The Tragedy of the Commons:

Using Computer Games to Analyze Behavior in Social Dilemmas

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Abstract

For our research study, we modeled a social dilemma using the computer role-playing game Neverwinter Nights. *Our goal was to examine player identity strategies in the game and understand both how they differed from real-world identity strategies and how the game playing affected choices made in a real-world scenario. We found that although players tried alternate strategies when playing the game, their game playing did not appear to affect their real life choices. Game playing did appear to promote deeper thinking about real-world social dilemmas.*

Introduction

Why do most people choose not to carpool, recycle, or vote? Why don't they show concern for the amount of pollution they produce in their day-to-day activities? In a general sense these people would agree that one should carpool, recycle, vote, and pollute less – obviously a lack of understanding is not the problem. Instead, a general lack of trustworthiness permeates our society at large. This feeling of distrust results when the whole of society does not "feel" the benefits of such activities. Additionally, enough people must participate; each participant only adds a small benefit to the whole. The effort each of these participants exerts in the current situation, when only a few people participate, is much higher than the benefit received. It is easy to see why it makes sense to not contribute, thus becoming a "freeloader" who benefits from everyone else's contributions yet contributes nothing. Taking this attitude further, it is easy to see why it is in someone's self-interest to not be trustworthy. Yet, if we all followed the most rational path, no one would contribute and we would have to live with congested streets, towering landfills, and large amounts of pollution. Situations where the self-interested or rational choice is not the choice that benefits the group, but is a self-interested choice detrimental to the whole of the group, have a name in Game Theory and social economic circles. These are called social dilemmas.

The best way to describe the concept of a social dilemma is to first explain a simpler model called the Prisoner's Dilemma.

Prisoner's Dilemma:
Joe and Sam are suspects in a criminal case. Each has the option to testify against the other. If neither testifies, there is enough evidence to send them to jail for 2 years. If both testify, they both get sent to jail for 4 years. If only one testifies, he gets out free but the other gets 5 years. If you look at it from a single person's perspective, the rational decision (where "rational" is defined as making decisions of self-preservation) is to testify… for example, Joe is thinking to himself, "If I testify I get either none or 4 years. If I don't testify I get 2 or 5 years." It is rational for an individual to testify, but if one looks at the overall group benefit, it is rational for the group to cooperate and for neither to testify.

The case for keeping one's mouth shut is easier to make when considering an iterated version of the Prisoner's Dilemma.

Iterated Prisoner's Dilemma:
This is the same situation as the regular version except it occurs multiple times with the same participants. In this case, it is rational to cooperate because if you don't the other person will learn from your behavior and betray you in return upon the next iteration. It is most rational (with lots of math and logic to back this up—see Meredith (1998)) to use a Tit for Tat strategy, where you begin by acting "nice" and then each time thereafter you mimic your partner's previous actions.

Social dilemmas expand the situation to include multiple participants. In these situations, it is even more ambiguous as to what the rational choice is; the rewards for participating or cooperating in the group are dependent upon the mutual participation of the many members of the group instead of just one other person. An example of this social dilemma is the Tragedy of the Commons.

Tragedy of the Commons:
A community shares a common pasture. Each farmer can let his cows graze on the common pasture for free, whereas placing cows on his personal pasture costs money. It makes the most rational sense for an individual farmer to put as many of his cows on the common pasture as possible, thus minimizing the amount of land he would have to personally own and care for. The problem is that if everyone maximized the number of cows they could place on the pasture, the shared pasture would be decimated.[1]

Studies examining social order and social dilemmas have concluded that the virtual world is an economy of cooperation (Kollock 2000, Rheingold 1993) where professionals routinely give advice for which they would ordinarily charge exorbitant fees. In a one-on-one real-life situation, where one colleague asks another colleague for guidance, there is an unspoken agreement between the two—a situation of altruism arises. Because the virtual world relies on the "kindness of strangers," there is the risk that every online inhabitant will take information without contributing anything in return. If everyone online manifested a selfish persona, the

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[1] From Hardin (1968):

As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility *to me* of adding one more animal to my herd?" This utility has one negative and one positive component.

1. The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly +1.

2. The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsmen, the negative utility for any particular decision-making herdsman is only a fraction of -1.

Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another.... But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit -- in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.

entire reciprocal nature of Usenet and community message boards would collapse; here we see a classic example of a social dilemma, very much akin to the Tragedy of the Commons.

In Hardin's original model of the Tragedy of the Commons, Hardin quotes the philosopher Whitehead's definition of a tragedy: "The essence of dramatic tragedy is not unhappiness. It resides in the solemnity of the remorseless working of things,"(Hardin, 1968). In our modeling of Hardin's now famous social dilemma, we are attempting to examine real-world attitudes—the "solemnity of the remorseless working of things"—in comparison to the economy of online altruism.

Hardin then goes on to describe his working model of the Tragedy of the Commons set in the now proverbial common pasture. We have taken the model of the common pasture and implemented it in the virtual environment. Much of the research exploring the Tragedy of the Commons has been incorporated into real-life simulations. Yung-mei Tsai attempted to explore the dynamics of the Commons using a group of college students (Tsai, 1993). Each student was allowed to take a certain number of points to increase their individual grade (the more points a student took, the greater their individual grade). However, if each student was selfish, and took too many points, their collective grade would drop 10%; in turn, if each student took too few points, the same thing would happen. Tsai attempted to find out if one or all of the students would try to outsmart the system and take the greatest number allotted, or go to the other extreme and take too few points.

There are various ways to attempt to solve social dilemmas ranging from religious concepts of control (if you don't participate, you will go to Hell), to secular concepts such as governmental law (i.e., imposing taxes, not paying up, and going to jail), to more pragmatic concepts (tracking members of a community who participate in group programs and then only letting those who participate benefit from the efforts). Another method is to instill in individuals a sense of morality and ethics. Leon Felkins (1999) says:

> "It has oft been suggested that if people were only moral, then the social dilemmas would be solved. The key ingredient necessary for solving the social dilemmas without using the force of government or the threats of religion is _trustworthiness_."

Felkins (ibid) then goes on to suggest following the tenets from Secular Humanism:

> For those of us who would like to see a more scientific basis for an ethical structure for humanity than religious pronouncements or the weak "normative[2] standards that we discover together," the conclusion reached above is profound. The solution to the social dilemma based on an ethical structure defines a minimum set of ethics. That is, there must at least be the common moral decencies defined in the Humanist's "Statement of Principles and Values": altruism, integrity, honesty, truthfulness, and responsibility. At the risk of even more overlap and duplication, I would add trustworthiness and cooperation.

We believe it is possible to teach these "principles and values" through interactive computer games.

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[2] Felkins' note on _normative_ is a reference to a lecture given by Herman Sampson for the Introduction to Agricultural Economics class at North Carolina State University. Here's an excerpt: "Normative economics tends to be subjective, value laden, and emotional in its presentation. Normative economics is often referred to as 'What ought to be' economics. 'We ought to do this,' or 'we ought to do that.' Normative economics is 'prescription' and/or policy oriented." This is opposed to positive economics which is the objective, cost/benefit analysis side of economics. In other words, "normative standards" are the previously mentioned governmental control and policy.

The difficulty in getting someone to "buy into" a particular way of thinking or to be a willing participant in a community, is to get them to see him or herself as someone who *wants* to be and *is* a part of the community. James Gee (2003) writes:

> It has been argued that some poor urban African-American children and teenagers resist learning literacy in school because they see school-based literacy as "white," as associated by people who disregard them and others like then. They don't believe that a society that they view as racist will ever allow them to gain a good job, status, and power, even if they do succeed at school-based literacy. Thus they will not envisage themselves in the new identity that success in school-based literacy requires—that is, as the "kind of person" who learns, values, and uses such literacy and gets valued and respected for doing so. Without such an identity commitment, no deep learning can occur. The students will not invest the time, effort, and personally committed engagement that active, critical learning requires.

