resources, regulation of conflict over resources, sedentarization, development projects sponsored by national governments and international agencies, and the changing economic conditions and terms of trade accompanying structural adjustment (Taylor and García Barrios 1995).[9]

Some pastoralist societies have been rapidly restructuring with their boundaries becoming permeable. Wealthy pastoralists break their reciprocal relations with agriculturalists to become cultivators themselves; agriculturalists become absentee herd owners; and the poorer peasants and herders become their hired laborers. Squeezed for time to take their herds out on the range, these herder-laborers allow their livestock to overgraze areas

close to their settlements, not—in contrast to Hardin's picture—out on the common grazed rangeland (Little 1988).

The emerging picture of nomadic pastoralism exemplifies and suggests extensions of the different aspects (a-d) of the first, non-system alternative. Where systemness implies clearly defined boundaries and coherent dynamics based on the interactions within the system, this picture of socio-environmental situations emphasizes that:

• a. Structures are subject to restructuring, e.g., nomadic pastoralism becomes combined with and constrained by agricultural activities.

• b, c & d. Conceptual and material boundaries are permeable, e.g., pastoralism/ agriculture; herding/ laboring; climatic/ economic forces. Levels and scales are not clearly separable, e.g., local, national, and international processes all enter the dynamics of the pastoral situation. Indeed, socio-environmental research itself, embedded in its context, becomes one of those processes.

• b & d. Control or generalization are thus difficult. For example, there may be plenty of degraded common property resources. However, if such situations are not seen as the inevitable result of some fundamental, apolitical dynamic, but are seen as transformations of existing complex and differentiated politics, then general policy recommendations are not warranted (Peters 1987; Berkes et al. 1989; McCay and Jentoft 1998).

I use the term intersecting processes to summarize this whole picture. That is, social and environmental change can be analyzed as something produced by the intersection of economic, social and ecological processes operating at different scales. These processes transgress boundaries and restructure "internal" dynamics, thus ensuring that socio-environmental situations do not have clearly defined boundaries and are not simply governed by coherent, internally-driven dynamics (Taylor and García Barrios 1995).

An intersecting processes picture raises interesting questions about pastoralism viewed as a system. Suppose, say, socio-environmental researchers found pastoralist societies isolated from external social currents. These bounded systems could be viewed not as the natural situation of pastoralism, but as special cases. The researchers might then examine how these societies closed themselves off, possibly in response to pressures to become involved with agriculture and incorporated into wider currents (Wolf 1957, 1982: 385-91; Smith 1984). Similarly, if researchers found a situation in which social stratification was lacking, they might ask how the socio-environmental dynamics have leveled previous inequalities.

If we go further and apply rhetorical analysis (alternative 2) as well, we might look into who chooses to study and document these societies. For example, human ecologists and biological anthropologists whose interests centered on the adaptation of human societies to their environment established their research project in a remote area of Kenya (Little et al. 1984)—far from the turbulence and intersecting processes of many other districts in Kenya (Little 1988). In short, if pastoral systems are viewed as special cases, systemness needs to be explained, not taken as a foundation or ideal type from which to build explanations.

How the tragedy becomes accepted as common(s) knowledge

The questions raised about the tragedy thesis—conceptually, empirically, and as applied in policy—might constitute sufficient grounds for giving that simple model no more attention. Indeed, some socio-environmental scientists have left behind the old determinisms by conducting detailed, regionally specific empirical studies, in which the particular historical contexts are given greater weight (Turner 1993; Peet and Watts 1996). Instead of simply turning our backs on Hardin's model, however, we could seek reasons for its persistent appeal. (Responding to the tragedy in this way follows from the alternative 2 by which we consider how models work rhetorically to secure support.) If we can interpret the tragedy's appeal in relation to the social context in which knowledge becomes established and applied, additional ways to challenge the continued use of the model should emerge.

