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GAMES, PLAY, AND THE STUDENT'S DILEMMA

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by

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1. **game theory**
2. **play**
3. **rationality**

Abstract

Using sources from the humanities, social sciences, and game theory, we explored the conceptual and real-world relationships among games, play, and rationality. In contrast to traditional game theory emphasizing only winning, we postulate a "play rationality" that allows for additional goals (like having fun). To observe the implications of "play rationality," we developed a "Student's Dilemma" game based on classic game theory. Our analysis looks at observations of our game in light of both experimental game theory and "play rationality."

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Objective

Play is a critical aspect of human behavior which is often overlooked in its many decision making roles. These roles include social, political, and economic characteristics, which are more commonly described and analyzed in game theoretical terms. Understanding the nature of play and the science of game theory poses a challenge, since play is about fun, which often rides on indeterminacy of outcomes. In sharp contrast, game theory is about predicting rational mutual decision making behavior in a deterministic manner. The two are entangled because the indeterminism of play is a fundamental part of human behavior which often affects decision making. To advance our knowledge of the outstanding issues at hand, we postulate the necessity of attempting to understand the "play rationality" that connects these different issues. Comprehending "play rationality" is a potential means for greater insight into the many problems it affects. Important questions to be asked in our project include:

- What are the characteristics of play and fun?
- What makes game theory a useful tool for understanding mutual decision making behavior?
- What are the limits to rationality and reason?
- What new concepts and issues does taking play rationality into account raise?
- What are the social ramifications of posing play rationality as a serious decision making factor?

Introduction

Our subject is why play is an important factor in decision making which we need to better understand. In order to convey the significance we must delve into many related topics:

- Game theory for mutual decision making,
- Play and game playing behavior,
- The issues and limitations of rationality,
- Experimental observation of these various factors.

While these topics segregate cleanly, they are intensely interconnected. Presenting these topics in a linear format is thus difficult. A top down approach to the subject is elusive, but considering these connections hypothetically may allow us to get a more complete picture in mind, the details of which will be filled in as we come to them.

From the most general perspective, this project is a study of behavior, which traditionally falls into the realm of psychology. However, we are only concerned with the specific behavioral issues of play and how they affect decision making processes. Game theory provides the most comprehensive view of mutual decision making, but to describe play exhaustively, game theory requires rational players at every stage, which clearly falls short of describing real world play behavior. Conventional models of rationality are useful but limited, and it is here that our supposed "play rationality" extends the traditional behavioral models of similar disciplines, such as economics. Unfortunately, the "play rationality" concept does not readily admit a neat decomposition, but we aim to demonstrate its viability, show a reasonable basis for its existence, and present a game experiment designed to illustrate the problems.

Play & Game Theory Basics

Game theory is the science of mathematical analysis of decision making in social scenarios. A relatively new formulation of thought, having sprung up in roughly the last 100 years and formalized in the last 50, game theory is becoming increasingly relevant to other fields such as economics and political science. More recent exploration has taken place in the direction of behavioral studies of game playing and experimental economics. While specific goals may vary, the overall direction of game theory is toward a means of understanding and leveraging mathematical analysis of games for more effective decision making.

Game playing, in contrast, is a primarily recreational activity, the critical aspect of which is play. Far removed from dry theory, play is rich and complex as both an act and a concept, varied and unreduceable. Considering the case of play as an end in itself is a uniquely insightful view of human behavior. Games themselves share many qualities with play in general, and it is these definitive characteristics which raise some interesting questions. Theoretical analysis of games has produced valuable insights and real world ramifications, but the real interaction between people and games is one of play which clearly introduces more goals and influences than mere utility. Thus, we suggest that there lie unexplored dimensions to these interactions

and that they undoubtedly hold much promise for future research. We present a preliminary study to improve our understanding of the deeper connections between game playing, theory, and play as a whole. Some questions to consider include:

- What are the applications of game theory knowledge to real world decision processes and play?
- What do the behaviors of play imply for the practical realization of game theory as a tool?

Some Play and Games Similarities

To describe the interconnected nature of play and games, it is useful to highlight their similarities and differences in areas where they overlap. Some of the more significant aspects they have in common include: benefits or utility, purposes and goals, abstract and experimental variations, the nature of interactions, inherent rules and boundaries, and learning factors.

The goal of a game is usually to win. In the game theory and economic sense, this ideal outcome is the maximization of "utility" which abstractly represents all beneficial results, and thus motivates the decision making process. Play, conversely, has a much broader and somewhat different purpose, much of which is not completely understood. There are clearly resulting benefits from play, such as enacting roles, enabling experiences and learning, building or releasing tension, and simple entertainment, but there also exists an undefinable quality to the play act itself which does not readily serve an external purpose. Johan Huizinga surveys such play characteristics extensively in Homo Ludens, a study of the play element in culture.

In order to analyze games formally, they are often treated in abstract forms independent of their traditional play context. Since game theory often views games from an analytic mathematical standpoint, games in this sense are purely abstract. In contrast, analysis of played games requires an experimental viewpoint, especially since real world play with real and complex people is at hand.

Game theory describes a game as a series of simultaneous or sequential decisions by players and represented as a branching tree or outcome matrix. The decisions made are prescribed by a strategy. Traditionally in game theory, the game is analyzed and the result determined by the chosen strategies, without any actual human interactive play. Game playing conversely, while it may consist of the same set of actions, hinges on the play that shapes as individual actions are made and points of critical tension are resolved. Playing a game is as much about the journey to the goal, the process, as it is about the outcome itself.

The mode of interaction is a key distinction between abstract and experimental views of games and game playing. Mathematical games represent rules only as the decision tree itself and the various outcomes' respective payoffs. Played games however commonly manipulate a variety of intricate behaviors according to a relevant rule set. Furthermore, in the real world, "games" often abide by implicit rules of the situation at hand, such as physical limitations, laws, and common understandings.

The restrictions of a game and boundaries of play also have some similar features and key differences. Mathematical games abide by the relevant rules, but play in general has a richer context-dependent notion of boundaries, including the social situation, physical space, and available time, as well as the options to discontinue and resume play according to external

constraints. The social "spoil sport," is a treasonous person who acts to break the illusion of play by ignoring rules, boundaries, or otherwise being disruptive, so as to ruin the play act for others [Huizinga]. The great offense of such an act is an obvious clue to the importance of play to those involved.

Elements of learning in games are a vital factor in the development of newer game theory disciplines, such as the behavioral and experimental groups, which were previously unaccounted for but are now a focus of evolutionary game theory and similar studies of dynamic interactions, as described by Don Ross in the Stanford Encyclopedia of Philosophy. Learning is also often an important factor in the simple entertainment value of playing, as having fun without learning is a deceptively difficult thing to do.

Finally, a major contrast arises out of the tendency for play to influence real decision making in complex ways, since game theory is becoming widely used for making serious decisions. It is this evolving balance that motivates the problem. Examples include everything from the very basis of society, as in the social compact, to corporate strategy, warfare, arms races, and international policy, such as the nuclear arms race towards a first strike in the Cold War. These phenomena critically reflect the importance of game theory as a science.

Project Goals

Game playing, as a recreational, educational, and scientific tool, will undoubtedly become of ever greater importance to humanity in the future. Already, the ease of simulating cheaply a wide variety of environments and scenarios has made interactive games a primary form of entertainment, an unparalleled cost-effective training method, and an incomparable scientific research arena. The value of the computer and video game industry alone has already passed movies as the highest revenue entertainment in the U.S.

Educating people about elements of game theory and conventional play and studying the results is a potentially insightful way to gain understanding about how people play games, the degree of criticality of the play element in modern society, and how game theory is applicable in practice. A natural medium then to convey this knowledge is a game of some form, interactively allowing one to explore the concepts and illustrate one's own play interactions and decision making processes. Our project includes the initial development, experimentation with, and analysis of such a game. Important project steps include the understanding of how play and game theory concepts relate and map onto one another, the behaviors of people concerned with playing and decision making in regard to these concepts, and developing the means by which people may be best introduced to explore and understand the advanced concepts and phenomena of playing and game theory for themselves. Given these requirements, the last step is creation of the game itself.

With such a game to explore, we intend to test and demonstrate the viability of applying the "play rationality" ideas in practice.

Literature Review

To relate the necessary background materials and connect key concepts, we here present, from the background literature we have read and identified, an introduction to game theory and the problems it entails, play concepts as they relate to human behavior, and the related limits of rationality. These areas are outlined to support the existence of play rationality. Our ultimate goal is a better understanding of the nature of play in decision making processes.

Prisoner's Dilemma / John Von Neumann, Game Theory, and the Puzzle of the Bomb, by William Poundstone, Doubleday Publishing, 1992

Introduction to Game Theory

Prisoner's Dilemma, by William Poundstone, explains the basics of game theory in the story of John von Neumann's life and the Cold War going on between the United States and Russia. The game theory explanations that Poundstone provides are directly connected to the real-world scenarios that went on at this time, and he illustrates the connections between the two very well.

Game theory is a fairly new branch of mathematics. Game theoretical games are not the "games" in the usual sense of the word: game theory covers "conflict among rational but distrusting beings" [Poundstone, p.39]. Any such conflict could be considered as a game, whether it is an actual game or a more abstract situation. These games always have some similarities, though: the players are assumed to be rational (i.e. logical) as mentioned above, and they are also assumed to be playing in their own best interests. That is, in game theory, games are not played in any way other than each player taking the absolute best move possible for them.

Indeed, this contrast between theory and experience goes even further. Instead of actually "playing" out a game, mathematical games are represented in some abstract form showing all possible outcomes for all possible moves. Then, the outcomes that result from "irrational" moves during the game are ruled out, and the remaining outcomes are the ones that are looked at. Each player picks a "strategy": a set of all the moves a player would make, given each situation in the game and each of the opponent's moves. No further interaction is needed between players once a strategy is chosen, as all possible situations are automatically considered. The outcome of the game is determined by the players' strategies; there is no need to "play through" the game.

Common games like checkers, chess, or tick-tac-toe are not games that are normally considered in game theory. Poundstone explains why by using tick-tac-toe as an example, completely describing the game and each player's possible strategies. From there, the game is "played" by each player picking one of the strategies. If each player is assumed to play in the rational and best way, then the game is always a tie. It is unknown whether the other games, such as checkers and chess, would yield a similar situation when fully described; it may be that

"playing" either of these games would also (in the game theoretical sense) be as simple as both players tying as soon as they agree to play the game.

For example, in the case of tick-tac-toe, there are only two real strategies for the first player's move of the game: if she picks the center square as her move, then she will be able to tie the game; if not, she will not be able to win or tie. The way the game is played out is dependent on this initial move, and the outcome is directly determined by the strategies that both players choose. In this case, it is determined by the strategy that the first player chooses, and can be traced back to the very first move of the game.

Another important idea in game theory is that of the Nash Equilibrium. An outcome of a game is a Nash Equilibrium if each player would not change their strategy given the choices of the other players. It can be seen as a "saddle point" of the game, an outcome that all players collectively prefer. There can be more than one Nash Equilibrium to a game, and it is possible that the equilibrium is not the best outcome for any or for all players. The Prisoner's Dilemma is an example of this sort of situation, where the best possible outcome for all players is actually not the Nash Equilibrium.

Prisoner's Dilemma and Game Theory Problems

The game that Poundstone describes in the most detail is the game that gives the book its name. The "Prisoner's Dilemma" was first described by Albert Tucker, a mathematician who worked with von Neumann at RAND. Asked to give a talk on game theory at Stanford University, Tucker came up with a game and a story to explain the game; this story would later come to be known as the Prisoner's Dilemma.

The Prisoner's Dilemma is a very simple game, in terms of rules. The story goes something like this: two men are arrested for a crime they worked together to commit. They are both detained by the police in separate rooms, with no possibility of communication between them, and are each given an ultimatum. If neither of the criminals confess, both criminals will end up going to jail for a lesser crime, as there is not enough evidence to convict either of them of the major crime. If one of the criminals testifies against the other, then the one who testified will go free while the other will get the full prison sentence for the major crime. However, if both prisoners testify against the other, they will both go to jail, although not for as long as in the case when they are singled out. Each criminal must make his or her decision in complete ignorance of what the other is doing.

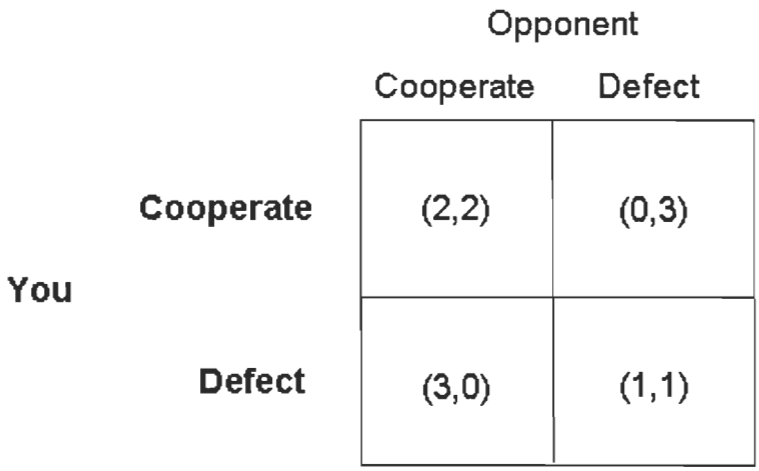


Figure 1: Prisoner's Dilemma Game Matrix
Payoffs are in the form (you, opponent).

There are only two strategies for the game: each player can choose to "cooperate" and keep quiet, or to "defect" and testify against the other. The game can be expressed as two by two matrix, with the rows corresponding to the possible strategies of one player, and the columns the possible strategies of the other player. The cell of the corresponding row and column is the payoff, that is, the prison sentences for each player given the chosen strategies.

