On Teaching

The Chocolate Conundrum: A Simple Simulation of a Canonical Management Problem

Pacey C. Foster and John Richardson

This article describes an exercise that simulates one of the most famous of all human management problems: the "tragedy of the commons." Coined by Garret Hardin in 1968, the term refers to any situation in which people acting rationally to meet their individual interests wind up depleting a shared resource to the detriment of all participants. Because these patterns arise in many real-world situations — from global warming and natural resource management to free-rider problems in markets and organizations — this exercise may interest a broad range of negotiation scholars, teachers, and practitioners. The Chocolate Conundrum is a simple exercise that uses candy to demonstrate the tension between individual and collective interests that arises in all social dilemmas. Because these dynamics also arise in many real situations, the exercise can be a powerful teaching tool for instructors in management, public policy, sociology, economics, and many other social science disciplines. Unlike some other simulations of collective action problems, this exercise is simple to administer, requires no computation or tallying of results, and works with a broad range of audiences and group sizes.

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10.1111/j.1571-9979.2011.00304.x

Key words: negotiation, conflict resolution, negotiation teaching, social dilemmas, tragedy of the commons, public goods, collective action.

Introduction

Variously called social dilemmas (Dawes 1980; Kollock 1998; Dawes and Messick 2000), public goods (Vugt 1997), and collective action problems (Oliver 1993), the "tragedy of the commons" is part of a general class of decision-making problems that also include two-person games such as chicken and the prisoner's dilemma. The prisoner's dilemma is a canonical two-person decision-making problem that was first defined in 1950 by researchers at the RAND Corporation (Poundstone 1992). In academic circles, the problem was popularized by the work of Robert Axelrod (1980a, 1980b, 1984) and has been the subject of hundreds of subsequent experiments and academic papers. (See Stuart 2011 in this issue.)

A story about two suspects being questioned by the police (first conceived by Princeton mathematician Albert Tucker) is typically used to explain this game theory dynamic and gave the problem its familiar name (Poundstone 1992: 117–118). In this story, two members of a gang have been arrested under suspicion of committing a serious crime and are being questioned in separate rooms with no means of communication. While the police do not have enough evidence to convict both for the serious crime, they do have enough to convict each for smaller offenses that come with smaller prison sentences. Each prisoner is therefore offered the following deal: confess and testify against your partner, and you can walk away free while he or she receives three years of jail time. This would be a relatively simple choice, but for the catch: if both criminals testify against each other, they both serve two years of prison time. This structure provides the following payoff matrix (which has been adapted from Poundstone 1992: 118 in Figure One)

Clearly, the best outcome for each is to give up the other (thereby going free and receiving no jail time), but this outcome depends on the other remaining quiet. Because both prisoners are aware that the other has been offered the same deal, neither can trust that the other will remain silent, and therefore both should confess. By doing so, however, each gets more jail time than they would if both had remained quiet. In both the two-person and larger versions of these games, the combined interdependence of choices, uncertainty about the cooperation of others, and distribution of outcomes creates a notoriously difficult decision-making problem. The tragedy of the commons represents a more complex version of the prisoner's dilemma phenomenon. In a more complex multiperson, multiround game based on the tragedy of the commons, individuals make decisions about how to

Figure One
Prisoner's Dilemma Matrix

	B stays quiet	**B confesses**
A stays quiet	1 year, 1 year	3 years, 0 years
A confesses	0 years, 3 years	2 years, 2 years

manage a commonly available collective resource such as grazing fields, stocks of fish, or other natural resources, and each player can take some in each round of the game. The resource can replenish itself, but it needs a critical mass left unclaimed after each round to maximize the replenishment. The players collectively want so much of the resource that they will hinder the ongoing replenishment unless they restrain their consumption. As in the cooperation strategy in the two-person game above, this outcome depends on coordination among self-interested actors who cannot be fully trusted and who each has an incentive to defect.