Gee (ibid) later suggests that the keys to allowing people to play with their identities and learn are:

1. The learner must be enticed to *try*, even if he or she already has good grounds to be afraid to try.
2. The learner must be enticed to *put in lots of effort* even if he or she begins with little motivation to do so.
3. The learner must *achieve some meaningful success* when he or she has expended this effort.

This applies to learning a particular literacy *or* learning to participate in and contribute to a community. Computer and video games already have the attraction needed to satisfy condition 1. Conditions 2 and 3 are easily addressed in a role-playing game. Role-playing games provide incentives to move the story along and to improve one's character and then rewarding the effort it takes to follow up on those incentives. Additionally, the kinds of rewards given could be situated as community rewards to emphasize cooperation and participation in the community.

A computer role-playing game (CRPG) can be defined as a game that puts the player in the role of a character that develops over the course of the game. The genre has its roots in traditional pencil and paper role-playing games like *Dungeons & Dragons (D&D)*, and most of them follow the same model where characters are defined using numbers for various attributes (strength, intelligence, dexterity, etc.) and skills (driving, climbing, melee weapons, etc.). Characters improve with situational experience, and, in *D&D,* each monster killed or problem solved is rewarded with the character gaining experience points (XP). There exists, then, a built-in incentive apart from the unveiling of the story to continue playing: to improve one's character. In a paper and pencil game, it is the Game Master's (GM) role to give out XP dynamically in accordance to changing situations. The player can do some very good "role-playing" and get some XP, and it's not only about killing monsters or overcoming pre-scripted obstacles. In a CRPG, however, there is no GM who can analyze the situation at any given moment and determine if a player is acting "in character." Instead, game developers have built in finer detail to XP rewards (if player character (PC) accomplished "X," reward with "Y"), which usually plays out through conversations with non-player characters (NPCs).

The best examples of this are CRPGs from a company called Bioware. Bioware created the *Baldur's Gate* series, *Neverwinter Nights,* and *Star Wars: Knights of the Old Republic*. In these games, the PC is often presented with a branching dialog tree during conversation. Each branch

is a decision point where an option precludes some or all the other options. I'll make an arbitrary example:

> **NPC:** Hi, how are you?
> **PC choice 1:** Fine, thanks. I found the ring you lost. Here you go.
> **PC choice 2:** Fine, thanks. I found the ring you lost. Looks like it might be worth something, so I've decided to keep it.

In a modern game, either decision offers various rewards to the PC. When looking at multiple instances of these conversations with a particular NPC or a category of NPCs, it becomes clear that often it pays to be "good." Being "good" does not only provide in-game rewards, but also creates a relationship that is built between the PC and the NPC. If the PC is not friendly early on, the NPC will refuse to deal with the PC, thus blocking the PC from future quests given by the NPC. In other words, the relationship the PC could potentially build with a particular NPC is very much like an Iterated Prisoner's Dilemma where the other participant (the NPC) is playing the Tit for Tat strategy. The NPC will continue to be nice and give out quests so long as the PC continues to be nice and completes the quests. This revelation allows us to compare game mechanics of morality with classical moral scenarios like social dilemmas. Presumably, through the course of playing a computer game that has been designed to emphasize cooperation, it would become clear that, even though being "evil" or selfish could give the PC some great rewards, the in-game community would suffer overall. On the other hand, the whole community would prosper immensely if the player was being "good" or unselfish and trustworthy.

We want to examine whether a person's behavior when confronted with a social dilemma differs when using a virtual identity (e.g., in a computer game setting) versus a real-world identity. If so, how, and does this difference affect their behavior in real-world social groups and in real-world social dilemmas?

A good computer game allows one to apply different strategies of play where failure in using certain strategies is not necessarily an indication of overall failure. In fact, it is through failing at specific strategies and then trying new strategies that players become able to construct their own knowledge of how the game system works. This knowledge construction is aided by the players' ability to off-load the cognitive process of visualizing or imagining the system (Scaife and Rogers 1996).

Additionally, a game allows a sort of embodiment for the player to act through his or her on-screen character (avatar). This embodiment creates a learning environment that is situated, and therefore promotes "sticky" learning, i.e., long-lasting full comprehension. It also lets players explore their own identities through the identities of their avatars.

The problem with games is not their inability to allow for learning of complex systems; it is that these complex systems often do not reflect real-world systems in recognizable ways. For example, a first-person shooter game may be extremely detailed in its physics engine, computer AI behaviors, and general complexity of cause-effect relationships, and learning these aspects of a system can often lead to better understanding of complex systems or engage the player in critical thinking about these systems. However, despite this complexity, first-person shooter games, and, indeed, games in general, do not contain direct transferable knowledge.

Our hope is to encourage gamers to think more critically about what it means to be a participant in a community, whether it is a small community like a rural town or a large community like a nation. Our own ideology of how an individual should proceed in a social or community situation is not relevant to this study; rather, we wish to encourage the player to think about his or her role/identity in his or her own communities and his or her relationship to the other community members. However, there is a basic expectation that individuals who have

learned to think critically through the game we have created will later invest in the welfare of their own communities.

Modeling a social dilemma is a way to provide the player with content that is transferable to real-life situations. If a game player is placed in a social dilemma situation and then given the opportunity to apply different strategies in the social dilemma, would the player think more critically of the situation? Would the game be able to affect how the player participates in a real-world situation? These are the questions we want to address.

Method

We decided to explore these issues by modeling the Tragedy of the Commons in a computer game. We observed how people play the game, what strategies they use for exploring the dynamics of the situation, and if the game-playing experience affects their behavior in a real-world social dilemma. We used the custom content creation tools from *Neverwinter Nights,* a fantasy-based game set in a Western medieval world. Because we are limited to the game's setting, we chose to simulate a medieval town.

The town we created features a common pasture that all of the farmers can share, but this pasture can only support 30 cows before the cows begin to become unhealthy (and thus worth less money) due to overgrazing. There are 6 cattle farmers with 10 cows a piece, and each farmer has his or her own personal pasture. The farmers have to decide how many of their cows to place on the communal or common pasture. The most equitable solution would be for each farmer to place 5 cows on the common pasture and the other 5 on his or her own pasture. Conversely, the most rational, i.e., personally beneficial, solution is for a particular farmer to place all of his or her cows on the common pasture, since it costs money to maintain the personal pasture. If everyone in the game acted selfishly, however, the common pasture would quickly become unsustainable leaving the farmers with deceased cows and with no other option but to pay the high price of maintaining their own personal pastures.

In our situation, the player takes on the role of one of these 6 farmers. The player loads up a game and chooses to be either a woman or a man (no difference to the game other than sex). The player then has to decide how many cows (0, 5, or 10) to put on the common pasture by talking to the other farmers and the groundskeeper of the common pasture. After making this decision, a season passes in the game and the player can see the effects of his or her choice. The player then decides how many cows to put in the common pasture for the next season, and another year passes. Each year, the player has the opportunity to talk to each of the other farmers and to various other NPCs in the game. This is an opportunity for the player to get a general sense of how they are doing, how the town is doing, if the farmers like the player, and what they think of the player's actions. In the last year, the player can talk to the groundskeeper again to get an idea of how well he or she has performed in the game. Additionally, the groundskeeper includes a tally of how much money the player has profited and gives a general sense of how well the town is doing and how the other farmers feel about the player.

More information on our modeling of the Tragedy of the Commons, including the actual numbers and equations we used, can be found in Appendix A.