Consider the idea that pastoralists living in more-or-less isolated systems are special cases, which invites us to examine either the history by which they became closed off from the wider world, or the sociology of the scientific field that chose to focus on them. The tragedy, which assumes a system of equivalent users of a common resource, can no longer be viewed simply as a first approximation to a more complex theory of common, non-privatized resources, nor even a crude first approximation. Indeed it may be serve as a diversion from developing such a theory. This possibility invites us to examine whether certain politics are built into the categories and relations in the model. That is, we can try to interpret science as socially shaped, not only in its sources of funding, the day-to-day practices of scientists, or its applications, but even in the heart of its conceptual formulations. The following broad brush illustration should help to make such an interpretation plausible.

The assumption of equal, undifferentiated individuals is central to the tragedy. With this assumption, the model's dynamics permit only a limited range of options. Hardin explicitly advocates two: privatization of the resource and "mutually agreed coercion." Mutually agreed coercion raises the specter of communism and fascism—recall that Hardin first wrote about the commons in the 1960s—and has not been widely invoked in discussions of the commons. The other three options that the model allows are also readily

discounted: Individuals can leave the system, but this cannot be a solution for every case. Individuals can all abandon their desire to accumulate in favor of conservation, but this is never presented as very likely. Individuals can drive the system to the inevitable degradation awaiting all non-privatized resources. In short, of the five options, privatization is clearly the privileged one. This message stands, even when the actual record of development efforts casts doubt on the effectiveness of that policy. More generally, negotiations and contestations among groups with different interests, wealth and power—the messy stuff of most politics—are kept out of the picture. The tragedy thus naturalizes the liberalized economics of structural adjustment and obscures the politics through which structural adjustment is imposed and implemented in poor, indebted countries.

The political strategy of appearing to by-pass politics, which is quite common in environmental politics, invites interpretation. The strategy brings two positions to the center stage: the enlightened guide, who can instruct us how we—an undifferentiated "we"—must change to avoid the impending crisis; and the technocrat, whose analysis shows all of us the scientifically justified or most efficient measures, to which it would be in our best interest to submit.[10] Moralistic views of social action are particularly comfortable for those who imagine themselves as the guides or educators; technocratic views befits planners or policy advisers. These roles do not require long-term and necessarily partisan engagement in specific situations. They especially suit natural scientists who can employ their status and skills without re-tooling in political-economic analysis.

The rhetorical exclusion of politics has also a broader appeal to people in affluent countries. In those countries, atomized consumers find it difficult to organize institutions that would ensure that private, corporate, or military property holders bear the full environmental costs of their activities. Concerned consumer-citizens have reason then to be anxious about their capacity to unite and organize with the goal of influencing corporate and military decision-making. In this light, the attention given to irrationality of non-privatized resources in poor countries can be interpreted ironically, as a displacement from unspoken issues closer to home (Haraway 1989)—issues other than what the tragic commons is literally about.

Turning the tables on oneself

An extra layer of complexity in rhetorical interpretation can be added if we consider the simplifications I have been making as author/teacher. My interpretations of the tragedy as rhetoric—naturalizing structural adjustment, by-passing differentiated politics, and displacing concerns close at hand to some distant, different people—are, of course, over-generalizations. Instead of viewing the interpretations simply as empirical claims, we could see them as further examples of rhetoric. In this light they serve primarily to reinforce the idea that the tragedy can be interpreted, that is, it does not have to be taken literally as a scientific account of the commons.

An extension of non-systemness (alternative 1) raises additional questions about the status of rhetorical interpretations. The interpretation of the tragedy in terms of moral and technocratic politics implies a direct relation between favored social actions and scientific analyses: Socio-environmental scientists' social locations can determine their views of favored social action and then their scientific analyses. They then invoke these to support their favored views of social action. Although this looks like an example of non-systemness in the sense of viewing social embeddedness as primary, the picture of intersecting processes encourages interpreters of science to question such direct determinations. We should attend to the particular details of researchers' different situations and how researchers draw upon multiple resources to make their science. More specific interpretations would illuminate the ways that actual peoples' actions and the views of social action or politics they favor are built into, facilitated by, and co-constructed with their accounts of the real world (Taylor 1995).