As an aside, it should be noted that the terms "cooperate" and "defect" representing the player's choices are historical in origin and do not correspond with in-game events or communication. They may be slightly misleading, but the intent is to convey choices in favor of group benefit, via "cooperation," and conversely in favor of self interest, via "defection."

A very interesting observation about the Prisoner's Dilemma is that two rational players should choose mutual defection. As mentioned above, in this case "to defect" means to testify against the other, and "to cooperate" means to keep silent about the operation. Looking at the payoff matrix, a player can see that if he cooperates, he may get the worst payoff in the case that the other player defects. Likewise, the other player can make the same observation about her strategy choice. In addition, each player can come to the conclusion that no matter what the other person does, they can reduce their jail time by defecting. So, the rational choice for each player independently is to defect.

But, when both players defect in a Prisoner's Dilemma, each gets a worse sentence than if they had both cooperated. The outcome from each player making a rational strategy choice is not necessarily the best payoff for either player, or both. Sometimes the best payoffs can only be achieved when one or both players act irrationally, although people often do act in this manner. Thus, the players are effectively blinded by the need to act repeatedly and without communication in their own best interest, even when mutual "cooperation" could improve the overall outcome for both parties, so they cannot consider the ideal "cooperative" joint strategy reasonably.

One of the more interesting parts of Prisoner's Dilemma is the example of a real world iterated prisoner's dilemma game, along with the commentary of the players. Even with the concepts of rational strategies explained, the experiment shows how people will not always act in the most rational or beneficial manner by choosing their individually best strategy. The

irrational methods in which they act, though, often leads to the better payoff or outcome.

To account for real players' irrational behavior in the individual Prisoner's Dilemma game, there is another model where it is extended to be more than a single Prisoner's Dilemma problem. If the game is many iterations of the original game, then it seems like the strategy for each player would change. Since the players will be playing the same game with each other for a "long period of time," i.e. the many iterations instead of only a single one, then it seems like it would be less logical to defect from the original agreement. A better choice would be to repeatedly cooperate with the other player, maximizing the long-term payoff even if giving the "sucker payoff" (when one player cooperates and the other player defects) in the short-term.

If the length of the game is known, however, then each player will be given the chance to defect without the chance of punishment (defection by the other player in the next round) on the last turn. This raises an interesting situation, though: if each player defects (or assumes the other player is going to defect) on the last round, then both players have the incentive to defect in the second to last round. This logic can be applied repeatedly until the beginning of the game is reached: again, the "rational" decision is to defect, but in the iterated case this decision is valid for every round. This is known as the "backward induction paradox" and will be discussed in the section on the limits of rationality. Mutual cooperation still produces the better overall results, though.

When the length of the game is not known, this sort of strategy does not apply. Since neither player knows when the last round will be played, there is no incentive for either to defect. This prompts people playing "rationally" to cooperate more; real world examples of this sort of situation show that cooperation, even if an uneasy one, is the best possible way to play. Theorists may view this as altruism or "fair play" in practice.

Real World Games

Game theory is useful because it provides a practical model for analyzing and predicting rational decision making in real world problems. Its application is not perfect due to the rational limitations and often irrational behavior of real people, as well as the complexity and external factors present in real scenarios, but illustration of some actual applications shows its relevance.

The idea of players being irrational even when a rational strategy is known is emphasized by the history of the arms escalation between the United States and Russia, and how von Neumann supported a preemptive strike. Were the United States to play the game of the arms race using a "rational" strategy, the choice would be to defect, and go ahead with the preemptive strike. The option was no different for Russia, and so it was only time, von Neumann believed, before they would come to the same conclusion and get the first strike. Were both sides playing by "rational" strategies, a nuclear war would not just have been an option, it would have been guaranteed. This is not the best situation for either side, but mutual defection -- in this case, defection is equivalent to the launch of nuclear missiles -- is, as explained above, the "rational" strategy to take. In reality, the outcome was that of mutual cooperation, not war.

It is not unreasonable to consider that people may have viewed any nuclear war outcome to be a losing one, as an overall failure of humanity, and so disrupted the original Prisoner's Dilemma structure, leading to the "cooperative" outcome.

The concept of nuclear war that Prisoner's Dilemma illustrates is an example of how playing a game-theoretical game in an individually rational manner will often not give the best

possible outcome (for either player in the game), and how a real life situation is often "irrational" but yet yields the best results. Mutual cooperation in a prisoner's dilemma is considered to be irrational, but yet it does happen often (as evident not only in the nuclear arms escalation game, but also in the experimental games such as the described one from RAND). This supports the idea that game theory cannot be used to realistically model situations as complex as the ones presented in real life. If real conflicts were as simple as finding individually the best possible "rational" strategy according to a fixed set of payoffs, the world would be a much simpler (and much different) place.

Homo Ludens, a study of the play element in culture, by Johan Huizinga, Beacon Press, 1949

Homo Ludens (literally: "man the player") makes a case for fundamental "play" as a definitive characteristic of human culture. The central position of Homo Ludens is that culture initially grows out of play (which may well be serious or sacred), as evidenced by the many play forms which cultural activities maintain. Farther in the long term, cultures as they develop tend to cover play up in routinized systems that remain even when the play itself is no longer the primary activity. Huizinga supports his position well and builds his case with myriad historical examples, but the most valuable part of Homo Ludens may be more the observations on play itself than the cultural ramifications. Huizinga's play is so rich and broadly defined that a distilled notion cannot do it justice. There are, however, some distinct aspects that make it a uniquely intriguing topic. Play is necessarily a free and voluntary activity, it need not serve an external purpose, and it is concretely real and irreducible. Play is an active endeavor, and the action is always interactive, although the player's counterpart need not be real in a concrete sense. This specifically makes viable the grounds that play is an activity, as Huizinga puts it, "of the mental sphere." That is, play is orchestrated on a mental level apart from "ordinary" life, where it follows its own rules. Play is not a necessity of physical being, but of human mental capacity and imagination. Therefore, play is also by definition irrational: it is not bound nor need conform to any fixed external notion of rationality, and does not necessarily serve any purpose other than play.

Some of the more important elements of Homo Ludens are not what's explicitly stated in the text, but the questions one poses to oneself when placing the ideas in some larger context. The results of play are largely explored, but its causes remain a mystery. For example, Huizinga suggests that our imaginative ancestors became the dominant species because of greater mental capacity and the resulting advantages, but what then is the specific evolutionary advantage of play? All through nature are indications that the more evolved and intelligent a species, the greater are its capacity and propensity for play. Humanity's dominance and undeniable play character are the greatest evidence of this, yet the "fitness" advantage of play is not obvious in the slightest. In a sense, play is a means of taking our exploration (and perhaps evolution) to the mental realm, above and beyond the needs and limitations of the physical and deterministic. It is perhaps the purpose of (and possibly the means by which we can cope with) sentience itself, and likewise the clear advantage that such consciousness provides. Is it humorous that humans so enjoy the play that may empower us so, or is it obvious that because of its possible power we must enjoy it so as to leverage its use?

The self contradictory nature of a player's behavior leads to a fascinating paradox. The

player of a game has chosen to play: it is a decision for an irrational activity. The play activity itself prescribes an internally consistent rational behavior, to win the game, which may be accomplished through a rational process that prescribes the correct actions to make in order to produce the desired outcome. Yet, the goal of play is purely play itself, regardless of whatever else it may accomplish. So, the ideal play action within in the game is one of playing instead of following rational behavior to win. Thus the player has a decision between two possibly conflicting goals: win the game, or maximize play. This apparent clash of rationalities suggests a larger issue, the existence of a more sophisticated "game player's rationality" which is not purely irrational nor rational according to conventional thought.

Limits of Rationality

A significant challenge for game theorists today is coping with the incompleteness of "rationality." Game theory struggles with the irrationality of normal people, who fail to play abstract and experimental games optimally, the sometimes seemingly irrational behavior of real world decision making, as in the real nuclear arms race outcome, and even incomplete basic theories, such as that described by the backward induction paradox.

As in economics, a rational entity is one that will make the optimal decision to maximize its utility, without regard to bias or real influences. The definitions of rationality are widely debated, but applications of analytic rationality toward problem solving are also troublesome. Real people, and especially players, consistently deviate from such prescribed rational behavior in systematic ways.

In practice, however, the abstract mathematical notion of rationality and the actual human rationality fail to coincide. The degree to which ideal rationality is useful naturally correlates with how well it approximates real behavior. This results in an incomplete overlap between the predictive power of rational analysis and the human reflection on experience as far as understanding decision making is concerned.

Sometimes both players can't be rational, as illustrated by some simple games which always define only one player as rational. An example is a game where two players make a binary decision and one player wins if they both make the same decision and the other player wins when they make different decisions. A real-world analogy is a merchant ship trying to escape a warship when traveling around an island: if both ships take the same route, the warship destroys the merchant and wins, but if they take different routes, the merchant has evaded the warship and wins. It is a somewhat arbitrary form of game, but it serves to show that in some situations, even if both players are supposed to be rational, only one can be according to the favorable outcome.

Another case is when the ideal outcome of a situation is not rational, and the rational outcome is thus suboptimal for both parties. The Prisoner's Dilemma is an example of this. The mutual defection outcome is the logical one but it is not the most desirable for the players. Again, real world decisions show that people often favor irrational behavior in such cases. The arms escalation between the United States and Russia is one example; the description of the experimental games in Prisoner's Dilemma is another.

Stanford Encyclopedia of Philosophy website, Game Theory entry by Don Ross: http://plato.stanford.edu/entries/game-theory/

One method for finding the rational solution of a game is called backward induction, described by Don Ross in the Stanford Encyclopedia of Philosophy. The mechanism is one of working in reverse, by examining the outcomes of a game and deducing the optimal decision for each player at each step and thus working back to the start. We may skip the details, but it is important to note that this is a standard method of determining the rational solution to a game, and it is one that overlooks a fundamental flaw. This philosophical problem is known as the backward induction paradox, and it arises since each player presumes the other is rational, yet they must analyze play paths in the game that could only happen if one had made an irrational decision. It is commonly dismissed since the player's behavior on these untaken paths is irrelevant (they would never happen if the players are rational). There also exists a flimsy alternative explanation, called the "trembling hand," which supposes that if there is a non-zero possibility of a player taking an action in error instead of making their desired choice then the other player, when irrational results have to be analyzed, may presume such an accidental error was made. Neither of these solutions is satisfying, as they leave the core issue of irrational behavior unresolved.

It is also suggested that "irrational" behavior such as altruism or "fair play" could be involved, but these behaviors presume a larger social situation in which they **are** rational, because altruism or "fair play" may then pay off in the long run.

Instead, a more comprehensive view might be to suppose that other factors are at hand when an irrational decision is made, and to reconsider game strategies accordingly. Considering our hypothesis, play rationality may be one of these factors. When one can no longer consider a player to be ideally rational, perhaps the best option is to "play" in response rather than continue following a flawed logic.

Individual Rationality as a Useful Approximation, by Alvin E. Roth: http://www.economics.harvard.edu/~aroth/rational.html

The science of economics is sometimes known as "the dismal science" on account of its reliance on a hypothetical rationality which real people do not exhibit. In "Individual Rationality as a Useful Approximation," Alvin E. Roth's viewpoint is that rationality alone is an incomplete representation of the factors involved in decision making but is still a useful approximation. Different models of rationality, such as the "risk averse man" now standard in economic theory, may be able to provide better approximations of real behavior by taking different factors into account. Some supposed models include "psychological man" and "neurobiological man," but the crucial point is that there is ample room for alternate models of rationality. Given the economic case for alternate rationalities, and likewise the need for game theory to explain non-rational behavior, there exists a strong possibility of play rationality providing important insight into this often overlooked aspect of human behavior.

Paradoxes of Rationality: Theory of Metagames and Political Behavior, by Nigel Howard, MIT Press, 1971

The most common definition of rationality, as behavior leading to maximum utility, relies on the notion that everything resulting from decisions can be captured in the utility function. By definition then, a higher utility is always preferred to a lower utility. This definition can be problematic because real people often make considerations beyond mere utility, which may result in irrational behavior, as often reported in real experiments. Even when attempting to make rational decisions, people have difficulty considering utility alone. Nigel Howard describes an attempt to overcome this classic limitation of game theory called the metagame theory, which supposes that instead of defining the outcomes' utilities in a game, it is only the actions that are described. Then the players themselves are then required to assign preference relations to the actions in the game. These preference relations describe the utilities of the outcomes for each player. The game actions describe a metagame, which is the family of individual games described by players' preference relations. This makes it possible to theorize on rational behavior within each game, and meta-rational behavior for the described set of games as a whole. The key advantage of this model is that it attempts to describe actual human behavior instead of predicting the behavior of a perfectly rational decision maker. It lends a more concrete approach, especially since inconsistencies in behavior can be captured in the model, and its notion of rationality may be revised to fit actual data.

Metagame analysis of purely abstract games is not very meaningful because the game "actions" are defined by their outcomes instead of the reverse. Experimental games however, those which are actually played, provide play actions which players can rank the results of with preference relations. Even games devoid of scoring or winning conditions can be analyzed this way, since only player preference of actions is significant.

Play Rationality

Ultimately, our goal is understanding play rationality and the impact it has on decision making behavior. As discussed, game theory, human play, and rationality limits all have aspects that suggest the existence of this important and largely unexplored area. While the effects of play rationality may be easily observed, a more difficult deduction is its cause. As Homo Ludens described, the inherent value of play is not yet well understood, and play is not obviously a byproduct or cause of some other beneficial behavior.

One might take issue with the label "play rationality" since part of the issue at hand is the irrational nature of play. This is an essential aspect to keep in mind, but the moniker is less about the irrational decision to play than the complex extra-rational behavior that is caused in decision making processes. That said, one should also be quick to note that the fundamental irrationality of play is tied directly to its existence in the mental sphere. The creative nature of play, being above and beyond normal deterministic physical limitations, demands the indeterminacy that is an essential part of fun.