We conducted the study on 3 players (one at a time), all of whom have a gaming background and who are familiar with computer role-playing games in particular. We hoped that this experience would allow us to look at how they treated their virtual identity and see if it affected their real-world identity. We first gave the players an introduction to social dilemmas and then asked them to write down their response to a carpooling scenario. The players then explored the

game multiple times while we videotaped their game playing. We asked them to keep playing until they found the most optimal solution to the game, and we asked them to consider what "optimal" meant based on the success factors in the game (gold, health of cows, other farmers' opinions of player, and the state of the town). After playing the game several times to their satisfaction, they were asked to reconsider their response to the carpooling scenario. Afterward, we interviewed the players, asking them questions about social dilemmas, their experiences with them, and the game.

Data Analysis: Expectations and Actual Responses

When conducting our study, we gave our participants a four-page handout (Appendix D) that outlined what they would be asked to do. We also presented them with a fleshed out real-life social dilemma (carpooling) and gave them instructions on what to do in the *Neverwinter Nights* module that we had created. Finally, we presented the participants with the same real-life social dilemma to gauge any change in response based on their game playing experience.

Our expectation was that the participants in our study would recognize that game playing lends itself to less severe or less permanent consequences than a real-life situation. They would therefore try out the game multiple times, using different approaches to the situation – the approach that helped the individual, the approach that helped the group, and the approach that sacrificed the individual to the group. We believed that due to the less severe consequences in the game, people would be more likely to explore behavior that they would not explore in real life (e.g., making a selfish choice, which most people would not do – or at least not admit to doing – in a real-life situation).

In addition to this, we also expected that our participants would not have recognized real-life situations that they encounter as social dilemmas, and that presenting them with the concept of social dilemmas in a game setting would make their approach to comparable real-life situations both more critical and more attuned to the socially beneficial choice.

With regard to exploration, our participants differed widely both from our expectations and from each other. Participant 1 was the closest to what we expected; she explored multiple different paths in the game (four in total), including all three extremes (selfish, group-focused, and self-sacrificing). Her response to the real-life scenario, both before and after the game playing, was one that chose the group-benefiting choice.

Participant 2, on the other hand, went through three iterations of the game, but never chose the most selfish path. When we asked her why in our wrap-up session, her response was very interesting: she said she didn't make that choice because she was afraid that all her cows would die (they would have) and "it's just a game, but I still want to do well, I want to win." This differed greatly from our expectation, which was that while people would recognize consequences in the game, the fact that it was a game and the consequences were not real would not deter them from experimenting with a "losing" choice. Participant 2 was a little more pragmatic than Participant 1 in the real-life scenario, also – her answer, both before and after playing the game, stated that she would attempt to do the group-benefiting choice. However, on those days when it was really inconvenient to do so, she would temporarily make a more selfish choice.

Participant 3 swung the opposite direction to Participant 2 in his playing of the game. Unlike the first two participants, he did not spend time exploring the extremes – he chose one extreme (the group-focused choice), one mixed response (group-focused one year, selfish the next), and in the last iteration of the game, he chose a completely different choice. In the final iteration,

Participant 3 killed all of the farmers and was finally brought to his end by a peep of angry chickens.

His response to the real-life scenario was the closest to selfish that we received. When questioned about carpool habits, he said that he would try to do the group-benefiting choice, but his reasons for doing so had more to do with his own personal benefit (somebody to talk to in the car, for example), than with the social benefit. He also indicated that "it wouldn't take all that much inconvenience for me to drop the carpool idea altogether."

Regarding our prediction that exposure to social dilemmas in a computer game setting would attune our participants to real-world social dilemmas and socially-beneficial choices in the future, we also had mixed responses. While all of our participants acknowledged that the game did a good job of illustrating the consequences of one's actions, only Participant 2 felt that it would have an impact on her choices in the future. Participants 1 and 3 both felt that the fantastic nature of the game made it difficult to truly relate it to real-life situations, which by definition are more complex. Thus, it would not affect their future behavior in social dilemmas.

All in all, our participants generally understood that our fictional social dilemma was "just a game," but their game behavior didn't always reflect this knowledge. Our prediction that each player would engage in behavior in the game that in reality they wouldn't ordinarily participate in, however, was correct. When it came to their future recognition of and behavior in social dilemmas, we found that while our participants' experience in the game did leave them with a sense of future consequence and an ability to recognize social dilemmas in real life, the game itself was fictional enough that it did not successfully impact their future behavior in social dilemmas.

The following tables and explanations outline the rest of the key data that we collected from our participants.

The Game:

Enjoyment	Did the participants enjoy the game?
First Choice	What was the first choice that the participants made in the game?
Goals	What were the participants' goals in the game?
Important Factors	What factors in the game were important to the participants?
Problems	What problems did the participants encounter?
Optimal Strategy	What did the participants consider to be the "optimal" strategy?

Did the participants enjoy the game?

All of the participants stated that they enjoyed playing the game module during the post-interview. Participant 1 specifically noted the graphics, the cows, and the farmers' moods/reactions as key points that contributed to her engagement with the game.

What was the first choice that the participants made in the game?

All of the participants chose the same option the first time – the group-focused choice. The first two participants both chose the same second option as well – the self-sacrificing choice.

What were the participants' goals in the game?

We had given all of the participants a stated "goal" – to find the optimal strategy for playing the game. However, each of them also displayed their own characteristics during play. Participant 1 seemed very interested in trying the most different strategies. She did not necessarily spend a lot of time talking to the farmers, but she did navigate through the game four different times, the most of any of our participants. Participant 2 approached the game from a

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very personal embodiment of the character she was playing – as mentioned before, she wanted to do well, even though it was "just a game." She spoke to the most characters and took note of everything that was going on in the town around her. Participant 3 approached the game as a stereotypical experienced role-player, whose behavior, in his own words, changed from "good to jerk to psychopath" in the three times that he played.

<u>What factors in the game were important to the participants?</u>

Participant 2 cited that both gold and being liked by the townspeople were important factors in the game. She believed that as long as she was making a profit it was better to make less gold and have people still like her than to make a greater amount of gold but have the farmers dislike her. Participant 3, on the other hand, focused on profit as the most important factor in the game. His end result was similar to Participant 2, but not for the same reasons: he felt that the goodwill of the farmers was secondary to the amount of money he made. If being a jerk had yielded a greater profit than being a good guy, he would have been interested in that. But given the current game setup, in which it doesn't pay to act selfishly, he felt that he might as well be nice since it yielded the same amount of money as being a jerk.

<u>What problems did the participants encounter?</u>

Aside from a few technical errors, which we fixed in-between participants as much as possible, the main problems we encountered had to do with the unrealistic nature of the game. Participant 1 felt that it was very fantastic and therefore did not communicate a realistic scenario as effectively as it could have. Participant 2 felt that it was too short and therefore did not communicate the results of one's actions as effectively as it could have if it were, for example, a year longer. She also felt that the lack of ability to compromise – to choose any number of cows from 0 to 10 to put on the commons instead of just 0, 5, or 10 – affected the realism of the scenario. Finally, she felt the predictable nature of the game detracted from her interest in talking to all of the farmers. Participant 3's biggest concern was that while the actions of the non-player characters in the game were predictable, actions of people in real life are not, and therefore it was impossible for the game to truly emulate real life.

<u>What did the participants consider to be the "optimal" strategy?</u>

All of the participants were in agreement that the "optimal" strategy was that of choosing the group-focused, group-benefiting choice. However, I think this says less about the participants than it does about the way the game was coded. Given the way the game was written, and the success factors that it included as well as the dialog feedback from the other farmers and other types of text feedback, it was obvious that the group-benefiting choice was the optimal choice.

Social Dilemmas:

Incoming Opinions	What were the participants' opinions on social dilemmas at the outset of the study?
Representation	Did the participants feel that the game was a good representation of a social dilemma?
Post-Game Opinions	What were the participants' opinions on social dilemmas at the end of the study?
Real-World Scenarios	Were the participants able to name real-world social dilemmas?