This essay has not, however, teased out the complexity of any particular situation in which research is or was undertaken.[11] So I admit some rhetorical excess in baldly advancing interpretations of rhetoric, such as associating undifferentiated socio-environmental analyses with moralistic-technocratic politics. Nevertheless, let me affirm the value of teaching such interpretations. The two alternatives provide angles of entry for would-be scientists to deepen their sense of the social embeddedness of science. The rhetorical interpretations invite students and researchers in environmental politics to take the social embeddedness aspect of alternative 1 seriously, to explore it as a "null hypothesis" or default position. Situations in which science is free from social influences and can focus on faithfully representing reality become special cases to be explained. Alternative 2 also means that theories, such as the tragedy, or policies based upon those theories, should not be assumed to stand or fall on their empirical merits as accounts of reality. Moreover—even without going into more detailed analyses of particular situations—alternative 2 should remind researchers that science has effects on society other than through revealing the nature of the world.

To acknowledge the rhetorical dimension of science is, however, to open up a further challenge. Suppose the work of certain scientists is tied up with simpling, reinforcing foundational assumptions, and so on. This means that the scientists will probably not change the way they make science about complex situations simply because other scientists or interpreters of science problematize systemness. They might not change even if alternative 1 draws

their attention to accounts that are more faithful to the complexity of socio-environmental situations. The challenge then—one that corresponds to a tension between writing critical accounts and engaging in actual situations—is for critical scientists and commentators on science not only to interpret, but also to get involved in mobilizing different resources and modifying the complexity of social influences that shape how research is undertaken.

TEACHING CRITICAL THINKING ABOUT ENVIRONMENT, SCIENCE, AND SOCIETY

Student engagement is key to my approach to teaching. Personally I favor the non-standard alternatives, but I do not dictate those positions. Instead, I use activities, such as the extended tragedy simulation, so that students participate in discovering such alternatives themselves. When I summarize what transpired in the terms described in this essay, I hope to provide themes for their ongoing questioning in other contexts or into more advanced classes.

This essay cannot, of course, replicate the full experience of interactions in a class simulation or seminar discussions. As an attempt to compensate, let me articulate my overall pedagogical approach to teaching critical thinking about environment, science, and society. This is directed more at teachers of environmental politics than students, but students should not stop reading—what follows will help you better appreciate the path this essay has described.

In a sense subscribed to by all teachers, critical thinking means that students are bright and engaged, ask questions, and think about the course materials until they understand well established knowledge and competing approaches. This becomes more significant when students develop their own processes of active inquiry, which they can employ in new situations, beyond the bounds of our particular classes, indeed, beyond their time as students. My sense of critical thinking is, however, more specific; it depends on inquiry being informed by a strong sense of how things could be otherwise. I want students to see that they understand things better when they have placed established facts, theories, and practices in tension with alternatives.[12] Critical thinking at this level should not depend on students rejecting conventional accounts, but they do have to move through uncertainty. Their knowledge is, at least for a time, destabilized; what has been established cannot be taken for granted. Students can no longer expect that if they just wait long enough the teacher will provide complete and tidy conclusions; instead they have to take a great deal of responsibility for their own learning. Anxieties inevitably arise for students when they have to respond to new situations knowing that the teacher will not act as the final arbiter of their success. A high level of critical

thinking is possible when students explore such anxieties and gain the confidence to face uncertainty and ambiguity (Taylor 2001).

My research and teaching connects environmental studies and studies of science and technology in their social context. Over the last decade I have had the opportunity to focus my teaching on critical thinking. Unlike many other colleagues teaching environmental studies, I have not felt the pressure to cover all the facts, issues, or established analyses that students must know. The challenges are somewhat different. An emphasis on critical thinking implies, even in large classes, an individualized model of teacher-student interaction, and students' corresponding raised expectations are difficult to fulfill. Their responses are sometimes emotionally intense, especially in the case of science students, which makes sense when we recall that their success in science has depended on learning what others already have discovered and systematized. This has forced me to—in much the same spirit that I expect my students to take more responsibility for their learning—experiment, take risks, and through experience build up a set of tools that work for me. In recent years I have made more time to learn from others about writing through the curriculum, designing opportunities for co-operative, experiential, and project-based learning, and fostering students' different learning preferences. To use Kolb's terms, I am gradually making more room for Concrete Experience, Reflective Observation, and Active Experimentation, in addition to the Abstract Conceptualization that is my own intellectual inclination (Kolb 1984). The conceptual emphasis remains, however, in the approach to teaching I have introduced in this essay.