Given the extent to which play has shaped modern social and cultural conditions, a natural question is to what degree play arose concurrently as a dominant behavior. Specifically, how did play rationality come about? Play, society, and culture are mutually supporting factors. If play is advantageous for fitness in a social population, then those who advance culture, and the

state of play, raise the bar for social success, resulting in even higher social fitness advantages for play, and a self-reinforcing feedback loop carries the entire process forward. This high level observation still begs the question: what is the evolutionary advantage of play? It is not purely a social factor, since play also happens completely independent of societies.

Play rationality as a concept exists somewhere between the fundamental evolutionary basis for play and the resulting influence it has on human decision making processes. From this point of view, play rationality is something of an interface between the historical processes that made play so important and the future decisions that will depend on it. Taking this as a whole view instead of independent parts, the wide reaching implications of play rationality are more apparent, as are the potential benefits of better understanding the phenomena involved.

Play Rationality as a Metarationality

One possible alternative in trying to understand the irrational nature of play is considering it not as a specific type of decision making, but a more general one. A "game" as looked at by game theory always assumes at least one fact: that each player is trying to increase their utility (whatever it may be) directly with each move. The act of "play", however, can include just about anything, any set of rules, as long as those rules are agreed on by each player. The rules for a game of this type may not be able to coexist with the rule of a game theoretical game: if the rules of a general game can not easily be translated into utility, and actions that immediately maximize that utility, then the act of playing the game may be "irrational" from a game theoretical standpoint.

Only looking at the rationality issue, and not considering the fun and voluntary aspects of play, "play rationality" could be seen as making the optimal choice for any given set of rules of a game. This set of rules would not need to include the utility-maximization rule that game theoretical games include; the rules could be more general statements such as "have fun", instead of (for example) specific rules on what moves or options are legal. In this case, the "optimal choice" would be whatever action leads to what the player thinks is the best result for the situation. Therefore, the "play rationality" of two players could be very different, even if they are playing the same game. The reasons they are playing the game could be very different, such as playing to win versus playing for learning, or playing to pass time enjoyably without having to be too concerned about the actual game itself.

Using this definition for play rationality does not violate the rules of game theory. Instead, the rationality of game theory would be a subset of the more general rationality, for when the utility-maximizing rules for game theory are given. When these rules are not given, the game cannot be analyzed through game theory methods regardless.

This definition of "play rationality" is not without problems. In the more general case, utility can not be measured as accurately. Metagame theory is useful in this situation, allowing utility to be assigned based on player action, but the decision of what the "optimal choice" is for the situation is much more open-ended. The choice of a player as to what is the "most fun" (for example) may be very hard to measure, and may even change depending on the circumstances surrounding the game. The question of how accurately metagame theory can help is still open.

Experimental Background

In the development of our experiment, we have considered traditional resources on both game development and game experimentation. Unfortunately, game developers are focused primarily on aesthetics and playability, with little interest in formally rigorous experiments, and game theorists tend to apply existing games in various elaborate experiments designed to test specific decision making factors, with little interest in revising or developing the basic games themselves. Our hypothesis, on play rationality as a decision making factor, suggests that these disciplines might learn a lot from one another, and likewise our experiment is an attempt to move in this direction.

Here we present some related background material on game theory experiments, as they relate to our project experiment. Following in the next section is a discussion of our developed experimental game and its results.

Introduction to Experimental Game Theory, by Vincent P. Crawford: http://weber.ucsd.edu/~vcrawfor/IntroEGTSym.html

Crawford's review covers a number of important points about why experiments of the type that we are running are important. The title mentions experimental game theory: Crawford states that "Experimental Game Theory refers to experiments whose goal is to learn about general principles of strategic behavior, as opposed to the performance of specific institutions." The need for empirical evidence of this strategic behavior is mentioned, and how experimental games are the best way to obtain evidence of this type.

This is exactly what the aim of our experiment is, to learn about these general principles of how people choose their game strategies, through an experimental game. In our case, the game strategies observed are for a game that is based both on game theoretical games and the classical entertaining board game.

A number of different commonly observed results for experiments of various types are described in Crawford's paper. Having other experiments to compare ours to will be very useful, to see if the behavior that we observe in our experiment is what would be expected for an experiment of the type.

One of the experiments which Crawford describes shows that players who are paired together for many iterated games will deviate from their short term strategy for maximum payoff, to show or teach the other player how to choose a strategy that will result in an overall better payoff for both players. However, players who know that they are not going to be playing in the same groups for many games have no incentive to give up a better short term payoff to educate the other player. This effect is called Strategic Teaching by Crawford. This is a very interesting point on iterated games and is demonstrated in our experiment by players learning to improve their overall outcome during the course of the game.

Framing effects are also mentioned, how predictions for a game are affected by the structure and the form of the game, and how these predictions are observed quite well in the behavior of the players. These framing effects are another aspect of experimental game design that we specifically take account for by framing the experiment as a situation familiar to all of the players.

Experience from a Course in Game Theory, by Ariel Rubinstein: http://www.princeton.edu/~ariel/99/gt100.html

Rubinstein asks exactly the same question that we raise in this project: "What is the relation between the 'game theoretic prediction' and the real world?" To learn about this question, Rubinstein has run many experimental games with students as players, and describes the results for each.

He does not believe that using questionnaires to observe subjects' actions in game theoretical experiments will provide usefully different results than constructing meticulous laboratory experiments with a tangible, usually monetary, payoff. He writes that any major differences in experimental results are due to cultural, educational, or personal differences in the subjects.

An interesting observation about running experiments and teaching game theory is that there was little change in the strategies of some of Rubinstein's students after the course in game theory. Learning about game theory does not necessarily mean that a player will choose the best strategies for a game, even if they have the tools available to determine what that best strategy is. In the case of our experiment, this means that players who have game theoretical background will not necessarily have an advantage over the others.

Experimental Methods

The "Student's Dilemma" Game

To familiarize people with the impact of play on decision making and the game theory concepts and problems, we developed an educational game. It is both a learning tool for players and a subject for experimental analysis of our play rationality hypothesis. In order to convey the essential importance of play rationality, the game necessarily touches upon the topics which surround it such as play, fun, and rational decision making.

We have named a convenient framing scenario "the student's dilemma" based on our own situation as WPI undergraduate students, and the ready availability of students to play. The basic concept is that students (the players) must allocate their resources (time, for example) between various ventures such as a cooperative student project, a competitive game tournament, and possibly others, in an iterated fashion (representing the course of weeks over a term or semester). Because the players of the game are almost all WPI undergraduate students, chosen mostly from a social group that plays many games, we feel as if this framing scenario will be easily understood and properly motivate the relevant strategic thinking.

To evaluate the play rationality hypothesis, we have surveyed and rate the game's success at teaching players about the various issues. Questions for the players include evaluations of the following:

- Whether they grasp the basic factors involved in "play,"
- Whether they grasp the basic game theory concepts,
- To what degree they were aware of play factors influencing their decision making,
- To what degree they followed a rationally optimal utility-maximizing strategy,
- How their playing and rationality interact in their decision making processes,
- What impact the recognition of play and game theory had on their interactions with other players,
- Whether the game raises any interesting issues or questions for the players.

The Experiment

For the experiment, we have created and run a "Student's Dilemma" game for other students, and observed and analyzed the results. The game is based on the better known game theoretical games, such as the Prisoner's Dilemma and resource allocation, but is played by students. The results are examined for information about the rationality (whether game theoretical rationality or play rationality) of the players. This includes whether the choices that they made seemed rational and consistent, the observations that the players made about the game during the course of the game, and the results of the played game compared to what game theory shows the result should be. The experiment was designed to help us gain some insight into how game theoretical games are actually played between human players (similar to the RAND Corporation experiment with the repeated Prisoner's Dilemma), and to also see if the "play

rationality" (i.e. irrationality from a game theory standpoint) is more prominent than rationality.

There are two general methods for running a game of this type. The first is that the game is played by a group of students that can freely interact with each other, such as if they are all together playing the game in real time, as one would play a board or card game. The other method is to run the game in a more game theoretical manner, by having the players all choose their strategies independently of each other and observe the result.

The first option allows us to observe the players and gather their reactions and comments during the course of the game. However, the disadvantage of this option is that if people know each other beforehand, then they may go into the game with certain expectations and not show what they would do in a more general situation. With the emphasis on projects at WPI, it is likely that people playing the game may have already worked on a project together, and know considerably more than even a friend about how they function in a group.

The second option allows the game to be run "blind." Although this does not allow getting the players' real-time commentary and observations on each move, each player is forced to choose a strategy that will be more general and not focused on individuals he or she is playing with.

Using both of the two methods is ideal. Running the Student's Dilemma game in two different manners, one that is played in a group setting, and the other played with no awareness of the other players, gave us information for both scenarios, and also gave us some other insights as to the connections into the rationality by which the games are played, which are discussed in the results.

The games were not specifically run with perfect information, that is, all information about previous moves were available to all players. The game was run with open holdings: the basic resources of each player were visible to all of the other players. In theory, this made the game history available to all players, but in practice there are limitations of memory and perception of the players. Although it specifically did not say in the rules that a player needs to answer questions about previous moves, all of the players chose to cooperate when asked questions about game history.

Student's Dilemma Game Design

The Student's Dilemma game is played on a board made of three separate tracks, one each for the project, the game, and slack, with a piece for each player on each track. A set of event cards goes with the board. Each player has a set of cards, corresponding to:

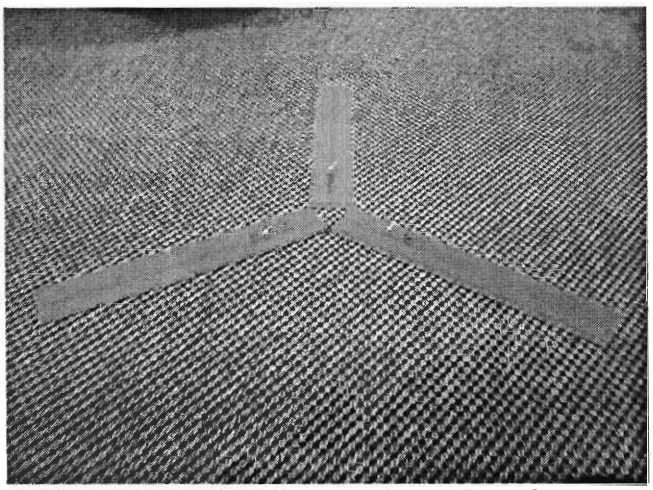
- The player's resources (in project, game, and slack),
- Action (challenge) cards,
- Movement cards,
- Cooperate / Defect cards.

Each player has the cards so that he or she can choose which movement or action to take without announcing it to all of the other players.

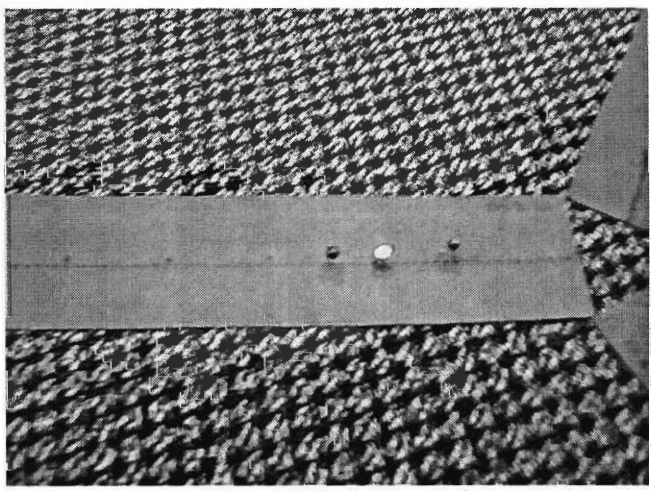
The game was designed so that it would include the four basic dilemmas (as the four basic actions), as well as other game theoretical games. The need for each player to advance if the other players advance (to keep up) is similar to the arms race scenario, which draws parallels to the dollar auction. Each player has to manage their resources carefully (in the initial allocation

of resources, the allocation of actions, and use of the actions during the course of the game), and make their decisions based on knowledge of the other players' resources.

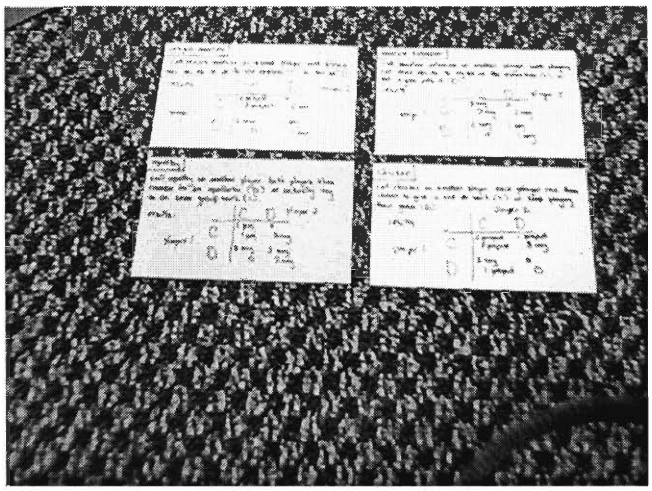
Other factors in designing a game theory experiment were taken into consideration, such as the issues of strategic teaching, and iteration of games among the same players. Having the same players be participants in the same set of games over and over again promotes learning how to best play off of the strategies of the other players. The use of punishment was included in the game, because punishment is often used in teaching other players how to find the best possible payoff, or between players in an iterated set of games.



Student's Dilemma Game Board



Track of Game Board



Action Card Payoff Charts

Game Rules

The Student's Dilemma game simulates the busy life of a student working on a project, but also trying to find time for other things, such as a tournament for your favorite game or slacking. The objective of the game is to complete the project, perhaps get a good grade on it, perhaps to find time to win the game tournament, or perhaps to just blow everything off without causing the entire project to fall apart for yourself and your partners. The specific goals are up to you.