<u>What were the participants' opinions on social dilemmas at the outset of the study?</u>

Participant 1 was already familiar with social dilemmas due to previous exposure in classes

she had taken. She believed that the system described in social dilemmas generally worked most effectively if people chose the group-benefiting choice, but that such systems were always unpredictable due to the fact that they were so dynamic. Participant 2 believed that one couldn't maintain a consistent strategy in social dilemmas, because each situation was different. She also felt that while group benefit was desirable, it needed to be weighed against personal inconvenience (this mirrored her response to the carpooling scenario). Participant 3 once again noted the instability of social dilemma systems, and declared that in order to consistently choose the group-benefiting choice, he wanted to have a higher degree of certainty of personal benefit.

Did the participants feel that the game was a good representation of a social dilemma?

In general, the answer to this question was, "yes." Participant 1 liked the fact that the outcomes were not ambiguous, so it gave a clear sense of consequence based on the choices made. Participant 2 felt that there were a couple of things that could be improved upon (no room for compromise, not entirely realistic), but that the game worked well to give the player a general idea of social dilemmas. Participant 3 felt that the game missed some key points that would make it an accurate representation of a social dilemma. This was due largely to the complexity of real life and real people (he felt that trust was a big issue in any social dilemma, and this was not really addressed in the game that we created.)

What were the participants' opinions on social dilemmas at the end of the study?

Participant 1 held basically the same opinion on social dilemmas at the end of the study as at the beginning of the study mainly due to her prior experience with social dilemmas. However, she stated that she was able to see the consequences of her actions and understand them in the game situation more clearly than in a theoretical or written context. Participant 2 also underwent very little change, largely for the opposite reason to Participant 1; namely, she had had very little familiarity with social dilemmas before participating in this study. Participant 2's lack of exposure provided her with no preexisting opinion to compare against the game. Participant 3 felt that he gained a better understanding of himself as a "hardcore pragmatist" in social dilemmas, but other than that, the game had no noticeable change in opinion.

Were the participants able to name real-world social dilemmas?

Participant 1 cited group work, where each person has to contribute some part to create the whole (much like this research project). While in the short term, it may be easiest to shirk your part of the work and let another person complete it for you. In the long term, this would be detrimental because you will not know the material and you will lose the goodwill of the people you are working with.

Participant 2 named littering in public spaces, such as parks as a social dilemma. While it may be easier and quicker to toss trash onto the grass instead of finding a trash can, in the long term, actions such as this will detriment everyone, including the litterbug, because the park will be dirty and spoiled.

Participant 3 saw neighborhood block associations, where people band together to keep their neighborhood attractive, safe, etc. as possible social dilemmas. This scenario is much closer to the one we represented in the game, because it deals almost exclusively with the goodwill of neighbors. If one does not keep up the appearance of his or her house or mow the lawn, neighbors will be upset. While there is a monetary aspect to this (property value will likely decrease), this may not actually affect the participant if he or she does not choose to sell his or her house.

Discussion

Based on our analysis, we concluded that it is possible to get players to think more critically about social dilemmas by having them play a game which models one. At the very least, the game playing helped one of the players to better define the role he plays in real-world social dilemmas. Unfortunately, we did not see any change in behavior in the carpooling scenario, but this may be largely due to our players' predefined patterns of behavior regarding carpooling, and not to their experience with our game.

In general, with regard to identity issues, it seems safe to say that not all gamers invest in their in-game identity. While Participant 1 tried out the two sexes while playing her four attempts at the game, the other two players did not see sex as playing a role in their character's behavior. They instead loaded the default configuration (a woman PC) each time. This might be evidence that there was little connection for these two players between their virtual identities and their real-world identities. On the other hand, it might simply indicate that they were not concerned with their character's appearance (in future studies, we should ask more questions about the players' identities while playing the game). Participant 2 did show some evidence of an embodied experience (projecting herself onto her avatar), when she mentioned that she did not try the worst-case scenario because she didn't want her cows to die or make the other farmers dislike her.

The three players had different agendas while playing the game. Participant 1 seemed very interested in meeting the requirements of our given assignment. She explored the different possibilities of the game (but did not actually explore the game environment itself much), examining each outcome fully. She seemed to think the object of the game was to discover the result of every possible game ending. Participant 2 approached the game, after reading through the instructions, from a very personal embodiment of the character she took on. Her goal was driven by the town liking her. Her objective was to keep the town in her favor. Participant 3 approached the game with profit in mind. He found altruism to be the most lucrative option in the game, and so he played that role.

Conclusion

Our research attempted to explore the dynamics between virtual identity and real-life identity in the context of a social dilemma. Each player in our study played the game in a different way and used a different strategy to find the optimal approach. This is good, but we were hoping that their strategy discovery would bring the role of identity to primacy. It is hard, however, to say that any type of strategy was an identity strategy. This may be due to our testing instruments or the way we collected data, but it may also be that issues of identity won't surface unless we build a more complex game, one where the "optimal" solution is not so easy to define.

There are multiple ways that the game could be made in order to explore identity issues in a deeper way. We could make the actual social dilemma more complex by introducing more variables, such as the ability to seed the common pasture (thus making it more fertile and able to support more cows), or by making the computer-controlled farmers' behavior less predictable. We could include multiple social dilemmas in the same game. For example, we could implement a year that would feature the opportunity to vote for mayor of the town. That way, the popularity of the player and the other farmers is considered; an element affected by choices made in the Tragedy of the Commons. A real-world urban or suburban setting might also help make the game more meaningful and transferable. As discussed in the analysis section, one consistent

complaint from our participants was the unrealistic nature of the game.

The game is modeled after a computer role-playing game, but it doesn't currently have the trappings of one; one way is to include character development and rewards for quests completed and goals achieved. By including these situations that are more commonly associated with computer games, we could used the backdrop of different social dilemmas, framing different social situations in a broader context.

The last possibility, the one with probably the greatest potential, is to make the game multiplayer. In a multiplayer situation, each participant plays the role of a farmer. In this case, the players would *have* to deal with real people and collaboratively come up with the best solution for the town.

We would like to expand this project in the future to include many of the above possibilities. Our hope is to make the game into a more realistic situation such that it can better convey the dynamics real-world social dilemmas.
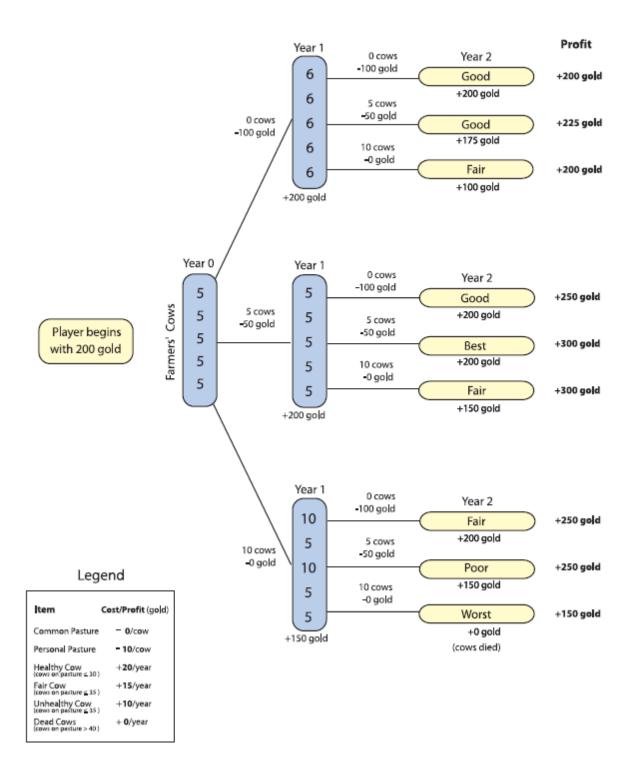
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Suggestions for Further Research

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Appendix A: The graphical algorithm for our game.

Tragedy of the Commons
Economy Structure

Appendix B: A sample set of dialog from the game.