Garrett Hardin (1968) explained this class of games using the example of herders whose animals graze on a common pasture. Each shepherd wants to graze as many sheep as he can produce on the pasture. If all shepherds graze the maximum number of sheep, the animals will eat all the grass, and the pasture will be destroyed. At the same time, any given shepherd always has a selfish incentive to graze more than his or her share of sheep in any given round. And even if one shepherd wants to cooperate, a risk remains that others will take advantage of this benevolence. As in the prisoner's dilemma, individually rational strategies can lead to suboptimal collective outcomes. This dynamic is seen in numerous empirical phenomena, including the burning of fossil fuels that causes global warming and other natural resource management issues, traffic congestion and the use of public transportation, "free-rider" problems wherein some individuals consume more their fair share of a public good, and many other group decision-making problems.[1]

The Chocolate Conundrum

"The Chocolate Conundrum" is a simple simulation designed to elicit the individual and collective tensions inherent in tragedy-of-the-commons problems and to offer students the opportunity to explore various approaches to dealing with such problems. This exercise was taught to the authors by Jeffrey Z. Rubin, a social psychologist who was one of the founders of the modern field of negotiation as well as the founding editor of this journal. His scholarly contributions include numerous articles and books on mediation and diplomacy (Rubin 1983, 1994; Kellerman and Rubin 1988), culture in negotiation (Fauré and Rubin 1993), escalation traps (Brockner et al. 1986; Rubin, Pruitt, and Kim 1994), and general negotiation theory and practice (Breslin and Rubin 1991). In an academic career cut short by a tragic accident in 1995, one of his greatest legacies — his contributions as an educator — has perhaps received less attention.

As the founding executive director of the Program on Negotiation at Harvard Law School and in a twenty-five-year career at Tufts University, Jeff taught thousands of people to be more effective negotiators. He was a brilliant negotiation instructor who delighted in developing new ways to distill the complex behavioral and theoretical lessons he loved so much.

It is quite possible that Jeff first learned of the exercise from an article by Julian Edney (1979) called "The Nuts Game." Since that time, however, the exercise has circulated largely by word of mouth and, to our knowledge, remains undocumented in existing negotiation and conflict resolution case collections and relatively unknown among negotiation educators. By shedding light on this simple and effective simulation, we hope to share some of the pedagogical magic that Jeff imparted to us and formally document this powerful exercise.

Before introducing the exercise, it is important to distinguish it from the many other iterated decision-making games involving prisoner's dilemmas and social traps. Exercises like "Pepulator Pricing Exercise," "Win as Much as You Can," and "Oil Pricing" have become staples of negotiation and conflict resolution courses around the world. These games typically require students to master complex instructions and take between one and three-and-one-half hours to run and debrief fully.[2] In contrast, the Chocolate Conundrum is a simple game that requires little introduction and can be used as a fast illustration of a complex social problem. Therefore, we feel that this exercise provides a useful complement to the many existing simulations of prisoner's dilemmas and commons simulations already available.

Instructions and Game Play

This exercise can be completed relatively quickly with classes of many sizes and experience levels. We have played the game dozens of times over the years with participants ranging from undergraduates to executives and found that it works well for a wide variety of people. This exercise works well with class project teams to demonstrate the challenges of managing interdependence. It can also be used as a stand-alone

Table One
The Chocolate Conundrum Rules

- No talking.
- You want to maximize return for yourself personally.
- You can grab all you can get at the beginning of each round.
- If any are left at the end of a round they will double.
- The bowl cannot hold more than the initial amount.
- No punching, illegal holding, wagering, etc.

exercise and complements a wide variety of course topics, including negotiation and group conflict, team dynamics, decision making, game theory, free-rider problems, and natural resource management.

Because the Chocolate Conundrum is a group exercise that depends on some variation in outcomes and requires at least four people (six is ideal) on each team, it is difficult to run it with fewer than twelve to fifteen players. On the other hand, if you play with one student group at a time while others observe, the exercise works well with groups of twenty to forty or with even larger classes (especially if you do not play with every group and are using it more as an icebreaker or brief illustration). The instructions are relatively simple and can be presented on a single slide or handout. (See below for our instructions.)

No preparation is required and the materials consist only of a bag of small chocolates (we use standard M&Ms or other wrapped candies) and a bowl. We begin by dividing the class into small groups of four to five people, asking teams to sit in such a way that each person can reach a bowl of candies that will be handed to them by the instructor. We typically restrict our introduction of the exercise to a simple description of the mechanics during which we discourage pregame coordination among teams.

After explaining that there should be no discussion of strategy among teams and that we can only answer questions about mechanics, we present the rules of the game. (See Table One.)

There are several important aspects that we highlight here.