Game Setup

To start the game, each player allocates 10 points between three categories: Project, Game, and Slack. Each player should allocate points based on what he or she thinks accurately describes him or herself. All categories must have at least one point allocated. These point allocations should be written down and placed somewhere that other players may reference them.

Each player then takes, in all three categories, a number of action cards equal to two times their resource rating in that category. These cards are not revealed to the other players until they are used.

Game Length

The standard length of the game lasts for 15 turns. This length can be increased or decreased during the course of the game, so the true length of the game is never known.

Game Turns

Each turn is broken up into three phases:

Phase 1: Random Event
The first phase of a turn is the random event. A player flips over the top card on the random event pile, and places it near the board so that everyone can see it.

The most common random event is a change to the length of the game. If a random event tries to make the length of the game shorter than it already is (i.e. tries to make the total number of turns less than the number of turns already played), then the game ends immediately.

There are very few random events in the game; most of the event cards are blank. The random events are the only source of randomness in the game, unless a player specifically decides to play with a random strategy.

The purpose of the random events is to ensure that the game length is uncertain. This prevents players from changing their strategies based on a known game length.

Phase 2: Main Phase
During the main phase of the turn, all players advance themselves one space along one given track (project, game, or slack). The choice of track is revealed simultaneously: each player places a card corresponding to their choice face down on the table, and when all players have selected their movement, the cards are turned face up.

Phase 3: Actions
After the main phase, each player may play one action card on another player. Again, the cards are placed face down on the table until all players have decided which (if any) card they will play. The order the actions are resolved, once all are declared, does not matter.

Winning

The game is over when the last turn ends. Unlike other games, there is no sole "winner"; the outcome of the game is based both on what each player did individually and how all players work as a group. The outcome for each track is determined by how far along the track each player is when the game ends, with one exception: if a player is 25 points (or more) behind all other players on a track, they are assumed not to be "passing" (i.e. past the first milestone on the track) in that given track.

The project as a whole requires at least some cooperation. The overall project grade is an average of the players' individual "scores" on the project track.

Action Cards

For reference, here are the four simple challenges. Actions and payoffs in bold are yours; those in regular type are your opponent's. All of the payoffs are in the form of number of steps of advancement along a track, i.e. "2 project" means to advance two steps along the project track, and "3 any" means to advance three steps along any track.

Project Meeting	C	D
C	**2 project**, 2 project	**0**, 2 any
D	**2 any**, 0	**1 any**, 1 any

Deadline Extension	C	D
C	**3 any**, 3 any	**0**, 2 any
D	**2 any**, 0	**1 any**, 1 any

Chicken	C	D
C	**2 project**, 2 project	**1 project**, 3 any
D	**3 any**, 1 project	**0**, 0

Apathy	C	D
C	**1 project**, 1 project	**0**, 3 any
D	**3 any**, 0	**2 any**, 2 any

Observations on the Game

During and after the game, the players were asked to make some comments and observations on the game, how they played, and whether they enjoyed it or not. The purpose of the specific questions is to provide insight into the following topics, as well as the questions that we have been trying to understand during the research part of our project :

- Do players have a different rationality that they use for games?
- Does this rationality work to help a game player achieve his or her goals in the game?
- Does this rationality have anything to do with whether a person finds something fun?
- Does the knowledge of game theory and the concept of rationality as utility-maximization have any effects on play rationality?
- What exactly makes a game fun?

Here we look at the general responses from each of the questions asked after the game in the questionnaire. We did not ask for numbers, or give any multiple choice questions: the purpose of the game to informally observe what the attitudes and beliefs of the players are regarding the game, and the material that it presents. The results are described and discussed, as it seems more useful to look at the opinions in depth, instead of simply listing off what the players have said and written in meaningless lists.

What sort of strategy did you use? One that was more logical, or one that was "just playing?" Why did you choose this strategy?

Most of the players were "just playing" the game, that is, they were playing the game to have a good time and enjoy themselves. Those people who were specifically chose a strategy to simulate their time at WPI were doing so in a joking and enjoyable way, i.e. placing more value in either the game path or the slack path than in the project path. People who spent their time in real life doing project work more seriously did not particularly care to recreate the experience.

Many of the players found individual strategies that were to their liking or amusement. One player described his strategy as "random." He would pick cards at random to select which path he would advance on each turn, and which action card he would play. To decide which other player he would target for his action card, he went around in a circle choosing all of the other players in order. His reasoning for this type of strategy was that he thought it would be fun to play, and that he wanted to see how it would work against other players who were putting more thought into what they were doing. His comment after the game on why he chose to play in this way was "[S]omeone should."

Some players did prioritize project work as being their primary goal. However, only a few players seemed particularly interested in being the one who had the most points on the project track. There was a concern for passing the project (scoring the minimum number of points along the project track that would qualify as passing, as determined before the game began), but not many people seemed particularly interested in doing well in the project. Keeping up with the group was the goal of many players, particularly those interested in advancement along one of the other two tracks. Naturally, those people who chose slack as their primary path of advancement seemed to care the least about the project track, and only about keeping up with the rest of the group to make the minimum cutoff. Out of all of the games run, nobody fell short of the minimum project score required to pass.

What were the best methods of action for each of the four action cards?

The two games that were easiest for players to figure out were the Deadline Extension (Stag Hunt), and Apathy (Deadlock). In the case of Deadline Extension, it is in both players' best interests to cooperate, and in the case of Apathy it is in their best interests to defect.

Most of the players realize during the course of the game that the slack path does not serve any particular function, and that the "sleep" action (negating one of the challenges) does not offer any benefit to the players, as an action cannot set one back along a path, but only cause advancement. This affects the choices of those players playing "to win," but not those playing "for fun."

Once the players have settled into a routine where they understand how the challenges work, and see the strategies of the other players, the game leans more toward the predictable game-theoretical behavior. There are always cases, however, that game theory is unable to compensate for: for example, the irrational desire of wanting to cooperate, or the random selection of actions by a player. The act of random selection generally confused the other players, and broke the routine where people could anticipate what the other party in a challenge was going to do.

- Project Meeting

The action card that corresponds to the Prisoner's Dilemma is the Project Meeting. The rational choice for the Prisoner's Dilemma is to defect, as defection will always give the player a higher payoff than cooperation, for whichever choice that the other player makes. This would lead both players, if they are playing rationally, to defect.

For the Project Meeting, however, players were equally split between cooperation and defection as the best course of action. Many players recognized that defection was the safer strategy, and the one that they should take to ensure a higher payoff. This did not mean that they would always choose to defect when playing the action. Players recognized that the benefit of mutual cooperation was better than that of mutual defection, and often times worked together to try to get the better results.

Although actual communication between players on their course of action was disallowed, the players did banter with each other, usually acting out scenarios that an actual project group would experience. Some players would act cooperative, and then choose cooperation as their strategy, so that they could get the best payoff for both players; some players would act cooperative, and then choose defection as their strategy so that they could get the best payoff in the challenge. Usually the defection was not done in ill-will, in the effort to prevent the other player from advancing, but just for the higher payoff.

During the course of the games the players would get a sense for who would cooperate and who would defect in the challenge. Those players that routinely cooperated would move to play the actions with each other, knowing that they could get a higher payoff that way. As one player commented, "Play C until they don't trust you."

The players that routinely defected would continue on with their banter, pretending that they were sorry for their previous defections. Of course, they would continue to defect. These players would identify who was more trusting or gullible, and continue playing actions with them.

- Deadline Extension

The action card that corresponds to the Stag Hunt is the Deadline Extension. It is similar to the Prisoner's Dilemma, but the best payoff is received when both players cooperate. The rational choice here is for both players to cooperate. Assuming that the other player is rational, the Deadline Extension should not be much of a problem. It is only when the other player is not rational that it becomes an issue of which strategy to choose. Since many of the players in the game were not choosing rational strategies, the Deadline Extension became much more of a challenge than it would have been in normal game theoretical analysis.

Players were split on the best course of action for the Deadline Extension. To some, the best choice was to cooperate, and to others the best choice was to defect. Many did not see a universal strategy that was best for the challenge, but instead chose to consider it on a player to player basis. Again, the players that were more cooperative tended to group together. A few players realized that mutual cooperation has one of the highest payoffs of any of the challenges, and took advantage of this fact by playing the card often.

- Chicken

Chicken is named the same in context of game theory and the Student's Dilemma game. The best payoff for a player is when she cooperates and her opponent defects. The game is different from the previous two in that it does not have one rational solution, but two: when one player cooperates and the other defects. Each outcome is equally rational as the other.

Players seemed to be very ready to cooperate in this challenge. Chicken is the only action card where it is possible for both players to score nothing, and the players were obviously aware of this fact. The idea of both players getting nothing for the challenge was even more unappealing, to both players, than one of the players getting nothing. The players did not seem to care about getting the "chicken" payoff versus the best payoff, as long as both players did not defect and get nothing for the entire challenge.

The amount of banter that went along with the challenge was less than with the other three challenges. Making sure that both players did not choose to defect was the theme of the conversations, and the phrase "someone has to do it" was said multiple times in reference to the challenge. No player ever completely avoided the challenge, however.

- Apathy

The action card that corresponds to Deadlock is Apathy. In Deadlock, the rational choice is to defect, as no matter what your opponent does, the payoff is higher if you defect. In this manner, it is similar to the Prisoner's Dilemma, but there is one big difference: mutual defection is better than mutual cooperation. Mutual defection is the Nash Equilibrium for this dilemma, making it not much of a dilemma at all.

Apathy is the action card that many players picked up the strategy for first. Many players noticed early on into the game that defection on apathy not only was the best choice, but was the best choice for both players. The players were actually determining the Nash Equilibrium for the game, even though they had no idea what a Nash Equilibrium is.

In the individual runs of the game, the players realized that Apathy was the action that would allow both players to advance quickly and gain extra points in any track, in a no-risk situation. Neither player would have the incentive to choose to cooperate, so the result of the challenge could be reasonably predicted. For this reason, many players chose to play Apathy, and play it often.

The players that first figured out how the challenge works showed the other players by example. Players who had not yet figured it out would observe how those playing Apathy were always advancing, with no real risk of losing out, and adopt the strategy for themselves. Iteration, in this case, was definitely a factor towards players learning about how the game works.

Do you think these methods of action gave you an advantage over the other players?

In general, the players who decided to play by rational strategies, i.e. those that maximized their payoffs, felt that the strategies they had chosen did give them an advantage over the other players. The players that chose the more "for fun" strategies and stuck with them even when they learned how the action cards worked, openly admitted that their strategies were not

optimal. These players maintained that their strategies were not worth playing by, to the point of recommending to other players that they never do it, whether in the game or in real life.

A couple of players commented that they would have been able to do much better if they were not so cooperative or trusting. One player remarked, when asked whether she had an advantage due to her strategy: "[N]ot really, because I'm too cooperative, [I] probably could have done better with cooperative players."

Can you recognize any parallels between the action cards and other real life situations?

Most players were not able to come up with any real world scenarios to compare the action cards to. References to real life project or school situations were the most common. Many players believed that the scenarios of the four action cards were similar to common situations between project group members. For example, one player said that it was similar to real life because "[p]eople blow each other off all the time." Another commented that "...project meetings are just like real ones."

One player mentioned, offhandedly, that the Project Meeting card was strikingly similar to the Prisoner's Dilemma. He said that he noticed this during the course of the game, and changed his actions concerning the challenge accordingly, to the Nash Equilibrium of the game.

Another player noted that the action cards could never set you back along a path, so it was always beneficial to play an action. The worst that could happen is that each player could get nothing for the action, and this was fairly rare. "Working with people is better than alone," he observes.

Did you enjoy the game? Why or why not?

One observation of each trial run of the Student's Dilemma game is that the players do seem to enjoy playing it. The game is not a dry exercise in maximization of utility. The players will often realize that they are taking actions that do not directly benefit them, but still choose to do so because it makes the game more "fun." Acting out the effects and repercussions of these choices is common among the players, and many players seem to enjoy reliving experiences from their past. When the players know each other beforehand, this effect of the game becomes much more evident.

In each run of the game, the players talked to each other as if they were in the scenario that they were playing out on the board. The conversations between the players describing which actions they were taking for their turns were very elaborate, often taking more time than it took to resolve the actions themselves.

As an example of this behavior, one of the players in the first game decided that he was going to "play the game like his junior year." Most of his resource allocation was directed into slack, and advancement along the slack path. He ended up far ahead of anyone else on the slack path, which he knew and admitted was completely worthless toward a "winning" scenario, but was very proud of his accomplishments nevertheless. He also was able to move as much as he needed to in the project path to keep up with the other players. For him, advancing to a very high score in slack while still being able to keep up with the project path, was his primary goal. He achieved this goal remarkably, and was very proud of himself. For him, this was the optimal

winning condition.

Each run of the game (except for the blind games) was a very social event. All of the players had full knowledge beforehand that the game was a part of a project, and that their behavior was being recorded and analyzed. This did not seem to stop anyone from doing what they would have done were the game a normal board game such as chess or checkers. Some players were very visibly pleased about being encouraged to write down their comments and thoughts during the course of the game. Making comments about what they were doing, how they were playing against the other players, and "getting into character" as a member of a project group through writing were all generally enjoyed.

In the blind games, almost all of the players commented on the fact that the game would be even more fun if they could play face to face with their opponents, or at least relay any sort of messages to them.

Did you learn anything from the game? If so, what?

Game theory aside, players learned about their own strategies, and how they work against other dissimilar ones. The most common observation of one's own strategy was the level of cooperation. For example, one player commented that "...most people aren't inclined to cooperate as much as I am." Another noted simply that "I need to change."