Key:
00 = 0 cows on the common pasture
05 = 5 cows on the common pasture
10 = 10 cows on the common pasture

When repeated, these numbers indicate multiple years, e.g., 0005 is 0 cows on the common pasture the first year and 5 cows on the common pasture the second year.

Black text = Non-player-character (NPC) dialog.
Red text = Participant dialog.

Sample text from townspeople:

Alice:
You must be <FullName>. Welcome. I wish I could invite you inside for tea, but I must tend to the chores of the day. My husband, Manus, may have some time to talk. He'll be glad to help you get settled.

Alice00:
<FirstName>, this year has been quite kind to our town. You fit in here nicely. Manus thinks very highly of you, and so do I.

Alice0000:
<FirstName>, hello! Glad to see you are well.

Alice0505:
<FirstName>, you are a valued citizen of our fair town. You are well-loved, despite your depraved love for circus animals. Manus and I are so glad you have stayed.

Alice10:
<FirstName>, this year has not been kind to our town. We all need to decrease our dependence on the common pasture. It can't hold that many cows. You seem like a reasonable person, I suppose you had no choice but to use the pasture to such an extent; we all need to survive. But if there is any way that you can keep more cows on your own pasture, we may have an easier time of it next year. Well, I can't talk any longer, but I will tell Manus you stopped by.

Alice1000:
<FirstName>, Manus and I are not willing to consort with such an inconsiderate and selfish person. You are an oafish pig. And a piggish oaf.

Alice1010:
<FirstName>, you should leave. You are no longer welcome in this town.

Beggar:
Please, please help me. The bandits have taken everything. They even stole my prize-winning dirt collection. I loved me dirt. And my cows, but now my cows have all died. My children are sick. Please help a sick father with no dirt collection.

Farmer1:
Hello friend! My name is Manus Al Tru. Welcome to our town! I hope you stay long.

- Thank you! I'm <FullName>.

I see you are also a farmer. Hopefully you will participate in our existing social system, which works well for all of us.

- How does the system work?

The communal pasture optimally supports 30 cows, thus each of us farmers (there are six of us now that you are here) is able to place half his herd -- 5 cows -- on this shared space, and everyone benefits equally.

-Go on.

Since it costs money to support our cows on our own personal pastures, it makes sense to participate in the system.

-I see.

Anyway, thanks for coming by. It has been a pleasure speaking with you.

-The pleasure has been mine. Goodbye.

Farmer1_00:

Hello <FirstName>! It is a lovely day today, don't you think?

- Yes, it is.

I am always so glad to see our town prosper in the way that it is now doing. All of our cows are doing well, and since you have chosen not to use the communal pasture, this year each of the rest of us will be able to place 6 cows, instead of 5, on the pasture. I am impressed and humbled by your generosity.

- Thank you, Manus.

You are welcome. Have a wonderful day.

- Bye.

Farmer1_0000:

Hello <FirstName>! It is a truly lovely day today, don't you think?

- Yes, it is.

I am always so glad to see our town continually prosper in the way that it is now doing. All of our cows are doing well, and since you have chosen not to use the communal pasture two years running, this year each of the rest of us will continue to reap the rewards of having 6 cows, instead of 5, on the pasture. I continue to be impressed and humbled by your generosity.

- Thank you, Manus.

Sure thing! Have a wonderful day.

- You, too! Good bye!

Farmer1_0005:

Hello <FirstName>! Good day to you.

- Good day, Manus.

I am glad our town is doing well, although not quite as well as in past years. Next year should be better, though, because we will be able to balance our resources properly and all place 5 cows on the communal pasture. I think everyone was a bit surprised when you didn't place any of your cows on the pasture the first year but then did this past year. However, it's only fair -- you have as much right to do so as anyone else.

- Well, thank you.

Sure. Anyway, have a good day.

- You too, bye.

Farmer1_0010:

Hello <FirstName>! Are you doing as well as can be expected?

- Yes, thank you.

I am saddened that the town is doing poorly. Next year I will place no more than my fair share of cows on the shared pasture. I hope you will do the same. Some in the town were not very happy with your behavior this past year.

- Thank you for the warning, Manus Al Tru.

You are very welcome. Have a good day.

- Bye.

Farmer1_05:

Hello <FirstName>! It is a nice day, don't you think?

- Yes, it is.

I am always so glad to see our town retain its equable state. I do so appreciate when everyone benefits equally. Next year should be just as good, for I will once again be placing 5 cows on the communal pasture. You made a wise choice when you placed 5 cows on our shared pasture.

- Thank you, Manus.

You are welcome. Have a good day.

- You too!

Farmer1_0500:

Hello <FirstName>! It is a lovely day today, don't you think?

- Yes, it is.

I am always so glad to see our town prosper in the way that it is now doing. All of our cows are doing well, and since you removed your cows from the communal pasture this year, the rest of us will be able to place 6 cows, instead of 5, on the pasture in the upcoming year. I appreciate your generosity.

- It is my pleasure, Manus.

That's very nice to hear. Have a wonderful day.

- You, too. Bye!

Farmer1_0505:

Hello <FirstName>! It is a nice day, don't you agree?

- Yes, I do.

I am always so glad to see our town continually retain its equable state. I do so appreciate when everyone benefits equally, and that has been happening for several years now. Next year should be just as good, for I will once again be placing 5 cows on the communal pasture. You made a wise choice when you chose to always place 5 cows on our shared pasture.

- Thank you, Manus.

You're very welcome! Be sure to check out the carnival! Bye!

- I will! Bye!

Farmer1_0510:

Hello <FirstName>! You are doing as well as can be expected?

- I suppose. Thank you.

I am saddened that the town is not doing better. Next year I will place no more than my fair share of cows on the shared pasture. I hope you will do the same. Your behavior this past year was not all that pleasing to the townspeople.

- Thanks for the advice.

You are welcome. Good day to you.

- Good day.

Farmer1_10:

Oh, <FirstName>, I didn't see you. Hello.

- Hi, Manus. How's it going?

I must say, I'm not very pleased with how our town is doing. This upcoming year I will continue to place no more than my fair share -- 5 cows -- on the pasture. Hopefully you will make the right choice and do the same.

- Well, I'll think about it.

Yes. Well, good day.

- Good day.

Farmer1_1000:

Hello <FirstName>! Today is a much nicer day than yesterday, don't you think?

- Yes, I would agree.
It would appear that your farming choice two years ago was questionable, but I believe that you have redeemed yourself by your more recent actions. Too bad other farmers decided to follow your earlier example and now the collective health of our cows is at an all time low.
- That doesn't sound good.
No, it isn't, but since you didn't put any cows on, we have been able to survive. I think if you had kept cows on the pasture, some or all of the cows would be dead from lack of food! But, now things are starting to look up and I bet everyone has regained their senses for the coming season.
- I hope so, too.
Good. Have a nice day!
- You, too.

Farmer1_1005:
Hello <FirstName>! Today is a much nicer day than yesterday, don't you think?
- Yes, I would agree.
It would appear that your farming choice two years ago was questionable, and your decision to scale it back to 5 cows this past year was too little, too late. It's too bad other farmers decided to follow your earlier example and now the collective health of our cows is at an all time low.
- That doesn't sound good.
No, it isn't, and I'm afraid for the health of all of our cows! I hope we come to our senses soon.
- I hope so, too.
Good. Have a nice day!
- You, too.

Farmer1_1010:
What do you want, <FirstName>?
- Hello, Manus.
I must say, I'm very displeased with the state of our town. All of our cows that were on the communal pasture are dead -- this is unacceptable. I do hope you will come to your senses and not take advantage of the generosity of others in future.
- I will consider your advice.
I hope you do. Bye.
- Bye.