1. *No talking*. Note that we do not prohibit *communication* (though we do not highlight this in the instructions). We find that some clever players use hand gestures and other nonverbal communication mechanisms to coordinate their activities. These can be useful to highlight and discuss in the debriefing.

2. *The purpose is to get as many candies for yourself as you can in the time allotted*. Here we highlight that each person is primarily concerned for her own outcome and is indifferent to the outcomes of others.

3. *There will be multiple rounds*. We do not say how many because the final round contains a particularly high incentive for defection and is a dynamic that emerges naturally in the exercise.

4. *Each round begins when the instructor says "go" and there will be no grabbing candies between rounds*. We prime them for some competition by using words like "grabbing" but you can decide how much to do this. (See the "Debriefing and Reflection" section below for a discussion of framing effects in the instructions.)

5. *At the end of each round, the total number of candies left in the bowl will double, up to (but not to exceed) the original amount*. You can specify the formula for determining the initial amount here if you wish — it is twice the group size minus one — but in our version, we like to see if students will ask about this fact, as knowing this number is critical for planning a strategy. Whether you share the number here or use it as a first small debriefing point (about the importance of understanding the rules of the game) while taking questions about the rules, be aware that the original amount is critical for game play. (See below for additional explanation.)

6. *The game ends when there are no candies left in the bowl or at the instructor's discretion*. This last part is important, as different games will have different dynamics and will therefore require different endings. (See below for a discussion about how to manage game dynamics in the class.)

7. We also include a final comment about no scratching, elbow throwing, etc., which typically gets some laughs. It also helps to prime the students for competitive behavior, thereby increasing the likelihood that some teams will have short games with little cooperation.

At this point, we typically ask if students have any questions. This is when it is especially important to enforce the "no discussion rule," as some teams may find it irresistible to start talking about their strategies in advance. At this point, we try to keep students focused on mechanics and ensure that most people understand the basic rules of the game. Because organizational learning is one of the interesting dynamics that can be addressed in the debriefing, it is not essential that every student has a complete understanding at the outset. They will learn by watching other teams play the game, and typically we see strategies improve as we walk from group to group running the game.

Either way, it is important that the instructor understands the original amount each team should get and why. Each team starts its game with a number of candies equal to double the size of the group less one ($2N - 1$). In other words, a group of five would get nine candies to start with ($5 \times 2 = 10$; $10 - 1 = 9$). Typically, we announce this rule several times to be sure that people are clear about it and to allow students to consider the implications of it for their strategies. Instructors should, however, resist the temptation to describe the reasoning behind this number (which we provide here for instructors). This explanation will be part of your debriefing.

By starting with an amount that is one less than double each group size, we remove the option of each person simply taking one candy and maximizing the amount that gets doubled at the end of each round. This dynamic is critical for game play and may factor heavily in your discussion. Even if each person only takes one candy, the amount in the bowl will gradually diminish until there are none left and the game ends. The optimal strategy is for all but one team member to take one candy each round. But this requires players to distribute the risk (including the emotional risk) of the game ending before they reap the benefit of their sacrifice. In this way, the amount in the bowl at the end of each round will be maximally doubled and game play can continue indefinitely — thereby managing the group resource optimally. It is quite difficult, however, for most teams to discover this strategy, especially without some form of communication, and typically it takes some time to evolve over multiple games as teams learn from the mistakes of others.

During the exercise, we move from group to group, running one game at a time and narrating the action for the rest of the class. While one small group is playing, the rest of the class is watching quietly while we narrate action. Although it is impossible to prevent laughing and spontaneous outbursts from the observers, we discourage any obvious strategizing by gently reminding teams about the "no talking" rule. While running games it is important to announce the start and end of rounds clearly and to provide some ongoing narrative for the observers describing the general distribution of payoffs, the number of candies remaining in the bowl, and how many candies are added each round. We discuss some more aggressive interventions below and while we have found it fun to adopt the role of a "sports announcer" (highlighting key moves and strategies) there is plenty of room here for instructors to ad lib to suit their own style and audience. It is also helpful at the end of each game to ask people to write down the number of candies they got before eating any of their winnings. If we have time, we ask groups to tally their results on the spot and announce the totals to the room as we go. Indeed, there are a number of "dependent variables" that can be usefully tracked and discussed including: (1) the total number of rounds, (2) the total amount obtained by all players, (3) the fewest and most obtained by an individual, (4) whether an equilibrium was reached, and (5) how many rounds until the equilibrium was reached.