Some players particularly enjoyed advancing at the expense of others, those that were the most trusting or gullible. The players who were often taken advantage of all noticed this fact, as they could see it before them on the game board in a very tangible manner.

Although very few of the players commented on it, most (if not all) of the players learned a lot about game theory. During the course of the game, players were identifying the Nash Equilibriums of the different action cards, and changing their strategies based on what they had figured out. Many players asked whether the Student's Dilemma game as a whole had anything to do with game theory, but only one player had enough prior knowledge of the subject to know what a Nash Equilibrium was before the game began. Although the players who learned about it during the course of the game would not recognize it as such, they would be able to identify the "rational" (as defined in game theory) choice to make in any of the four challenges.

Do you think this subject matter makes a board game? Why or why not?

Players were divided on the question whether the subject makes a good board game or not. Most of the players, as mentioned above, enjoyed the game a lot. The acting that players got to do, as members of a project group, seemed to be the most enjoyable. Those people playing "for fun" apparently had the most fun: even though they were doing silly things in regards to advancement in the game itself (advancing primarily along the slack path, for example, or playing with a random strategy), they knew they were doing silly things, and the game was more enjoyable for that reason.

Some players, however, do not like the game as a board game all that much because of its parallels to stressful situations in real life. One player even went as far as describing the game as "too traumatic" due to its subject matter. These players were primarily those who were playing "to win," that is, who could get the most advancement along the project track. Some players were genuinely frustrated by others' choices to defect from actions like project meetings or

deadline extensions, as if it had happened in real life with a real project. Other players took it more in stride, and even were affected by the way those players were going about having a good time: for example, one player said "...randomness inspires randomness" in regards to the way the random strategy player was playing his game.

Were your decisions affected in any way by knowing the players beforehand?

Almost none of the players reported to be affected in any way by knowing the others beforehand. For the few that did mention some sort of additional knowledge from knowing the other players, it was always whether another player would be more inclined to cooperate or not, whether they were a more helpful person naturally.

Players in the blind game, who did not know who the other players were, mentioned that not knowing the other players or being able to communicate with them made it considerably harder to try to work out mutually beneficial agreements.

Do you think that you would have acted differently were this a real situation instead of a game?

Players' responses to this question varied based on the type of strategy they were playing. Those who were playing the "for fun," silly strategies said that they would definitely act differently were it a real life situation. After all, too much is at stake when working on a project in real life, as opposed to in a game where anything goes, and people do not have to worry about what happened the following day.

Those who were playing to recreate their experiences doing projects generally said that they would not have acted differently, or only a little differently, were it a real project they were working on. The most common thing that a player would have changed were it real life and not a game, was the amount that they punished the other players.

Most of the players said that they would hesitate more before punishing the other players, particularly if they were in the same project group. In the game, players often punished the person who was ahead in any given path, including the project path, which was supposed to be the common goal that all of the players were working towards. According to the comments, the players would generally not punish any work done on the project, but would still be willing to punish for advancement in the other two tracks (game and slack).

One player mentioned that were it a real situation she "...would have punished people for not being cooperative." All of the other players who spent their actions to get to punish someone did it either for the fun of it, or for seeing the person in the lead knocked back, but never was it done for lack of cooperation in an action. The common repercussion for lack of cooperation was simply changing the type of action played with the uncooperative player.

Closing Observations

Some specific results of the Student's Dilemma game are similar to those of other experiments in game theory. Players learn how the game works during the course of the game, and then educate the other players through their actions, teaching them how to get the most beneficial payoffs, in terms of the number of moves along the path of their choice. Just because a player learned how to get the highest payoff for a given subgame did not mean that they would use the rewards of the payoff in a beneficial manner.

The most notable difference between our experiment and many of the others that exist is that in the Student's Dilemma, there exists a specific goal that has no predefined utility: that of slack. However, some players still chose advancement along the slack path as their primary objective, only putting in minimal advancement required along the project path. These players generally realized that the slack path offered no real reward in the end, but still chose to go along with it out of a sense of fun.

The players of the game were almost all WPI undergraduates or alumni, and so the game's presentation, the project scenario, was familiar. Players, however, often did not act in the same manner that they would have were it a real life situation, that is, they chose to pursue strategies that they knew were not optimal. Even players with prior game theory knowledge did not change their actions or their strategies towards maximizing their utility as defined by the game's framing scenario (project work). Each player chose his or her own way of playing the game, but was consistent with the chosen goals.

Players also tried to form alliances with each other, even if unable to communicate (such as in the blind games). The players would try to get a feel for how the others played, and set up their actions such that they could both get the best possible payoffs (even if not the rational choice for the actions). Players would often test the others by making a risky choice (such as cooperation in the Prisoner's Dilemma game), to show their willingness to cooperate even if it did put them at risk. During the blind games, players often expressed their disappointment at being unable to communicate with the others, but even so, still attempted to communicate through their actions. Cooperation, even if not the rational choice, was still what most players aimed for.

Conclusions

Game theory has traditionally provided tools to analyze strategies in competitive decision making and is increasingly being applied to help understand real world situations. There has been some disagreement over what game theory research is trying to accomplish, beyond mere analysis or prediction, in terms of its practical application. Since game theory has become a significant tool for serious decision makers, in the future it should necessarily move toward capturing other elements of human behavior, such as notions of fair play, altruism, strategic teaching, and values of interaction.

The purpose of this project was to improve our understanding of the relationships among play, games, game theory, and rationality so as to further a more comprehensive view of decision making processes. Our approach included background research on these topics, identifying many key terms and issues and their contributions, the formulation of a hypothesis extending the classical definition of rationality, and experimentation on this new premise.

The "play rationality" hypothesis postulates that play is an important decision making factor to consider in analyzing strategic human behavior. Play rationality is inclusive of peoples' real and complex goals and factors that play introduces to decision making, allowing for a more comprehensive analysis of behavior. We have explored it with regard to traditional game decision theory and conducted our own experiment to survey its observable impact.

People's values and priorities are reflected in their decisions. The Student's Dilemma game and experiment shows how they can learn about game theory, their own decision making process, and the role of play therein.

Learning these subjects may or may not change people's strategic behavior, as observed by Rubinstein. Most students recognize and prefer optimal strategies within the Student's Dilemma game, and some modify their behavior accordingly. Those who do not revise their behavior, instead favoring a self directed goal of fun or learning for example, are evidence of play rationality at work.

Game theory has found some definite problems with classic models of rationality, such as the backward induction paradox, and will likewise continue to modify its notion of rationality. Similarly, economics has adopted risk-aversion into its model of rationality because it more accurately depicts real world behavior. Some alternate models of rationality are useful because they capture extra elements that impact the decision making process. The play rationality hypothesis does not yet provide a concrete revision to modern game theory's rationality model, but it may be this important play factor that is considered for inclusion in the model in the future.

We have shown the relevance of play as a factor affecting decision making and examined the "play rationality" hypothesis as an initial attempt to evaluate the situation with the traditional tools of game theory. The Student's Dilemma game and experiment follow accordingly, providing both means to teach these concepts and observe their practical implications.

Future work on the play rationality model is needed in order to realize its potential. The specific modes and methods of play behavior warrant study so they can be recognized and dealt with practically in decision making applications. Toward this end, additional experiments with games such as the Student's Dilemma may allow a more rigorous examination of play rationality in practice. New games may also be developed to test specific issues that play raises in decision making, such as alternate player priorities like competition and learning. Lastly, the social implications of play rationality are largely unexplored and may be important in understanding its causes and the ramifications.

Glossary of Rationalities

[classic] rationality: logic dictating the path to mathematically optimal outcomes in a decision process

play rationality: rationality which considers a larger context than just winning the game, such as fun, learning, tension, and related elements

play irrationality: the recognition that "to play" is an irrational decision, since it is not strictly necessary for survival and serves no external purpose, and therefore the logic of play must be extra-rational

metarationality: formal rational analysis of the rationalities of all possible assignments of goals or priorities

Appendix : Game Results and Comments

Here we list the moves and actions that made up each of the games, as well as the players' comments on the games.

We use the following abbreviations to show what the moves and actions were:

Letter	Move
P	Project
G	Game
S	Slack

Letter	Action
P	Project Meeting
D	Deadline Extension
C	Chicken
A	Apathy

Game 1

Turn Moves

	Green	Blue	Red	Yellow
1	S	G	P	G
2	P	P	P	P
3	G	S	P	S
4	S	P	P	P
5	S	S	G	S
6	P	P	P	P
7	S	G	P	P
8	S	P	P	G
9	P	P	P	G
10	P	G	P	G
11	P	P	P	P
12	S	P	P	P
13	S	P	P	G
14	P	S	P	P
15	S	P	P	P
16	S	P	P	P
17	S	P	P	P
18	S	P	P	P
19	P	G	P	P

Turn Actions

	Green	Blue	Red	Yellow
1	A	C	None	C
2	P	D	P	D
3	C	None	C	A
4	A	C	A	D
5	None	C	P	C
6	D	D	None	D
7	C	A	D	P
8	None	D	None	C
9	None	D	D	A
10	C	C	P	D
11	A	A	P	A
12	A	P	P	D
13	C	P	C	A
14	D	C	D	C
15	C	D	C	A
16	A	P	D	P
17	A	C	P	P
18	A	D	A	D
19	A	A	D	C

Game 1 - Comments

Following are photocopies of the original player comment sheets.

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment
1	Slack	Apathy-Red	Slacked A lot. Just like the beginning of school
2	Project	Project Meeting -Blue	He didn't even show up to the meeting! Figures. Why do I even bother? At least we got an extension from the advisor. Time to drink!
3	Game	Chicken -Yellow	Should Get some Work Done. But... Pints...
4	Slack	Apathy-Red	I should do some work, but we got plenty of Time...
5	Slack	Sleep!	The week after Midterms? I'm relaxing
6	Project	Deadline EXT - Red/Yellow	I can't believe they bailed on me! Screw 'em the whole group can fail...
7	Slack (Double!)	Chicken - Sleepy Yellow	Wow, a nice Productive week
8	Slack	Nothing	Ah... Still got a little work done
9	Project	Nothing	I Still pull my weight... sorta, mostly
10	Project	Chicken - Blue	
11	Project	Apathy -Red	I can't believe they interrupted my Slack Time. We're doing fine on the project
12	Slack	Apathy -Red	
13	Slack	Chicken -Yellow	
14	Project	Deadline -Blue	
15	Slack	Chicken -Yellow	We are SO set. We can coast for the rest of the Project
16	Slack	Apathy-Red	
17	Slack	Apathy- Yellow	We've already passed...
18	Slack	Apathy -Yellow	
19	Project	Apathy -Yellow	Last Ditch
20			
21			
22			

40 Proj 1 Game 40 Slack

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?

  I was simulating my junior year. It was mostly playing, but it also helped for perspective on that year

- What were the best methods of action to take for the following action cards:
  - Project Meeting Defect
  - Apathy Defect
  - Deadline Extension Cooperate
  - Chicken Cooperate

- Do you think these methods of action gave you an advantage over the other players?

  No. They did not always go for maximum gain vs maximum relative gain.

- Can you recognize any parallels between the action cards and other real life situations?

  It was remarkably like my first MQP.

- Did you enjoy the game or not? Why?

  It was amusing to remember project group activities in a game format.

- Did you learn anything from the game? If so, what?

  Slack didn't make a big difference in keeping me passing in the proje

- Do you think this subject matter makes a board game? Why or why not?

  for WPI Students... yes.

- Were your decisions affected in any way by knowing the players beforehand?

  Nope.

- Do you think that you would have acted differently were this a real situation instead of a game?

  No. This pretty accurately represented my junior year. Includ the drunkenness

By figuring that the initial action didn't mean as much as the interaction I used the interactions to get ahead and the initial action to get ahead in class while everyone else ignored it. I still got a B in project...

Strategy: Never Risk a Zero Gain

1) who will I cooperate on a challenge the way I want them to?

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment
1	1 Game	Chicken Green	+1 Project (IC, GD) (Challenged by Blue, Chicken, ID, BC, +3any, 1project 2game
2	1 Project	Deadline Ext. Red	+3 any (IC, RC) 1slack, 1Project, 1game (challenged by Red, Proj Meet, IDRC, +2any, 1game 1project
3	1 Slack	Apathy Green	+2 any (ID, IGD) +1 Project +1Slack (Challenged by Green, Chicken, ICGC, +2project
4 +1 Turn	1 Project	Deadline Ext Blue	+2any (ID BC) +1 Project +1game no challenges
5	1 slack	Chicken Green	Slept through +2any, 1Game 1Project Challenged Blue, ICBC, +2Project | Ch. Red Chicken, IDRC,
6	1 Project	Deadline Ext Red	+2any (IDRC) +2 Project Challenged by Green, ProjExt, IDGC, +2any 1Game 1slack
7-2 Turns	1 Project	Proj Meet Green	+2any (IDGC) 1Project 1Game Challenged by Green, Chicken, ICGC, +2project
8	1 Game	Chicken Blue	+1project (IDBC) No challenges
9	1 Game	Apathy Green	+2Project (IDGD) +2any Ch. by Red Proj Meet ICRC, +2 project
10	1 Game	Deadline Ext Red	+2any (ICRD) STUPID!!! No Challenges
11	1 Project	Apathy Blue	+2any (IDBD) 2 Project
12	1 Project	Deadline Ext. Green	+2any IDGC, 2project +2any 2 proj Chal. by Blue, IDBC, +2any, 2project | Ch. Red Proj ext IDRC
13	1 game	Apathy Green	+2any 2project IDGD ch. by Green, Chicken, ICGD, 1project
14	1 project	Chicken Red	+2 proj ICRC ch. by Blue, Chicken, ICBC, 2project
15	1 project	Apathy Blue	+2any 2project IDBD Chal. by Green, Chicken, ICG●, +2 project
16	1 Project	Proj Meet Green	Chal by Red Proj Ext ID 1proj
17	1 project	proj meet blue	
18	1 project	deadline ext green	
19	1 project	chicken green	
20			
21	(Rnd 16)		Only
22	(Rnd 15)		Will not beat Red directly, must challenge others pref. Blue

5

11

3game 2project
5project 1s
5game
8project 3 s
5game
10project 3s
6game
13project 4 s
7game
16project 5 s
8game
20project 5
9game
21 Project 5
10game
25 project 5
10game
25 project 5
11game
28 project 5
11game
35 project 2
11game
38 project 5
12game
43 project
12game

Punished for Gaming -1
Risked, ~~Lost! HA!~~ trying to win back points

(filling in for player because she got tired)

1) Use Move to steadily gain on Game board
2) use Action(s) to gain faster on Project
3) Slack not worth it

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?