Farmer4:
Hi friend! Let me introduce myself. I'm Farmer Sal Fesh, but most of my friends call me by my first name, Verry. I hope you enjoy living here in Commontown.
- Thank you! My name is <FullName>.
I see you're also a farmer. Hopefully you'll participate in our existing communal system, which works well for all of us.
- Which system is this then?
The communal pasture in the center of town. You can't miss it. Basically, it most efficiently supports 30 cows. In other words, all 6 of us are able to put 5 of our cows on this shared space, and everyone benefits equally. It'd be nice to be able to put more on though, since it costs 10 gold a cow to keep them on our own pastures.
- Oh, I understand. Yeah, that would be nice...
Anyway, thanks for coming by. It has been a pleasure speaking with you.
- The pleasure has been mine. Goodbye.

Farmer4_00:
Good day, <FirstName>! I am doing well today.

- That is good to hear, Verry Sal Fesh.

It was a good year for me last year. This upcoming year will be even better, because I will be able to place 6 cows, instead of 5, on the communal pasture. Good thing you didn't put any cows there yourself -- you must have been trying to curry favor with the townspeople.

- Well...

Well, it worked! I need to go get dressed for my party tonight, I will see you later.

- Uh, yeah...

Farmer4_0000:

Good day, <FirstName>! I am doing well today.

- That is good to hear, Verry Sal Fesh.

It was a better than expected year for me last year. This upcoming year will be even better than the last, because I will once again be able to place 6 cows on the communal pasture. You're definitely milking -- ha! -- your reputation for all it's worth with the townspeople.

- Well, that wasn't really my--

[nudge] Well, it seems to be working for you, so don't complain! I need to go get dressed for the party that is being thrown for me tonight, goodbye for now.

- Um... good bye...

Farmer4_0005:

Good day, <FirstName>! I am doing well, although the price that my cows fetched this past year was less than I'd expected.

- I'm sorry to hear that.

Yes, me too, me too. I'm glad the town's prosperity hasn't suffered very much, but I will know for future reference that I need to place 5 cows on the communal pasture. Your move was pretty sneaky -- changing your number of cows from 0 to 5 -- perhaps next time you'd be better served to tell people your plans?

- Oh, yes, I will try--

Anyway, I must be going, I have important things I need to do. Good day.

- Bye.

Farmer4_0010:

Good day, <FullName>! I am not doing as well as I'd hoped.

- I'm sorry to hear that, Verry Sal Fesh.

Yes, me too, me too. Thanks to the overloaded pasture last year, my cows did not fetch a very high price at the market -- hopefully this year will be much better, or at the very least my expenses will be lower. My plan is to place 10 cows on the shared pasture. Don't you agree that that is only fair?

- I see your point--

Anyway, good bye, I have important things that need to be attended to.

- Ok, bye.

Farmer4_05:

Good day, <FirstName>! I am doing well today.

- That is good to hear, Verry.

It was a good year for me last year. This upcoming year should be equally good, since I'll continue to place 5 cows on the communal pasture. You were looking out for number 1 when you put 5 of your own cows there -- good job!

- Oh, well, actually--

Anyway, as much as I'd love to stay and chat, I need to go get dressed for my party tonight. It promises to be fun. [winks]

- Uh, okay, good bye.

Farmer4_0500:

Good day, <FirstName>! I am doing well today, and my cows are about to be doing even better!

- That is good news, Verry.
It was a good year for me last year. This upcoming year will be even better, because you've removed your cows from the communal pasture, and thus I'll be able to place 6 cows, instead of 5, there. Good move on making yourself popular -- it was a move worthy of me. [winks]
- Oh, I--
Well, it's been lovely chatting, but I must be going! I have things to do, people to see -- you know how it goes.
- Good bye!

Farmer4_0505:
Good day, <FirstName>! I know you'll be glad to hear that I am doing well today.
- Yes, I am glad to hear that, Verry Sal Fesh.
Last year was another good year for me! This upcoming year should be just as good, since I'll continue to place 5 cows on the communal pasture. I like your strategy of putting 5 cows on the shared pasture -- you're looking out for yourself but keeping the rest of the farmers happy. Well done!
- Well, I didn't actually intend--
I do love talking to you, but I must be going. I hear the carnival has a fortune teller!
- Ok, bye... and good fortune!

Farmer4_0510:
Good day, <FullName>! I am not doing as well as I'd hoped.
- I'm sorry to hear you say that, Verry Sal Fesh.
Yes, me too, me too. Thanks to the unexpectedly overloaded pasture last year, my cows did not fetch a very high price at the market -- hopefully this year will be much better, or at the very least my expenses will be lower. My plan is to place 10 cows on the shared pasture. Don't you agree that that is only fair, to try to regain the money I lost?
- Well, I don't know if I'd call it--
I'm glad you agree. Anyway, good bye, I must go and tend to more important things.
- Bye.

Farmer4_10:
Good day, <FirstName>. I am doing well today, although my cows are not.
- I'm sorry to hear that, Verry.
It was not a very good year for me last year. This communal pasture was overused, and my cows did not bring as much in the market as they otherwise would. I have decided that this year I might as well take advantage of the communal pasture myself -- I will also place 10 cows there. If I am going to get a lower price for my cows, I see no reason why I should pay to farm them.
- Huh, that's interesting.
Anyway, I'll talk to you later.
- Ok, bye.

Farmer4_1000:
Good day. I am not doing too well today.
- That's too bad.
Even though you didn't put any cows on the common pasture last year, it was still overburdened with cows since a few of us decided to try to take advantage of the system as you did the first year. At least next year should be better.
- I'm--
Well, it's always fun chatting, but I must go. Other obligations call, you know.
- Bye.

Farmer4_1005:
Good day. I am not doing too well today.
- That's too bad.
You tricked me! I thought it was safe to put all of my cows on the common pasture since you were able to do it successfully two years ago. Now all my cows are in poor health!
- I'm--
No! I don't want to talk to you! I wish you and your family poor health!
- Bye.

Farmer4_1010:

Get out of my sight! I don't want to talk to you!
- I'm--
If you continue to try to talk to me, so help me, I may get violent. Good bye!
- Sorry. Bye.

Groundskeeper:
Hi, I'm Willie, the groundskeeper for the common pasture. You can tell me how many cows you want to put on the common grounds, and I'll handle the rest.

1) Okay, I'd like to put none of my cows on the common pasture!

None? Okay if you say so. Are you sure? [If you say "Yes" time automatically passes to a year from now.]

i) Yes. I am ready to move on to the next year with none of my cows on the common pasture.
ii) No, maybe I should reconsider.

That might be prudent. Be sure to talk to the other farmers, too.
Okay, bye.

2) Okay, could I put 5 of my cows on the common pasture?

Five cows, huh? I love seeing the system work fairly! Are you sure you want to go with this decision? [If you say "Yes" time automatically passes to a year from now.]

i) Yes. I am ready to move on to the next year with 5 cows on the common pasture and 5 cows on my own pasture.
ii) No, maybe I should reconsider.

That might be prudent. Be sure to talk to the other farmers, too.
Okay, bye.

3) Hey, I'd like to put all my cows on the common pasture. Will you do that?

All of them? Trying to work the system, eh? Are you sure? [If you say "Yes" time automatically passes to a year from now.]

i) Yes. I'm ready to put 10 cows on the communal pasture and move on to the next year.
ii) No, maybe I should reconsider.

That might be prudent. Be sure to talk to the other farmers, too.
Okay, bye.

4) Um, can you tell me how the common pasture works again?

Sure. Basically, it can support about 30 cows. More cows might be able to live on it, but I'm pretty sure they wouldn't be as healthy and therefore they wouldn't make as much money as healthy cows.

Go on.

Healthy cows make 20 gold pieces a year for you. Unhealthy cows might make only 10 or 15 gold a head. It makes sense to put cows on the common pasture since it doesn't cost you any money to do so. Each cow you have to take care of on your own personal lot costs 10 gold each year. Do you understand?