A final question left open by this essay concerns the productive role of ambiguity for critical thinking. I mentioned that anxieties inevitably arise for students when they have to respond to new situations knowing that the teacher will not act as the final arbiter of their success. I claimed, moreover, that a high level of critical thinking is possible when students explore such anxieties and gain the confidence to face uncertainty and ambiguity. Yet, because a certain level of confidence is needed to deal with ambiguity, I also realize that I need to present some propositions in which students can be confident. A sense of ambiguity is generated when during the class simulation I disallow students' appeals for me to make or clarify rules and thus withdraw from the role they expect of a teacher. I rein in the ambiguity, however, when I follow the simulation with a presentation of the classification of the four levels in their responses, draw out the lessons, and summarize them in terms of two alternatives.

A similar tension is present overall in this essay. Its relevance was not supposed to be limited to science and policy about the commons. I would advocate the exploration of non-systemness and rhetorical analysis more generally. In environmental politics courses and in socio-environmental

research, I think it is important to examine ways that simple models frame our thinking, giving priority to simple principles about individuals over differentiated and complex social dynamics and favoring powerful interests over others. But I have not demonstrated the non-standard lessons apply beyond the case of the commons. I can only hope that readers—students and teachers alike—have been stimulated to experiment, take risks, and through experience weave my aprroach into their set of tools for working in other areas of science and environmental politics. I suspect that, if I had presented a fully developed analysis of a particular concrete case, readers interested in some other area of the world, the environment, or politics would have skipped the paper. Yet I know that reading such a case wold have made some readers more confident about whether and how to employ the non-standard alternatives this essay has introduced. I have to admit that a tension between opening up questions and establishing confidence in answers continues to run through my work (Taylor 2002). So, before reading further, ask yourself what changes you would seek in order to foster critical thinking about environmental politics...

QUESTIONS FOR REFLECTION AND DISCUSSION

Q1. Some authors and teachers use the "tragedy of the commons" to refer to the degradation of resources held in common. Taylor uses the term more strictly, to refer to the model that explains the degradation in terms of the selfish behavior of equal, non-communicating individuals. What are the consequences of the contrasting conceptions of Hardin's thesis?

Q2. Consider the following contrast: Science makes little progress when it focuses on situations that show non-system like complexity -vs.- Whether one thinks about context and relationship or about parts out of their context is a preference molded by one's culture (Goode 2000).

Q3. In their 1985 paper on global change and sustainable development, environmental scientists Clark and Holling wrote: "We are moving into a period of chronic, global, and extremely complex syndromes of ecological and economic interdependence. These emerging syndromes threaten to constrain and even reverse progress in human development. They will be manageable - if at all - only with a commitment of resources and consistency of purpose that transcends normal cycles and boundaries of scientific research and political action (Clark and Holling 1985, p. 477). Identify the words and phrases that indicate moralistic or technocratic views of politics.

Q4. Choose a general article that draws policy or political lessons from environmental science. Analyze its argument and rhetoric in terms of the contrast between Taylor's standard interpretation and the two alternatives.

Q5. Contrast Taylor's view of critical thinking with your own or others you have encountered. Characterize if possible the standard views and alternatives that emerge.

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Notes

[1] In this essay I have reworked Taylor (1998) so as to explore its implications for teaching critical thinking. I acknowledge the comments of Yaakov Garb, Michael Maniates, the Changing Life working group, and an anonymous reviewer.