Common Game Play Patterns

We have identified some common patterns that emerge in this game. They include:

Nasty, Brutish, and Short. One of the most common patterns (particularly in groups that play early) is the nasty, brutish, and short game. In these games, people aggressively pursue their short-term interests and seem to view the game as a Hobbesian war of all against all. As a result, they immediately seize all the candies, at which point, the game is over. Sometimes, the aggressiveness of this self-interest can be hilarious. One time, while using a Styrofoam bowl with a group of graduate business students, our first team literally tore the bowl to shreds in an effort to beat each other to the candies (most of which wound up on the floor). These games always generate energy and amusement and uneven distributions of resources. Because inevitably some people on these teams receive no candy, we always bring enough so that we can pass the bag around during the debriefing.

Slow Wasting. Another typical pattern is the slow wasting game. This pattern occurs when people are trying to collaborate but cannot quite figure out how to distribute resources optimally or fairly. In this type of game, participants will be more tentative about taking candies (and in the extreme may even need to be encouraged). These games typically result in a more even distribution of rewards and go on longer than the purely competitive game described above. A common outcome in these games is a slow diminishing of resources over time, which we point out by calling out the totals in the bowl at the conclusion and/or start of each round.

As we narrate the outcomes, we point out any unequal accumulations over time, which can itself serve to prompt more competitive behavior. In extreme cases, we sometimes have a group so tentative that people seem unwilling to take any candies at times. In this case, we typically make a joke about having the power to end the game at any time if people no longer want to take any candy. This usually gets a slow group moving, though it is also fine to end a slowly wasting or tentative game before the resources are completely gone by saying, "OK, we know where this one's headed."

When we do end a game unilaterally, we are careful to announce the last round clearly to the group and the class. At this point, with no remaining incentive to maximize the amount left in the bowl, people are less likely to cooperate and will typically compete over any remaining candies. Most groups will realize this without prompting and even the most tentative teams will leap into activity, although we have occasionally seen some groups leave candies in the bowl even at this late stage. In these rare cases, a comment about the wisdom of leaving value on the table will typically prompt someone to take the remaining candies and can provide a useful discussion point in a debriefing.

Taking Turns (and Other Maximizing Strategies). As described above, the optimal solution to this game is for all but one person to take one candy each round. To keep an equal distribution, the group must rotate the responsibility to hold back. This is hard to coordinate without talking, but some groups will typically manage some form of a maximizing game at least for some period of time. It is important to point these out, though they will typically become obvious to the class as people continue pulling candies out of the now endlessly refilling bowl.

In these games, watch for nonverbal communication and emergent leaders as one person on a team will often figure out the optimal strategy and try to communicate it to the rest of the team somehow. These people may shake their heads, place their hands over the bowl, wave people off, point and otherwise try to communicate their strategies — with varying levels of success. It can be helpful to narrate some of these attempts and the reactions they get from others in their groups.

We have also found several variations on this general pattern that are worth looking out for, although they typically occur less frequently than the general pattern of taking turns. They include:

- **Reinvesting.** After taking turns, perhaps the next most common pattern is reinvesting. This occurs when someone realizes the total resource is diminishing and/or that rewards have not been distributed evenly. Some people in this situation choose to act unilaterally to correct the situation by placing some of their candies back in the bowl. This often generates laughter when it is noted and can surprise other participants and generate cascades of reciprocal trusting behavior. It is therefore worth noting this kind of move, though you can decide whether to praise it as forward-thinking altruism, gently chide it as naïve communalism, or remain nonevaluative.
- **The benevolent dictator.** Another pattern that sometimes emerges is what we call "the benevolent dictator." This happens when one person clearly understands the strategy and is able to convince the group that they will be trustworthy stewards of the resource. For example, we have seen games in which one person places a hand over the bowl at the start of the first round and makes a gesture signaling that they will distribute candies to each person. However it emerges, this pattern involves one person picking up all the candies and distributing them to other group members according to some predefined mechanism.

Because it requires high levels of trust and an emergent leader who both understands the rules and can communicate this nonverbally to the team, this pattern is fairly unusual and is worth commenting on should it emerge.