  My strategy was to consistently choose the option that would guarantee me at least some gain. When choosing the ratio of action cards at game setup I didn't fully understand the proportionality of the resolution system, so my action set was somewhat less desirable as the game moved along and I realized my game was suffering from lack of favorable actions.

- What were the best methods of action to take for the following action cards:

  For each action, the "best" method was the one that gave me at least some points, and then the one that gave my opponent points as well. Rather than look at the individual challenge grids, the strategy can be summed up in one statement: When I was challenged, I scanned the possible resolutions (2 sets) depending on what the other player could choose, and then chose the outcome that guaranteed me at least some points; when I was doing the challenging, I chose actions that had the strongest possible outcome for me regardless of what my opponent could choose.

- Do you think these methods of action gave you an advantage over the other players?

  I think that this method gave me a slight advantage over most of the other players. All of us, except for Noah, were at heart selfish players who were interested in besting the others in the game. Noah, on the other hand, seemed to choose actions that would always maximize everybody's gain, even at the risk of gaining nothing for himself if the opponent chose to screw him (which I was forced to do from time to time due to the strategy I chose to hold to). The outcome showed that, while Noah did indeed have more points overall, he chose to sink most of them into Slack and therefore did not get ahead of the pack in either Game or Project. The other two players were behind me in both Game and Project by the end of the night. So, it seems that the strategy worked, mostly because the other players were deficient in points but also because Noah "wasted" his extra points in Slack. One part strategy, one part execution.

- Can you recognize any parallels between the action cards and other real life situations?

  At the time, I had a vague idea that there were parallels to real-life logic puzzles, but it wasn't until after the game when they were discussed that I recognized the theory behind the challenge design. Sometimes the brain just can't put two and two together very fast (especially when it's getting very, very late and I have to try and stay sharp enough to drive home at O'Dark:30am).

- Did you enjoy the game or not? Why?

  I enjoyed the game very much. It was a good exercise to meticulously record everything that happened in the course of the game; it probably sounds silly but from time to time it's good to stretch one's ability to observe, and write, and develop strategy, and gauge progress against other players, at the same time. Besides, good company is always fun no matter what the activity.

- Did you learn anything from the game? If so, what?

  I learned that it's been a long time since I've thought about logic puzzles. I was reminded that people's motivations are usually apparent as long as you're looking to see them. I recognized that a game such as this is not dissimilar to the game one plays in the job market, or the stock market, or any host of other situations; wherever a known set of outcomes is based on multiple persons' inputs, one has to judge what the best outcome could be given the nature/disposition of the other persons involved. It was also interesting to see confirmed, at least in this game, that faithfully watching out for one's own interests will pay off in the end.

- Do you think this subject matter makes a good board game? Why or why not?
  I think it's quite a good subject matter for a game to WPI students. With a bit of editing (reworking the interface to make it more engaging/entertaining), it could even be turned into an interesting board game for a broader population of players.

- Were your decisions affected in any way by knowing the players beforehand?
  No, but my decisions were very strongly affected as the game progressed and I watched how the other players were carrying through on their strategies (or lack thereof). Choice of action cards and who to challenge became very dependent on what I had observed the other players do during the course of the earlier rounds.

- Do you think that you would have acted differently were this a real situation instead of a game?
  No. I stuck with the "selfish" strategy because, in general, it's what I tend to do. As long as my own interests are covered (be it my own projects at WPI, or my job, or just about anything else), I prefer to see other people profit/succeed along with me. However, the human condition being what it is, very often it is another person's direct goal to see that you don't profit/succeed; because this is so often the case, it is best to keep self-interest at the forefront of decision-making. After all, it's very rare that someone else will have your best interests at heart.
  (And, incidentally, when I was really in school my life played out much like this game did – I aced all my projects and ran a very large and successful game, and still managed to graduate on time. Much like this game here, I put very little time into slack as the years progressed until, during senior year, I was never seen because there was so much work to do. So to answer the question a different way, no, I would not/ did not act differently when this was a real situation.)

Good job Seth!

Best of luck on your project.

:) Jamb.

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

I am blue

Turn	Move	Action	Comment
1	G 1	chicken yellow	too many cards
2	P1+2 +3	deadlineg	
3	S	none	checking the win/loss charts is good
4	P	chicken red	cooperating on chicken always wins
5	S	chicken yellow	
6	P	extension green	would have punished Wodh if he got in sloc
7	G	Apathy green	~~Deadline extension~~ = prisoners dilema
8	P	deadline red	project mtg.
9	P	deadline green	
10	G	chicken green	2 chickens defected, bad move
11	P	apathy red	Always defect meetings & apathy
12	P	meeting yellow	Always cooperate chicken & deadline
13	P	meeting red	Gained considerably following above is
14	S	chicken yellow	
15	P	deadline green	everyone else groks rules too, point distr
16	P	meet yellow	decline when offered chicken
17	P	chicken red	
18	P	deadline yellow	
19	G	Apathy red	
20			
21			
22			

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?

  Started just playing, shifted to logical once I got the hang of it.

- What were the best methods of action to take for the following action cards:
  - Project Meeting Defect
  - Apathy Defect
  - Deadline Extension Cooperate
  - Chicken Cooperate if offering, Defect if offered

- Do you think these methods of action gave you an advantage over the other players?

  Only slightly, they figured it out too. if at all

- Can you recognize any parallels between the action cards and other real life situations?

  Not clearly, Real World social interactions rarely have quantifiable payoffs

- Did you enjoy the game or not? Why?

  yes, but card & stat management was a little annoying. Interesting psychological strategy

- Did you learn anything from the game? If so, what?

  Small constant gains are a better strategy than big risk/rewards, people don't always follow logical

- Do you think this subject matter makes a board game? Why or why not?

  yes, I enjoy this kind of puzzle, & the game adds an interesting social/psychological element e.g. guessing other peoples strategy.

- Were your decisions affected in any way by knowing the players beforehand?

  Not really, I didn't know them.

- Do you think that you would have acted differently were this a real situation instead of a game?

  I would have worried more, but I would th to do some risk/benifit and loss/win thinking to decide logically

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment
1			
2			Project meeting Yellow
3			Chicken Green
4			Apathy Green
5			Project meeting Yellow
6			
7			Deadline extension (Blue)
8			
9			Deadline Extension (Green)
10			Project Meeting (Yellow)
11			Project Meeting (Green) Run Step... Woah no St... n/a
12			Project Meeting
13			Chicken
14			Deadline extension (Green)
15			Chicken (Blue)
16			Deadline Extention (Yellow)
17			Project meeting (Blue)
18			Apathy (Green)
19			Deadline Extention (Yellow)
20			
21			Make point system more clear Player 1 Player 2 Lower point game by turn 15
22			everyone have figured it out

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?
  Observe people's habits by taking repetative risks to learn pattern

- What were the best methods of action to take for the following action cards:
  - Project Meeting
    Denial
  - Apathy
    Depends on Player
  - Deadline Extension
    Denial (evil)
  - Chicken
    Acceptance
- Do you think these methods of action gave you an advantage over the other players?
  Some, over Blue + Green.

- Can you recognize any parallels between the action cards and other real life situations?

- Did you enjoy the game or not? Why?
  Game is enjoyable 20 turns is a long length because by turn 15 everyone Defects on everything but chicken
- Did you learn anything from the game? If so, what?

- Do you think this subject matter makes a board game? Why or why not?
  Makes a good one but because after first turn the game is figured out

- Were your decisions affected in any way by knowing the players beforehand?
  Did not know anyone very well except Noah
  Knowing Noah a bit helped alot in challenges
- Do you think that you would have acted differently were this a real situation instead of a game?
  No, I am truly a boring person

Game 2

Turn Moves

	Green	Blue	Red	Yellow
1	P	G	G	P
2	G	S	S	S
3	P	P	G	P
4	P	P	P	S
5	P	P	P	G
6	S	G	P	S
7	P	G	P	S
8	P	S	G	S
9	S	P	S	S
10	P	P	G	P
11	P	P	P	P
12	P	P	S	P
13	P	G	P	S
14	P	G	P	P

Turn Actions

	Green	Blue	Red	Yellow
1	C	D	A	P
2	P	D	C	None
3	None	C	P	D
4	P	A	P	D
5	A	A	P	A
6	P	A	C	D
7	P	C	D	D
8	P	A	A	D
9	P	A	A	C
10	P	A	D	A
11	P	A	D	C
12	P	A	C	C
13	C	A	C	D
14	P	A	A	D

Final Results

	Project	Game	Slack	Total
Green	37	4	8	49
Blue	27	12	17	56
Red	26	12	17	55
Yellow	32	6	13	51
Total	122	34	55	211

Game 2 – Comments

Following are photocopies of the original player comment sheets.

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment
1	P	C (red) C C	
2	G	PM (blue) C C	
3	P		
4	P	PM (yel) C, P (red)	
5	P	A P P (red)	
6	S	PM (red) C, C	
7	P	PM (blue) C C	
8	P	PM (red)	
9	S	PM (yel)	
10	P	PM (red) D, C	
11	P	PM (red) D, sleep	
12	P	PM P, P (red)	
13	P	C (yel) C, C	
14	P	PM (blue)	
15			
16			
17			
18			
19			
20			

Player / Color: brera
Game:
Date: 4/10

P: 37
C: 8

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?

  Actions— don't do things that can lose lots of project you points

- What were the best methods of action to take for the following action cards:
  - Project Meeting
    D
  - Apathy
    D
  - Deadline Extension
    D
  - Chicken
    C
- Do you think these methods of action gave you an advantage over the other players?

  No

- Can you recognize any parallels between the action cards and other real life situations?

  somewhat

- Did you enjoy the game or not? Why?

  Yes; nothing else to do

- Did you learn anything from the game? If so, what?

  Project most important

- Do you think this subject matter makes a board game? Why or why not?

  No; too traumatic

- Were your decisions affected in any way by knowing the players beforehand?

  At first
  Then I realized it wasn't relevant

- Do you think that you would have acted differently were this a real situation instead of a game?

Yes.

(Think my opponents would have too).

Don't really think it adequately represents real life.

Role of sleep definitely strange.

P 32
G 6
S 13

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment
1	P	PM(G)	
2	S	——	
3	P	DE(G)	
4	S	DE(B)	
5	G	A(G)	
6	S	DE(R)	R plays random
7	S	DE(Y)	
8	S	DE(G)	
9	S	C(R)	G play to avoid being screwed
10	P	A(R)	
11	P	C(G)	That worked!
12	P	C(G)	not this time.
13	S	DE(B)	
14	P	DE(B)	
15			
16			
17			
18			
19			
20			

Player / Color: Kate - Yellow
Game:
Date: 4/10/02

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?
  Tried to get values equal with resources because it seemed reasonable
- What were the best methods of action to take for the following action cards:
  - Project Meeting
    depends on player
  - Apathy
    D always
  - Deadline Extension
    C is with B, otherwise about even
  - Chicken
    C with G, otherwise ~~random~~ C
- Do you think these methods of action gave you an advantage over the other players?
  not really, because I'm too cooperative, probably could have done better with cooperative players
- Can you recognize any parallels between the action cards and other real life situations?
  yeah, project meetings are just like real life ones
- Did you enjoy the game or not? Why?
  yes was interesting probably wouldn't want to play many times though
- Did you learn anything from the game? If so, what?
  yes, most people aren't inclined to cooperate as much as I am, moreover randomness inspires randomness.
- Do you think this subject matter makes a board game? Why or why not?
  not especially, to close to reality without enough humor
- Were your decisions affected in any way by knowing the players beforehand?
  no

- Do you think that you would have acted differently were this a real situation instead of a game?

slightly, would have punished people for not being cooperative

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment
1	G	Ap D	Blue
2	S	Ch D	Yellow
3	G	[illegible] D	Green
4	D	PM C	~~Gree~~ Blue
5	D	PM C	Yellow
6	P	Ch C	Green
7	D	DE D	B
8	G	Ap S	y
9	S	Ap C	G
10	G	DE C	R
11	P	DE	G
12	S	Ch	G
13	D	Ch	B
14	P	Ap	y
15			
16			
17			
18			
19			
20			

Player / Color: Red
Game:
Date:

26 project
17 stack
12 game

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?

  Random, because someone should.

- What were the best methods of action to take for the following action cards:
  - Project Meeting Random
  - Apathy Random
  - Deadline Extension Random
  - Chicken Random

- Do you think these methods of action gave you an advantage over the other players?

  No

- Can you recognize any parallels between the action cards and other real life situations?

  I sleep through apathy.

- Did you enjoy the game or not? Why?

  Sure

- Did you learn anything from the game? If so, what?

  Random Loses

- Do you think this subject matter makes a board game? Why or why not?

  Needs more cat cards

- Were your decisions affected in any way by knowing the players beforehand?

  No.

- Do you think that you would have acted differently were this a real situation instead of a game?

yes!