Yeah, I think so.

So, the most equitable state is if each farmer puts 5 cows on the common pasture and 5 on their own personal ground. It would then cost 50 gold for the 5 on their own ground, and each cow would give them a 20 gold pay off. But it might make sense, if one wanted to work the system, to put all their cows on so that it doesn't cost anything to maintain them.

I see. Thanks.

So, do you know what you want to do?
[return to the original 4 options]

Groundskeeper00:

Hi, <FirstName>. It seems you're doing pretty well. Here's the 200 gold you made off the cows this past year. Each cow in your personal pasture made 20 gold.

Thanks!

You can tell me how many cows you want to put on the common grounds for this year, and I'll handle the rest. Be sure to come talk to me each year to collect your money, though.

1) Okay, I'd like to put none of my cows on the common pasture!

None again? Okay if you say so. Are you sure? [If you say "Yes" time automatically passes to a year from now.]

i) Yes. I am ready to move on to the next year with none of my cows on the common pasture.

ii) No, maybe I should reconsider.

That might be prudent. Be sure to talk to the other farmers, too.

Okay, bye.

2) Okay, could I put 5 of my cows on the common pasture?

Five cows, huh? I love seeing the system work fairly! Are you sure you want to go with this decision? [If you say "Yes" time automatically passes to a year from now.]

i) Yes. I am ready to move on to the next year with 5 cows on the common pasture and 5 cows on my own pasture.

ii) No, maybe I should reconsider.

3) Hey, I'd like to put all my cows on the common pasture. Will you do that?

All of them? Trying to work the system, eh? Are you sure? [If you say "Yes" time automatically passes to a year from now.]

i) Yes. I'm ready to put 10 cows on the communal pasture and move on to the next year.

ii) No, maybe I should reconsider.

4) What's my total profit so far?

You've made a total of 100 pieces of gold. That's 20 per head of cow minus the expenses of keeping them all in your own pasture which is 10 per cow. You might be interested in knowing that the other farmers have been able to take advantage of the common pasture and have made considerably more money than you have.

I see. Thanks.

5) Um, can you tell me how the common pasture works again?

[same text as year 1]

Groundskeeper0000:

Hi, <FirstName>. It seems you're doing pretty well. Here's the 200 gold you made off the cows this past year. Each cow in your personal pasture made 20 gold.

Thanks!

The game ends here, but feel free to roam around checking things out if you want. Also, if you would like, go ahead and load up this game again to try out different choices!

1) Ok, thanks.

2) What's my total profit and how did I do in the game?

You've made a total of 200 gold pieces out of a possible of 300. That's 20 per head of cow minus the expenses of keeping them all in your own pasture which is 10 per cow. You did this two years in a row, earning 100 gold per year.

Go on.

The town did well, but the other farmers have been able to take advantage of the common pasture and have made considerably more money than you did.

I see. Thanks.

Groundskeeper0005:

What's my total profit and how did I do in the game?

You've made a total of 225 gold pieces out of a possible of 300. The first year you maintained all of the cows on your own pasture at the cost of 10 gold per cow. That cost you 100 gold. You made 20 gold for each of them since they were healthy. So you made 100 gold total for the first year. This past year, you put 5 of them on your own land, for a cost of 50 gold total, and you made 20 gold for each of those. The 5 you put on the common pasture, however, only made 15 each since they were a little unhealthy. The total profit for this year was 125 gold.

Go on.

The town is doing well even though the other farmers have had to adjust to your erratic land usage.

Groundskeeper0010:
What's my total profit and how did I do in the game?

You've made a total of 200 pieces of gold out of a possible of 300. The first year you maintained all of the cows them on your own pasture at the cost of 10 gold per cow. That cost you 100 gold. You made 20 gold for each of them since they were healthy. So you made 100 gold total for the first year. This past year, you put all 10 on the common pasture, but only made 10 each since they underfed. The total profit for this year was 100 gold, too.

Go on.

Since you did not participate the first year and then put all 10 of your cows on the pasture the second year, the pasture itself was very overloaded, and the cows are very underfed. It looks like if you continue on this path, you and possibly other folks will not be able to survive as farmers

Groundskeeper0500:
What's my total profit and how did I do in the game?

You've made a total of 250 pieces of gold out of a possible of 300. For the first year, you put 5 cows on your own land, costing you 50 gold total. All of your cows made 20 gold per cow, so you made 150 gold the first year. This year you put all 10 on your own pasture, so that's 20 per head of cow minus the expenses of keeping them all in your own pasture which is 10 per cow. This year's profit was 100 gold.

Go on.

Additionally, the town is doing very well. The other farmers like you and value your contribution to the community. Some of them are saddened that you chose not to participate this year.

Groundskeeper0505:
What's my total profit and how did I do in the game?

You've made a total of 300 gold pieces out of a possible of 300. For both years, you put 5 cows on your own land, costing you 50 gold total. All of your cows made 20 gold each, so you made 150 gold total each year.

Go on.

What's truly amazing is that all of the farmers were able to do as well as you. The town is very prosperous right now, and you've even attracted a traveling carnival!

Groundskeeper0510:

What's my total profit and how did I do in the game?

You've made a total of 300 gold pieces out of a possible of 300. For the first year, you put 5 cows on your own land, costing you 50 gold total. All of your cows made 20 gold per cow, so you made 150 gold the first year. This year you put all 10 on the common pasture, but each cow only made 15 gold since they were a little underfed, meaning this year you also made 150 gold.

Go on.

I don't think the common field is at a sustainable state, and some of the other farmers are starting to resent you taking more than your fair share since it is making all of your cows worth less.

Groundskeeper1000:
[duplicate dialog as found in 0000 deleted]
What's my total profit and how did I do in the game?

You've made a total of 250 gold pieces out of a possible of 300. The first year you put all your cows on the common pasture. Each of them only made you 15 gold, since they were all a little malnourished. So that year's profits were 150 gold. This last year, you put them all on your own land, costing you a total of 100 gold. They each made 20 gold for you, though, making this year's total profit 100 gold.

Go on.

The town itself is recuperating from your actions the first year. Since you were able to put more than your fair share of cows on the common pasture, other farmers felt they had the right to do the same thing. As a result, the field is being overused, but with careful practice the situation can still be saved.

Groundskeeper1005:
[duplicate dialog as found in 0000 deleted]
What's my total profit and how did I do in the game?

You've made a total of 250 gold pieces out of a possible of 300. The first year you put all 10 on the common pasture, but each cow only made 15 gold since they were a little underfed, meaning the for first year you made 150 gold. For this year, you put 5 cows on your own land, costing you 50 gold total. All of your cows on your own pasture made 20 gold, so you made 50 gold off of them. The 5 cows you put on the common pasture, however, did not do so well since it was overgrazed. Each of these only made you 10 gold, for a total of 50 gold from the common pasture. That makes the total money for this year 100 gold pieces.

Go on.

The town is in a sorry state. If the number of cows continues at their current levels, the field will become dangerously overgrazed. All of your cows will continue to be unhealthy and malnourished.

Groundskeeper1010:
[duplicate dialog as found in 0000 deleted]
What's my total profit and how did I do in the game?

You've made a total of 150 gold pieces out of a possible of 300. The first year you put all your cows on the communal land. Each of them only made you 15 gold, since they were all a little malnourished. So that year's profits were 150 gold pieces. This past year, as you can see, all the cows starved to death! You didn't make a single copper piece.

Go on.

Additionally, all of the other farmers are also not doing well, having lost cows, too. The town is in a very bad state and has attracted criminal elements. It might be time to move since your welcome here has expired.

Appendix C: Script and interview questions.

Read to participant:

The research project that we have put together addresses the issue of social dilemmas. In case you are unfamiliar with the term, a social dilemma describes a situation where the most personally beneficial choice – i.e., the most selfish choice – for an individual is not the choice that would provide the most benefit to the group at large; in fact, if enough people were to cooperate and make the group-benefiting choice, the individual benefit would actually exceed the benefit gained from the selfish choice.