- **Stockpiling.** A final pattern that sometimes emerges is stockpiling. In this kind of game, individuals simply place their rewards in a common pile to be distributed at the end of the game. This solution cleverly resolves the problems of free riding and trust that can limit cooperation. Like the benevolent dictator strategy, however, it is difficult for groups to achieve this without some form of clever nonverbal communication. Because it is also a fairly uncommon pattern, it is certainly worth noting if it occurs and discussing in the debriefing.

One important decision you will face in any kind of maximizing game is deciding when to end it. Because these games often reach some quasi-stable equilibrium, they can theoretically go on indefinitely. Our goal is to provide enough time to allow a general pattern to emerge while not going on so long that the rest of the class loses interest. Narrating the action will help maintain interest in slowly evolving maximizing games, but the goal should be to allow these games to go on only so long as a general cooperative pattern seems to have emerged and a team has found some way to allocate the sacrifice one member is required to make each round. Once the basic pattern seems clear, you can end the game and move on. However, because it does help the debriefing to have a good distribution of outcomes among the teams, it is worth letting a maximizing game go on long enough that the team clearly reaps greater rewards than nonmaximizing teams. Again, when you decide to end these games, it is important to announce the last round clearly, as you should get competition in the last round even among the most cooperative maximizing teams.

Debriefing and Reflection

Another advantage of this exercise is that the debriefing can be scaled easily to fit the time that is available. At a minimum, you should leave fifteen to twenty minutes to review some of the variations in group outcomes and to discuss maximizing strategies and connections to real-world problems, but you could easily fill forty-five to sixty minutes debriefing a class with five or more groups.

We typically begin our debriefing by reviewing the distribution of outcomes across the class and then drill into variations in strategies and tactics and their impacts on individual and group outcomes. Gradually, we move toward a discussion of optimal strategies and highlight the difficulty of identifying them. We typically conclude with a discussion of linkages to real-world problems or broader course theories.

If time is short, we sometimes review outcomes quickly by focusing on some of the extreme groups, those with small or large totals and equal or unequal distributions. When we have more time or a smaller number of groups, we ask each team to report the total rewards obtained and their distribution among members. After reviewing the distribution of group and individual outcomes, we typically ask what explains this variation. At this point, it is worth drilling into the results of at least two teams — a primarily competitive team and some kind of maximizing team — to identify how their strategies and tactics differed.

During this more detailed discussion, we highlight several common themes and dynamics. The first, and perhaps most important, is the tension between individual and collective interests that emerges in this game (Messick and Brewer 1983; Axelrod 1984). One way to explore this is to ask students what is the best tactic to "get as many candies for yourself as possible." Some will say that grabbing as many as you can is obviously the best approach. To these people, you can point out that individuals on teams who somehow coordinated seemed to do better on average than individuals on teams who did not because the average number of candies per person is typically higher in maximizing groups.

Others will say that cooperating is clearly better. To these people, you can point out that these groups were always susceptible to one person defecting and taking all the loot. You can also point out here that when faced with the end of a game, people always seemed to compete, suggesting that this strategy is somehow dominant. To explore this dynamic, you might ask one of the maximizing groups why they suddenly competed in the final round. You will find that most teams agree that competing when there are no more rounds is the best approach.

When we teach this exercise in negotiation classes, we usually include a discussion of the tension between creating and claiming value (Lax and Sebenius 1986; Mnookin, Peppet, and Tulumello 2000) that is found in nonzero-sum negotiations. We typically conclude this discussion by pointing out the challenge of establishing and enforcing ongoing cooperation in the face of short-term incentives to defect and noting that cooperation generates better individual and group outcomes over time when achieved. A nice concluding point here is to mention that the best strategy for an individual is also the best for the collective, but only if the group comes up with a way to ensure that everyone cooperates. Otherwise, the competitive strategy typically dominates.