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment
1	G	D on Y	Both actions resulted in profit
2	S	D on R	Yay profit!
3	P	C on G	Screw
4	P	A on B	Profit, Profit, Screw
5	P	A on Y	Apathy is broken- there is no reason for C
6	G	A on R	
7	G	C on G	
8	S	A on R	Slept on!
9	P	A on G	
10	P	A on R	R never plays C on my As.
11	P	A on Y	
12	P	A on R	
13	G	A on R	
14	G	A on R	
15			
16			
17			
18			
19			
20			

Player / Color: Greg / Blue
Game:
Date:

27 P
12 G
Score 17 S

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?

- What were the best methods of action to take for the following action cards:
  - Project Meeting
    C — Play C until they don't trust you.
  - Apathy
    D
  - Deadline Extension
    C, sometimes D
  - Chicken
    C, sometimes D

- Do you think these methods of action gave you an advantage over the other players?
  I've always been in the top 2 in all 5.

- Can you recognize any parallels between the action cards and other real life situations?
  Oh yes.

- Did you enjoy the game or not? Why?
  Yes.

- Did you learn anything from the game? If so, what?
  Don't Keep a copy of all your files. Over-specialize.

- Do you think this subject matter makes a board game? Why or why not?
  It definitely reflects the day-to-day drama of college.

- Were your decisions affected in any way by knowing the players beforehand?
  I knew that Craig might help me.

- Do you think that you would have acted differently were this a real situation instead of a game?

I probably wouldn't delete any Project files.

There is no way for Leslie to get more done

Game 3

Turn Moves

	Green	Blue	Red	Yellow
1	G	G	G	S
2	S	S	S	G
3	P	G	G	G
4	P	P	P	P
5	G	P	P	P
6	P	P	P	P
7	S	G	P	G
8	P	G	P	P
9	P	P	P	P
10	P	P	P	P
11	G	P	P	G
12	P	S	S	G
13	G	P	G	G

Turn Actions

	Green	Blue	Red	Yellow
1	A	C	A	A
2	C	C	None	C
3	P	C	C	C
4	C	C	P	D
5	D	P	P	P
6	C	C	P	C
7	D	P	C	D
8	None	C	P	C
9	None	P	D	A
10	None	None	C	C
11	C	None	D	P
12	P	None	A	C
13	C	None	P	C

Final Results

	Project	Game	Slack	Total
Green	25	17	9	51
Blue	17	3	5	25
Red	45	4	6	55
Yellow	25	15	2	42
Total	112	39	22	173

Game 3 – Comments

Following are photocopies of the original player comment sheets.

Score - P - 25
S - 2
G - 15
Total - 42

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment
1	black	Apathy	
2	game	chicken	
3	game	Chicken	
4	P	D	
5	P	M	
6	P	C	No points in work project
7	P	D	
8	P	C	
9	P	A	
10	P	C	
11	G-	M	
12	G-	C	Score on Mike ever!!
13	G	C	
14			
15			
16			
17			
18			
19			
20			

Player / Color: Edwin / Yellow
Game: 3
Date: 4-11-02

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?
  "just playing" - I wanted to have fun at it
- What were the best methods of action to take for the following action cards:
  - Project Meeting - C
  - Apathy - D
  - Deadline Extension - C
  - Chicken - deflect
- Do you think these methods of action gave you an advantage over the other players? Playing on chicken usually did
- Can you recognize any parallels between the action cards and other real life situations?
- Did you enjoy the game or not? Why?
  Yes, the race to dress the best Arson doesn at the end was fun
- Did you learn anything from the game? If so, what?
  if you count for someone else to do something in the project, you will get burned.
- Do you think this subject matter makes a board game? Why or why not?
- Were your decisions affected in any way by knowing the players beforehand?
  No

I wanted to do recently on the project while still preparing for the tournament.

There is always someone who has no life and works on the project, and there is always someone who has no life and does absolutely nothing.

- Do you think that you would have acted differently were this a real situation instead of a game?

  slightly. I might have actually shooked more. God damn computer... never works when ya need it.

[redacted]

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment		Hel	
1	G	Chicke	Mike and I Both got 2 Project	C	C	
2	S	Chicken	Daren I get 1 project	C	D	
3	G	Chicken	Daren Nothing happens	D	D	
4	P	Chicken	Mike Nothing	D	D	Got 2 Project from Mike Meeting
5	P	Meet	Edwin I Any?	D	D	
6	P	Chicken	Edwin	C	D	
7	G	Meet	Edwin	D	C	
8	G	Chicken	Edwin Sabotage mike w/chicken	D	D	
9	P	Meet	Mike	C	D	Make up
10	P		Gonna sleep			
11	P					
12	S		Slot Monitor			
13	S					
14						
15						
16						
17						
18						
19						
20						

working against others early hurt me Now Nobody trusts me

Player / Color: Blue
Game: 3
Date: 4/24/02

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?
  I Burnt the other players in the beginning then nobody would work with me
- What were the best methods of action to take for the following action cards:
  - Project Meeting
    Work with the other players : C
  - Apathy
    Didn't Play
  - Deadline Extension
    Didn't Play
  - Chicken
    Play a C
- Do you think these methods of action gave you an advantage over the other players?
  No, I lost
- Can you recognize any parallels between the action cards and other real life situations?
  Working with other people is better than alone
- Did you enjoy the game or not? Why?
  No, it's too close to my real life which I hate.
- Did you learn anything from the game? If so, what?
  Yes, I need to change
- Do you think this subject matter makes a board game? Why or why not?
  Yes, Good for freshmen to play
- Were your decisions affected in any way by knowing the players beforehand?
  No

Final 3 Game 5 slack 17 project

Total : 25 pts

- Do you think that you would have acted differently were this a real situation instead of a game?

Unfortunately, No.

I'm sort of a loner, Working together doesn't really work for me.

Slack 4
Game 6

Disagreeing
3 bad fr ang Jake who agrees

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment
1	6	apathy	
2	5	~~loop~~	
3	6	chic	
4	P	proj	Stupid mike didn't show... Then did the proj.
5	P	proj	Hunted mike down made him
6	P	proj	HA!!! I called a meeting and
7	P	Chick	Extensions all round
8	P	proj	That's it.. Mike didn't show
9	P	EXT	
10	P	Chick	
11	P	EXT	
12	S	Apathy	
13	6	meet	
14			
15			
16			
17			
18			
19			
20			

Player / Color: mike / red
Game: 3
Date: 4/11/02

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?
  Just playing. I opted for Project cards & tried to work w. others
- What were the best methods of action to take for the following action cards:
  - Project Meeting
    D
  - Apathy
    D
  - Deadline Extension
    D
  - Chicken
    C
- Do you think these methods of action gave you an advantage over the other players?
  yes
- Can you recognize any parallels between the action cards and other real life situations?
  yes I like how you get more from disagreeing to apathy
- Did you enjoy the game or not? Why?
  I liked it, I got an A by merely paying points to proj
- Did you learn anything from the game? If so, what?
  yup how to make the system work
- Do you think this subject matter makes a board game? Why or why not?
  I think so, since you learn from it
- Were your decisions affected in any way by knowing the players beforehand?
  Not really, I hope not.

I would get paying

- Do you think that you would have acted differently were this a real situation instead of a game?

Yes. I wouldn't be as much of an ass.

If people match they get the same better if C worse if D

If they don't C usually gets zero and D gets a lot

pick D if anything but Chicken

and you will tie or win if chicken pick and you won't do too badly

During the Game

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment
1	G	A	
2	S	C	
3	P	P	Games are Bad
4	P	C	I Played games
5	G	D	
6	P	C	Always Disagree on chicken
7	S	D	cooperating can hurt
8	P		like extention
9	P		No Actions is interesting
10	P		
11	G	C	
12	P	P	
13	G	C	
14			
15			
16			
17			
18			
19			
20			

Player / Color: green
Game:
Date: game 3

Slack : 9
Game : 17
Project : 25

After The Game

Please answer the following questions:

- Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?

  I was Trying for 2nd in Project and 1st in other 2.

- What were the best methods of action to take for the following action cards:
  - Project Meeting
    - not sure
  - ✓ Apathy
    - and Disagree
  - Deadline Extension
    - both agree but Play on
  - Chicken
    - someone you don't competing wi
    - Try to get them to agree then Disag

- Do you think these methods of action gave you an advantage over the other players?

  Yes

- Can you recognize any parallels between the action cards and other real life situations?

  yes People Blow each other off all the time

- Did you enjoy the game or not? Why?

  it was good to help a friend.

- Did you learn anything from the game? If so, what?

  not much APathy was good but didn't have

- Do you think this subject matter makes a board game? Why or why not?

  It could, if it were more up to chance Many Part. in it

- Were your decisions affected in any way by knowing the players beforehand?

  Yes I knew one of them He likes to cooperate so I used him to Agree with me while I did not.

- Do you think that you would have acted differently were this a real situation instead of a game?

yes I wouldn't have hindered People as much.

I figured that someone would go all out for Project so I was hoping to get 2nd in it and 1st in the rest.

I stopped Playing actions for 2 turns. That hurt me so I Played actions after that.

I Watched one Player to try and see what he would do. Then Played off of that.

Blind Game 1 - Results

Turn Moves

	Green	Blue	Red
1	P	P	P
2	P	G	P
3	G	P	P
4	P	P	P
5	G	P	P
6	P	P	P
7	P	P	G
8	P	P	G
9	P	P	G
10	P	S	G
11	P	P	P

Turn Actions

	Green	Blue	Red
1	A	D	C
2	A	D	A
3	P	A	P
4	D	C	A
5	D	A	A
6	D	None	A
7	D	A	D
8	C	P	A
9	D	A	D
10	D	A	A
11	A	A	C

Final Results

	Project	Game	Slack	Total
Green	35	12	-1	46
Blue	35	6	6	47
Red	35	5	2	42
Total	105	23	7	135

Blind Game 1 – Blue Comments

Please answer the following questions:

Which sort of strategy did you use? One that was more logical, or one that was "just playing" Why did you choose this strategy?

somewhere between logical
and vengeful. I reacted to the other players modes.. and worked the same as them. except more conscious of the other categories
What were the best methods of action to take for the following action cards:

Project Meeting

usually d but if it seemed we were bother attacking
the same person I would go for c

Apathy - d got more points but I think I should be allowed to be a slacker.. so bleh to you

Deadline Extension - I'd go for d.. except when the person challenging with me needed the points as much as I did..

Chicken - c

Do you think these methods of action gave you an advantage over the other players?

would have to work with another play to get an advantage over another one.. mostly I was just doing what would benefit me most no matter what they said..

Can you recognize any parallels between the action cards and other real life situations?

yes but I see them differently

Did you enjoy the game or not? Why?

it was sorta confusing and I wanted ice
cream. but I started to get it.. I think I would like it more if I knew who I was playing with.. and could compensate more.. cause just guessing their goals got annoying..

Did you learn anything from the game? If so, what?

I learned that Seth owes me BIG time.. hehe.. nah. um.. I learned that some people want to have the best work at the sacrifice of everything else..

Do you think this subject matter makes a board game? Why or why not?

sorta..
but it would need to be clarified more.. I realize its still a model so its
cool

Were your decisions affected in any way by knowing the players beforehand?

I didn't know them. but if I did they would be

Do you think that you would have acted differently were this a real situation instead of a game?

yup.. I'd be much more lazy.. cause I would know all that was expected me... and just do what I had to.. hehe..

Blind Game 1 – Green Comments

Please answer the following questions:

which sort of strategy?
revised minmax for the most part. logical. why did i choose it? because it works for this sort of dealie. :)

best methods for cards:

project meeting: choose D.
apathy: choose D.
deadline extension: choosing D is better, because at worst youll get 1any,at best you get 2 any, but you get no 0s.
chicken: choose C.

do i think they gave me an advantage?
i did win the game tournament and tie for winning the project...

parallels?
everything is a tradeoff in a sense. most situations in which you have to give an advantage in one thing for a disadvantage in another can be minmaxed or otherwise linprogged.

did i enjoy the game?
i was amused by it. it was long. it would have been more fun if we could have talked with the other players, made agreements, etc. the game would be very different tho if we did.

did i learn anything?
i learned which players to do which sorts of agreements with...

does it make a good board game?
if youre a math major or enjoy playing with probabilities, yes. i thought it was fun.

i didnt know the players beforehand so i cant answer that question.

would i have acted differently irl?
interesting question. there tends to be more data than a 2x2 matrix can handle in real life. :) in that sense, yes. in the sense of minmaxing, i would have acted pretty much teh same.

green (me) : 7 project 1 game 2 slack

red: 6 project 2 game 2 slack
blue: 3 project 3 game 4 slack

10 deadline extension / 4 meeting
2 chicken
2 apathy / 2 sleep

turn 1 random event: -2 turns (total turns now 13)
pick move project/game/slack

move 1
project

red: project blue: project green: project

pick deadline extension against blue.
pick C. (if C, 3 any, if D, 2 any)
blue plays apathy on me:
pick D. (if C, 3 any, if D,0 any)
blue picks C for deadline extension. (3 any moves)
move 3 along project. (project 3, game 0, slack 0)
blue picks C for apathy. (3 any)
move 3 along project. (project 6, game 0, slack 0)
move 1 on track because of project. (project 7, game 0, slack 0)

total: project 7 game 0 slack 0
9 d.e. 4 p.m. 2 c 2 a 2 s

end of turn 1:
red 4p/0g/0s blue 2p/0g/0s, green 7p/0g/0s
12 turns remaining

turn 2:
random event: none

move 2:
pick project

pick deadline extension against blue.
pick C. (if C, 3 any, if D, 0 any)
blue calls D on me. (0 any)
move 1 along project track (project 8, game 0, slack 0)

total : project 8 game 0 slack 0
8 d.e. 4 p.m. 2 c 2 a 2 s

end of turn 2:
red 7/0/1 blue 4/2/2 green 8/0/0
11 turns remaining

turn 3:
random event: none

move 3:
pick game

pick project meeting against red.
pick C. (if C, 2P, if D, 0.)
red picks D. (0)
move 1 along game track (project 8, game 1, slack 0)
blue calls apathy on me.
pick D. (if C, 3 any, if D, 2 any)
blue picks D. (2 any)
move 2 along project. (project 10, game 1, slack 0)

total: project 10 game 1 slack 0
8 d.e., 3 p.m., 2 c 2 a 2s

end of turn 3:
red 10/0/1 blue 8/2/3 green 10/1/0
10 turns remaining

turn 4:
random event: none

pick:
path project

pick d.e. against blue.
pick C. (if C 3 any, if D 0 any)
blue calls chicken on me.
pick D. (if C, 3 any, if D 0)
blue picks D for d.e. (0 any)
blue picks C for chicken (3 any)
path project gives project 11 1 0
move 2 along project, 1 along game : 13 2 0

total : project 13 game 2 slack 0
7 d.e., 3 p.m., 2 c, 2 a, 2s

end of turn 4:
red 12/1/1 blue 13/2/4 green 13/2/0
9 turns remaining

turn 5:
random event: none

move 5:
pick game.