In our research project, we wish to determine whether letting people role play different identities in a simulated social dilemma, where they can see the long-term effects of the choices they make, will have an effect on their choices in real-world social dilemmas.

In this research study, we will ask you questions about your behavior in a real-world social dilemma, have you play a module of Neverwinter Nights that displays the long-term effects of different choices in a theoretical social dilemma (you will be able to play through the module as many times as you wish to see the results of different behavior), ask you to achieve what you consider to be the "optimal" results from your game playing, present you with the same real-world social dilemma to see if your behavior was impacted by the game, and then ask you some questions about your experience with the game to see if it had any effect on the way you view and/or will respond to social dilemmas in future.

Post-exercise follow-up questions:

- What are your general opinions on social dilemmas?

- Did you enjoy playing the game module?

- Did you feel that it adequately represented a social dilemma?

- Did you get a sense of consequence from your actions while playing the game?

- Did your experience in the game change your perception of social dilemmas?

- Did it help you to more fully understand the ramifications of choices made in social dilemmas?

- Do you feel that you will now recognize real-world social dilemmas in the future?

- Do you feel that playing the game has had an impact on the decisions you will make in real-world social dilemmas in future?

Appendix D: Participant handout including introduction, real-life social dilemma question, and game instructions.

Welcome:

Hello and welcome! Thanks for participating in our research study. The following list outlines what you will be doing during the next hour and a half:

1. Answer questions about your behavior in a real-world social dilemma.

2. Play a module of *Neverwinter Nights* as many times as you wish to obtain the "optimal" result in a theoretical social dilemma.

3. Answer questions about your behavior in the same real-world social dilemma.

4. Answer questions about your experience playing the game module to see if your attitude towards/future behavior in social dilemmas has changed as a result of what you learned from the game.

Nobody would argue that the traffic situation in Seattle is bad, and would be much improved if there were fewer cars on the road. One of the ways to accomplish this is for people in Seattle – who are currently single car drivers – to carpool on a regular basis. Carpooling would decrease the number of cars on the road, and thus lead to less congestion.

Assume you are a single car driver. Driving by yourself in your own car every day has many benefits – you can set your own daily schedule, you can stop and run errands on the way to/from work if you need to, you do not have to be beholden to anyone else's schedule. However, the big downfall of driving by yourself is that you have to sit in traffic for long periods of time. If you choose to carpool, instead of driving by yourself, you will have to coordinate with other people's schedules both to and from work and you will have less flexibility to do things you may need to do on the way to or from work. However, there are benefits: you will be using less gas, which is kinder to the environment, and you will be able to use the carpool lane to avoid a good deal of traffic. The pitfall of carpooling, though, is that because there are still so many cars on the road, you will not really see a great change in the amount of time it takes you to get to and from work. In fact, the time that it takes to get to and from work may actually *increase* slightly if you have to drive to other people's houses to pick them up in the process of carpooling.

Given all of these factors, what is your decision with regard to carpooling? Do the benefits outweigh the disadvantages? Knowing that for it to really "work" the way it is supposed to many more people would have to participate would you still choose to do it? Why or why not?

Answer:

Game Instructions:

What you will be seeing now is a module from the role-playing game *Neverwinter Nights*, which has been customized to present an adaptation of a theoretical social dilemma, the Tragedy of the Commons. You are one of six farmers in a small village (you are a newcomer), and you must decide where to place your cows – on your own personal pasture or on the communal pasture in the center of the town. Each of the farmers (recognizable by the white light over them) will have information and/or advice for you, so it is worthwhile to talk to each of them before you decide what to do. Groundskeeper Willie (yellow light) can help you understand the situation as it currently is and what your options are. He is also the person who will take your "order" once you have decided what to do and keep you updated on how much money you have earned in any given year and throughout the game.

The game will cycle through several years. The decision that you make each year will impact the other farmers' opinions/advice, so it is advisable to speak to each of them each year, including the year after your final decision has been made, to understand their reaction to your decision(s).

Your instruction in this part of the study is to find what you believe to be the "optimal" result from the game module. You can do this by trying out an identity (e.g., playing a nice person, playing a selfish person, etc.), and playing the game multiple times using different identity strategies. Which series of actions yields the best outcome and why? What does "best outcome" mean, anyway, and is it a value judgment? Once you have played the game through fully, please replay it to discover alternate outcomes based on different choices that you can make.

Your "success" in the game can be gauged by the following four factors:

1. How much gold you have
2. The health of your cows
3. The other farmers' opinions of you
4. The general state of the town

Participant notes:

Real-World Scenario Follow-up: Carpooling   **Participant #:**

Nobody would argue that the traffic situation in Seattle is bad, and would be much improved if there were fewer cars on the road. One of the ways to accomplish this is for people in Seattle – who are currently single car drivers – to carpool on a regular basis. Carpooling would decrease the number of cars on the road, and thus lead to less congestion.

Assume you are a single car driver. Driving by yourself in your own car every day has many benefits – you can set your own daily schedule, you can stop and run errands on the way to/from work if you need to, you do not have to be beholden to anyone else's schedule. However, the big downfall of driving by yourself is that you have to sit in traffic for long periods of time. If you choose to carpool, instead of driving by yourself, you will have to coordinate with other people's schedules both to and from work and you will have less flexibility to do things you may need to do on the way to or from work. However, there are benefits: you will be using less gas, which is kinder to the environment, and you will be able to use the carpool lane to avoid a good deal of traffic. The pitfall of carpooling, though, is that because there are still so many cars on the road, you will not really see a great change in the amount of time it takes you to get to and from work. In fact, the time that it takes to get to and from work may actually *increase* slightly if you have to drive to other people's houses to pick them up in the process of carpooling.

Given all of these factors, what is your decision with regard to carpooling? Do the benefits outweigh the disadvantages? Knowing that for it to really "work" the way it is supposed to many more people would have to participate would you still choose to do it? Why or why not?

Answer:

Appendix E: Game manual and map.

Screenshot 1 annotations:

your map

Navigation:
Click on the ground to move to that location.
  (The pathfinding sucks, btw.)
To rotate the camera left and right, move the
  mouse to the edges of the screen.
  (If you want to get tricky, hold the
  mouse-wheel down while moving the
  mouse to have total control of the camera
  pitch and angle.)
Use the mouse-wheel to zoom in and out.

Hotkeys:
m   minimap
     (The arrow shows where you are and
     where you're facing.
     The dots show places of interest.)
i   inventory
     (Check your gold here.)

review conversations and messages here

your compass

Michael: Welcome to Commontown! It may help to open up the mini-map by pressing 'm.' Be sure to visit all of your fellow farmers who are marked on the map as gold dots.
Michael: Note the common pasture in the middle of town. When you are ready to move on, talk to Groundskeeper Willie in the NorthEast corner of the map.
Talk:

F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12

Screenshot 2 annotations:

Farmer Manus Al Tru
I see you are also a farmer. Hopefully you will participate in our existing social system, which works well for all of us.

1. How does the system work?

Dialog:
To talk, click on the person you want to talk
  to. Then click on one of the conversation
  options at the top-left of the screen.

Farmer Manus Al Tru: Hello friend! My name is Manus Al Tru. Welcome to our town! I hope you stay long.
Michael: Thank you! I'm Michael.

Farmer Manus Al Tru: I see you are also a farmer. Hopefully you will participate in our existing social system, which works well for all of us.
Talk:

F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12

Farmer
Herto Pragmato

Farmer
Mari Apathi

Groundskeeper
Willie

Farmer
Verry Sal Fesh

Farmer
Manus Al Tru

Common Pasture

Farmer
Darick Independo

your farm

various NPCs walking around town

various houses and other shops