[2] For simplicity of making calculations while running the class, I set the threshold at a total herd size of 100 cows. Below this threshold, the income per cow per year is $100 and above it the income is $200 minus total herd size, that is, a drop of $1 for each additional cow. I do not inform herders of the threshold or the formula used to calculate the income; they make their own sense of the trend. If the class has N members, I set the initial number of cows per person at about 80/N. I set this figure as the maximum number of cows a herder can purchase in any one yearly cycle and, multiplied by $100, set this as the initial cash per person. That is, if N=20, herders begin with 4 cows and $400 each. The buying price per cow I set at $100. Herders

indicate purchases on pieces of paper. I add these up as I collect them and then update the total herd size and income per cow on the board. Herders then update their accounts and decide on the next year's purchases.

[3] Classroom activities that illustrate Hardin's conclusions are described in Bybee 1984, 57ff, Meadows and van der Waals n.d., and Wheeler 1995. See also the "Report on Course Exercises" at the main web page of the Project on teaching Global Environmental Politics, http://webpub.alleg.edu/employee/m/maniate/GepEd/geped. html

[4] The standard post-Hardin lesson is that agents communicating and working together in communities can overcome their short-term self-interest and maintain local institutions for managing a resource held in common. Successful institutions are operated by those directly concerned with the resource and are "externally accepted," that is, the government, markets or industries tolerate, or even support the community of users' jurisdiction over the resource (Berkes et al. 1989, Ostrom 1990). In the future I plan to extend the simulation in the direction of these post-Hardin lessons. After arriving at the situation of unequal assets and overstocking, my idea would be not to continue negotiations as a whole class, but to break up into groups of three— each including a well-off, a poor, and an in-between person. I would give each group a different scenario (e.g., nomadic pastoralists, Western U.S. cattle graziers, New England fishing people), and ask them to attempt to come up with a mutually acceptable arrangement in their particular situation. After a while, I would ask them to respond to a little devil who whispered in their ear: "Add another cow to your herd or pull in another fish—you'll get all the benefit and any cost will be shared by all." (I suspect that the responses will be more qualified and contingent than Hardin implies.) The simulation would end with reports back to the whole class on a) the group's negotiations and outcomes; and b) different individuals' responses to the little devil.

[5] The four aspects of the first alternative could also be used to open up questions about simple models of systems other than the tragedy. For example, in more general complex situations, in biology as well as in society, instead of viewing the properties of units as fundamental they could be viewed as contingent on the units' embeddedness in their context.

[6] The political significance of framing is also discussed by Dabelko and Matthew's essay on environmental security and the classroom in this volume.

[7] Hymes, a socio-linguist, invented the term to describe the way Chomskyan linguistics gradually reconsidered the meaning of expressions after having first stripped the idea of language down to its underlying, "generative" grammar. The term is, however, apt in this context as well.

[8] Analogous conceptual tensions are worth exploring in ecology proper, conservation biology, and studies of science and technology in their social context (Taylor 2002).

[9] Structural adjustment refers to the effects of conditions attached by international lending agencies on loans granted to poor countries, often to cover interest from previous loans, that require measures such as reduction in government spending on domestic services and infrastructure, devaluation of currency to make exports cheaper and imports more expensive, openness to foreign investment and elimination of programs to stimulate or favor domestically-owned businesses. Green (1995) provides an accessible overview of the "neo-liberal" economic theory underlying structural adjustment.

[10] These positions are dominant in environmental discourse more generally; see Taylor and García Barrios (1997).

[11] My expository choices invite interpretation using the very framework I have presented. See Taylor (1995, 2002) for extended and more reflexive accounts of the social construction of models.

[12] The image I often use is of a spring, with a standard view and an alternative at its two ends. When the spring is stretched it pulls back; when compressed it pushes out. That is, the standard view cannot be considered without taking the alternative into consideration, and vice versa. Nor can the two of them be collapsed into one concept. I also use the term "critical heuristic." By heuristic I mean a proposition that stimulates, orients, or guides our inquiries, yet breaks down when applied too widely. Critical heuristics are ones that place established facts, theories, and practices in tension with alternatives. For example: "There will be a qualitative change in the analysis of causes and the implications of the analysis if an emphasis on short-term interest is replaced by a focus on institutions of collective governance." The alternatives in this essay can be rephrased in this way as critical heuristics.