Another debriefing topic focuses on leadership and other systems for generating and sustaining maximizing outcomes. Some groups that reach a maximizing solution do so by allowing or appointing someone to take a leadership initiative. Because these initiatives often involve nonverbal communication, this is a place where we discuss how communication can be difficult in real-world situations and is not limited to verbal methods. We highlight some of the leadership moves that generated cooperation and discuss why these were hard to achieve in nonmaximizing groups. We often conclude this topic by pointing out that coordination requires the imposition of — or agreement on — some system to ensure that individual short-term interests do not generate negative long-term outcomes for the group. We find it useful here to discuss the factors that enabled and prevented people from acting as leaders and point out that having a clear goal, as well as an understanding of the game's structure, is an important prerequisite. In fact, there is growing scholarly interest in the roles that leaders play in social dilemmas and cooperative dynamics (De Cremer 2003; De Cremer and van Dijk 2005; Stouten, De Cremer, and van Dijk 2005). Despite the widespread belief (and our own anecdotal observations) that leaders can often improve collective outcomes (Ruve and Wilke 1984), more recent work shows that leaders can sometimes claim more than their share (De Cremer and Van Dijk 2005).

In addition to these central dynamics, there are several other patterns that may be worth discussing. First, there is often organizational learning that takes place during the exercise as later teams learn from the mistakes of earlier, often more competitive, teams. Typically, if you run the game with more than a few groups, cooperative strategies will gradually emerge as people begin to see the costs of pure competition. If this happens, you can certainly include a discussion of organizational and other or social learning dynamics in your debriefing.

Another interesting pattern has to do with the framing of the problem and your interventions along the way. Some research evidence indicates that the framing of these kinds of games can dramatically affect outcomes. For example, when a prisoner's dilemma game is called "The Wall Street Game" it generates more competitive behavior than when it is called "The Community Game" (Kay and Ross 2003; Liberman, Samuels, and Ross 2004). This general finding can be shared with the class and used to discuss the impact of pre-existing (or instructor-primed) mental models on student strategies and tactics.

By this point, if it has not already emerged in discussion, we ask the group about the optimal strategy for this game. After taking some suggestions, we typically provide a clear explanation of the way that the original starting amount, communication limitations, and uncertainty about the trustworthiness of others generate incentives for defection. We often include in this part of the debriefing a brief general explanation of game-theoretic problems of which this exercise is one example. This is also a place where instructors can transition to illustrations taken from real-world examples. The first, and perhaps most obvious, real-world corollary is the depletion of global fish stocks, forests, and other natural resources. Each day, the incentive for each fisherman, logger, or other user of natural resources is to take as much possible for him- or herself. In the case of fish stocks, for example, individually rational behavior has led to a catastrophic depletion of resources. Similarly, one of the challenges of implementing environmental agreements and other conservation measures is that countries, corporations, and individuals have incentives to avoid the additional costs of compliance if they can. If you can be the only country, corporation, or person polluting, you get the benefits of a clean environment without the costs of conservation. If everyone adopts this approach, however, the environment declines rapidly and everyone suffers.

The general problem of free riders is particularly well described by this exercise. Indeed, the current debate about national health care in the United States includes many such problems at its core. In the current system, the costs of people who lack insurance are borne by those who have it and by health-care facilities. For insurance companies to be willing to cover everyone, however, they want to be sure that everyone participates lest people wait until they are sick (and relatively more expensive) to obtain insurance.

Even political campaigns can take on characteristics of collective action problems. For example, in the 2008 U.S. presidential primary, commentators often discussed how Hillary Clinton and Barack Obama risked losing the race for the Democrats if they attacked each other too vigorously. On the other hand, because each wanted to become the nominee for the party, they needed to attack each other enough to win. This dynamic indeed created delicate decision-making challenges for each of the campaigns.

Because the kind of problem that is illustrated by "The Chocolate Conundrum" arises in settings as small as student project teams and as large as the national and global systems described above, the exercise can be tailored to many different teaching contexts, courses, and topics. It is appropriate for use as a team development exercise; to illustrate general challenges of coordination, collaboration, and negotiation; to introduce basic game-theoretic and decision-making concepts; to discuss natural resource management and other public policy issues; and to illustrate many other contemporary issues in management, public policy, economics, and sociology. Because these dynamics are at the center of some of the most important challenges of our times, it seems particularly important now to help our students recognize and better understand them.

NOTES

1. For those interested in this work in the academic literature, a large body of literature has explored these kinds of problems in law, political science, psychology, sociology, and economics. Several reviews have been published in experimental economics (Ledyard 1995) and sociology (Oliver 1993; Kollock 1998).

2. All three of these exercises are available from the Program on Negotiation Clearinghouse at http://www.pon.org.

REFERENCES

Axelrod, R. 1980a. More effective choices in the prisoner's dilemma. *Journal of Conflict Resolution* 24(3): 379–403.

— — — . 1980b. Effective choice in the prisoner's dilemma. *Journal of Conflict Resolution* 24(1): 3–25.

— — — . 1984. *The evolution of cooperation*. New York: Basic Books.

Breslin, J. W. and J. Z. Rubin (eds). 1991. *Negotiation theory and practice*. Cambridge, MA: PON Books.

Brockner, J., R. Houser, G. Birnbaum, K. Lloyd, J. Deitcher, S. Nathanson, and J. Z. Rubin. 1986. Escalation of commitment to an ineffective course of action: The effect of feedback having negative implications for self-identity. *Administrative Science Quarterly* 31(1): 109–126.

Dawes, R. M. 1980. Social dilemmas. *Annual Review of Psychology* 31: 169–193.

Dawes, R. M. and D. M. Messick. 2000. Social dilemmas. *International Journal of Psychology* 35(2): 111–116.

De Cremer, D. 2003. How self-conception may lead to inequality: Effects of hierarchical roles on the equality-rule in organizational resource-sharing tasks. *Group and Organization Management* 28(2): 282–302.

De Cremer, D. and E. van Dijk. 2005. When and why leaders put themselves first: Leader behavior in resource allocations as a function of feeling entitled. *European Journal of Social Psychology* 35(4): 553–563.

Edney, J. 1979. The nuts game: A concise commons dilemma analog. *Journal of Nonverbal Behavior* 3(4): 252–254.

Fauré, G. O. and J. Z. Rubin. 1993. *Culture and negotiation*. Newbury Park, CA: Sage Publications.

Hardin, G. 1968. The tragedy of the commons. *Science* 162: 1243–1248.

Kay, A. C. and L. Ross. 2003. The perceptual push: The interplay of implicit cues and explicit situational construals on behavioral intentions in the Prisoner's Dilemma. *Journal of Experimental Social Psychology* 39(6): 634–643.

Kellerman, B. and J. Z. Rubin. 1988. *Leadership and negotiation in the Middle East*. New York: Praeger.

Kollock, P. 1998. Social dilemmas: The anatomy of cooperation. *Annual Review of Sociology* 24: 183–214.

Lax, D. and J. Sebenius. 1986. *The manager as negotiator*. New York: Free Press.

Ledyard, J. 1995. Public goods: A survey of experimental research. In *The handbook of experimental economics*, edited by J. Kagel and A. E. Roth. Princeton, NJ: Princeton University Press.

Liberman, V., S. Samuels, and L. Ross. 2004. The name of the game: Predictive power of reputations versus situational labels in determining prisoner's dilemma game moves. *Personality and Social Psychology Bulletin* 30(9): 1175–1185.

Messick, D. and M. Brewer. 1983. Solving social dilemmas: A review. In *Review of personality and social psychology*, Vol. 4, edited by L. Wheeler and P. Shaver, pp. 11–44. Newbury Park, CA: Sage.

Mnookin, R. H., S. Peppet, and S. Tulumello. 2000. *Beyond winning: Negotiating to create value in deals and disputes*. Cambridge, MA: The Belknap Press of Harvard University.

Oliver, P. E. 1993. Formal models of collective action. *Annual Review of Sociology* 19: 271–300.

Poundstone, W. 1992. *Prisoner's dilemma*. New York: Doubleday.

Rubin, J. Z. 1983. *Dynamics of third party intervention: Kissinger in the Middle East*. New York: Praeger.

— — —. 1994. Models of conflict management. *Journal of Social Issues* 50(1): 33–45.

Rubin, J. Z., D. G. Pruitt, and S. H. Kim. 1994. *Social conflict: Escalation, stalemate, and settlement*. New York: McGraw-Hill.

Ruve, C. G. and H. A. Wilke. 1984. Social dilemmas and leadership. *European Journal of Social Psychology* 14(1): 105–121.

Stouten, J. D. De Cremer, and E. van Dijk. 2005. I'm doing the best I can (for myself): Leadership and variance of harvesting in resource dilemmas. *Group Dynamics: Theory, Research, and Practice* 9(3): 205–211.

Vugt, M. V. 1997. Concerns about the privatization of public goods: A social dilemma analysis. *Social Psychology Quarterly* 60(4): 355–367.