pick d.e. against red.
pick C. (3 any/0)
red calls apathy.
pick D. (3any/2any)
blue calls apathy.
pick D. (3any/2any)
red picks C to d.e. (3 any)
red picks D to apathy (2 any)
blue picks D to apathy (2 any)
move on game. (13 project 3 game)
spend 4 on project, 3 on game. (17 project, 6 game.)

total: project 17 game 6 slack 0
6 d.e. 3 p.m. 2 c 2 a 2 s

end of turn 5:
red 16/1/1 blue 16/2/4 green 17/6/0
8 turns remaining

turn 6:
random move: none

move 6:
pick project.

pick d.e. with red.
pick C. (3any/0)
red picks C. (3 any)
move 1 from project path. (18/6/0)
move 2 project, 1 game. (20/7/0)

total: project 20 game 7 slack 0
5 de 3 pm 2 c 2 a 2 s

end of turn 6:
red 19/1/1 blue 17/2/4 green 20/7/0
7 turns remaining

turn 7:
random move: none.

move 7:
pick project.

pick d.e. with red.
pick C. (3any/0)
blue calls apathy.
pick D for apathy (3/2)
red calls d.e.
pick C for d.e. (3/2)
blue chose D. (2 any)
red chose C for one d.e. (3 any)
red chose D for other d.e. (0)
move 1 along project (21/7/0)
move 3 along project 2 along game (24/9/0)

total: 4de 3pm 2c 2a 2s

end of turn 7:
red: 23/2/2 blue 19/3/4 green 24/9/0

turn 8:
random move (-2 moves) total 11 moves:

move 8:
pick project.

pick chicken with blue.
pick D. (3/0)
blue calls p.m.
pick D. (2/1)
blue calls D on p.m (1 any)
blue calls C on chicken (3 any)
move 1 on project (25/9/0)

move 3 on project, 1 on game. (28/10/0)

total: 4de 3 pm 1c 1a 2s

end of turn 8:
red 25/3/2 blue 25/4/4 green 28/10/0
3 turns remaining

turn 9:
random move: no random (Total 11)

move 9:
pick project.

pick d.e. with blue.
pick D. (2/1)
blue picks D with deadline. (1)
move 1 on project (29/10/0)
move 1 on project (30/10/0)

total: 3de 3pm 1c 1a 2s

blue knocks me back one:
29/10/0

end of turn 9:
red 30/4/2 blue 29/7/5 green 29/10/0

turn 10:
no random:

move 10:

pick project.

pick d.e. with red.
pick C. (3/0)
red calls apathy.
pick D. (3/2)
blue calls apathy.
pick D. (3/2)
red calls D for d.e. (0)
red calls D for apathy (2)
blue calls D for apathy (2)

move 1 for project (30/10/0)
move 2 for project 2 for game (32/12/0)

end of turn 10:
red 34/5/2 blue 31/7/6 green 32/12/0

turn 11: (last move)
no random

move 10:
pick project.

pick apathy with blue.
pick D. (3/2)
blue calls apathy.
pick D. (3/2)
blue picks D. (2)
blue picks D. (2)
move 1 on project (33/12/0)
move 3 on project, 1 on game. (36/13/0)

blue knocks me back 1 in game. (36/12/0)
red knocks me back in project and slack (35/12/-1)

end of game:
red 35/5/2 blue 35/6/6 green 35/12/-1

Blind Game 1 – Red Comments

During the Game
Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:

Turn	Move	Action	Comment
1	project	chicken, blue	i went to punish right away, with D, blue played C, and i got 3 for anything and 1 for project. i put 3 toward project for an early head start.
2	project	apathy on blue	blue calls apathy on me, too. we both choose D, for a tie-game
3	project	deadline ext. on blue	green calls meeting on me, i choose to punish him with D. i win. blue picks
4	project	apathy on blue	D/D, +2/+2 i'm getting punished via cooperation by the other two guys... they're starting to work together now.
5	project	apathy on blue	green calls deadline, blue sleeps through. we both choose C, getting 3/3
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Player / Color: Red
Game: Blind Game 1

After The Game
Please answer the following questions:

Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?

I tried to alternate between cooperating and spoiling, so most of my energy went to figuring out which choice the other player would make when I posed a game to them. This worked pretty well, although I did miss some points because I was trying to gain the "trust" of the other player. In the end it paid off, but it might have been more useful to have better point values in the end.

What were the best methods of action to take for the following action cards:

Project Meeting

Attempt to hurt the other player by choosing D. The other player might try to be cooperative and choose C so we both gain, so I would choose D if that player was ahead of me. If that player was behind, I would choose C since that would retain the current margin, other things equal.

Apathy

Always choose D. It's the best option in any case, since both players choosing C is an unstable set of decisions. Who knows? The other player might be generous and pick C.

Deadline Extension

This was the hardest game to play. If I felt I was "trusted" by the other player, I would take C so we could both reap mutual gains and retain our current difference in score. If I felt trusted and it was the end of the game, I would attempt to get the 2,0 scoring to pull ahead some, particularly if I was behind that person. Once with each other player I signalled my willingness to cooperate by voluntarily taking a hit by choosing C.

Chicken

This game was fairly useless after the first two rounds. After that, it was disfavored because the incentives were so evenly matched for everyone to cheat, or to cooperate. I cheated early on once with this game, but avoided it for the rest of the game.

Do you think these methods of action gave you an advantage over the other players?

I think the primary effect was to keep me even with the other players. After 3 or 4 iterations the other two had established "trust" and were pulling ahead of me for two turns by cooperation on one or two of the games. This is what prompted me to make my "concession" by signalling cooperative mode. This had the effect of breaking their cooperation and getting me back into the game. In this respect, it did give me an advantage. On the other hand, until about half way through the game, my methods did not properly account for the effects of mutual gains resulting

from gaming with me, and once that was factored into my thought, I was able to stay basically even.

Can you recognize any parallels between the action cards and other real life situations?

Driving. You can sometimes gain extra "profit" by cutting someone off, but if you both try it you both lose.

Did you enjoy the game or not? Why?

Yes. I like this sort of thing. It is a chance to try and think 2 steps ahead about low-level psychology.

Did you learn anything from the game? If so, what?

Consider the gains others may make from neglecting your actions before you cheat. Punish early and punish often. At the end of the game, cheat since that won't affect any long-term gaming strategies toward your side, like mutual willingness to play a game with you.

Do you think this subject matter makes a board game? Why or why not?

Yes. It is like a board game where you can advance by cooperating with the other players, or by cheating them, in alternating fashion.

Were your decisions affected in any way by knowing the players beforehand?

I did not know them or even who they were.

Do you think that you would have acted differently were this a real situation instead of a game?

Yes. Cheating is not acceptable when there are real standards of conduct to be observed. If the game consists of figuring out when to cheat, then it is okay. Most of the real world is not like that, though.

Blind Game 2

Turn Moves

	Green	Blue	Red
1	S	S	P
2	P	P	G
3	G	P	P
4	G	P	G
5	P	P	P
6	G	P	G
7	G	S	P
8	P	P	G
9	G	P	P
10	P	G	P
11	G	G	P
12	G	P	G
13	G	P	P

Turn Actions

	Green	Blue	Red
1	A	A	None
2	C	D	C
3	D	A	A
4	P	D	C
5	A	P	C
6	A	P	P
7	A	C	C
8	A	None	D
9	C	A	C
10	A	D	None
11	C	A	C
12	C	P	D
13	C	A	P

Final Results

	Project	Game	Slack	Total
Green	11	25	3	39
Blue	31	7	2	40
Red	39	7	0	46
Total	81	39	5	125

Blind Game 2 – Blue Comments

Turn	Move	Action	Comment
1	move(slack);	action(apathy,green,D);	I have no idea what I'm doing.
2	move(project)	action(DE,green,C)	Hoping green'll take prior relationship and do the good thing. And he did. Rock.
3	move(project)	action(apathy,red,D)	Apathy makes a great introduction. Gonna try to pull red into a relationship with me. Bet green already does and that's why he's moving ahead. And it looks like it did. Red apparently had the same thought, with apathy played on me as well. With the way green's moving, my aspects for overall point win look iffy. Maybe I can just get the most in project.
4	move(project)	action(DE,red,C)	Testing relationship with red... Looks like it's there, but not completely. And green's just funny. And a poopy-head.
5	move(project)	action(PM,red,C)	No clue what to do this move. red's a whore.
6	move(project)	action(PM,green,D);	
7	move(slack)	action(chicken,green,C)	Gotta move forward in the other areas now. Screw niceness with either one.
8	move(project);	action(pass);	
9	move(project);	action(apathy,green,D)	I have no clear plan at all at this point.
10	move(game)	action(DE,green,C)	If green is mean, out of band punishment. Green's now officially an outlaw.
11	move(game)	action(apathy,red,D)	And green just doesn't know when to stop.
12	move(project);	action(PM,red,D)	I'm operating in a hostile environment now.
13	move(project)	action(apathy,red,D)	Last turn. Go for a sure thing, then knock down green with leftovers. And we did. They all killed me. Looking back, I should have let it go, and screwed green only if he knocked me back here.
14			

Turn	Move	Action	Comment
15			
16			
17			
18			
19			
20			

Player / Color: Blue
Game: Blind game 2
Date:Tue Apr 23 19:02:08 PDT 2002

After The Game
Please answer the following questions:

Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?

I had no overall strategy, just optimism at the beginning, and then growing resentment as the game went on. I was trying to initially find someone to play nice with, but no one stepped up.

What were the best methods of action to take for the following action cards:
- Project Meeting

Defect.
- Apathy

Defect.
- Deadline Extension

I don't know. Cooperation would be nice, and i thought it was, but everyone was mean and stuff.
- Chicken

This one was a problem for me too. I eventually just did defect on it. Whether that was the best or not..

Do you think these methods of action gave you an advantage over the other players?

They would have, had I actually thought about things.

Can you recognize any parallels between the action cards and other real life situations?

The cards? Not quite so much.. The degeneration into such hostility, yes.

Did you enjoy the game or not? Why?

Sure, at first. It lasted too long.

Did you learn anything from the game? If so, what?

Yes. People are mean.

Do you think this subject matter makes a board game? Why or why not?

Possibly. Not enough apparent complexity to be profitable, likely.

Were your decisions affected in any way by knowing the players beforehand?

Yes. I started off nice and tried to be nice for that very reason.

Do you think that you would have acted differently were this a real situation instead of a game?

I would have been more hostile more quickly.

Blind Game 2 – Green Comments

Turn	Move	Action	Comment
1	1/3/2	Apathy, Red, Defect	
2	5/2/1	Chicken, Blue, Cooperate	
3	0/1/0	Deadline, Red, Cooperate	
4	1/2/0	Project, Blue, Defect	
5	3/0/0	Apathy, Blue, Defect	
6	0/5/0	Apathy, Blue, Defect	
7	0/9/0	Apathy, Red, Defect	
8	1/2/0	Apathy, Blue, Defect	
9	0/3/0	Chicken, Blue, Defect	
10	3/3/0	Apathy, Blue, Defect	
11	0/1/0	Chicken, Blue, Defect	
12	1/1/0	Chicken, Red, Defect	
13	1/1/0	Chicken, Red, Cooperate	
14			

Player / Color: Green
Game: Blind Game 2

Date: 04/23/2002

After The Game
Please answer the following questions:

Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?

I suppose I chose a strategy that was more playful than logical. Toward the end, however, I adopted more logic. To be honest, I'm not sure why I picked that strategy. I just followed the tao.

What were the best methods of action to take for the following action cards:

- Project Meeting

Defecting is always the best choice as most of the time it will leave you with points to distribute freely.

- Apathy

Defect.

- Deadline Extension

Defect.

- Chicken

Defect.

Do you think these methods of action gave you an advantage over the other players?

Not particularly. Upon seeing a trend they could always choose not to send their actions my way.

Can you recognize any parallels between the action cards and other real life situations?

People enjoy putting things off. I enjoyed using the apathy cards.

Did you enjoy the game or not? Why?

Once I got the hang of it, yes. It gave me something to do.

Did you learn anything from the game? If so, what?

That my friends and I are vindictive [expletive].

Do you think this subject matter makes a board game? Why or why not?

Sure, it was fun enough.

Were your decisions affected in any way by knowing the players beforehand?

No.

Do you think that you would have acted differently were this a real situation instead of a game?

Probably not, sadly enough.

Blind Game 2 – Red Comments

Please keep a log of your moves, as well as any comments or thoughts you may have about the game or game strategies:
P=Project, G=Game, Ch=Chicken, Ap=Apathy, Sl=Sleep, PM=Project Meeting, DE=Deadline Extension, Gr=Green, Bl=Blue, C and D are apparent.

Turn	Move	Action	Comment
1	P	Pass	C on Green's Ap. Received 0 payoff.
2	G	Ch, Gr, C	Received payoff of 2 project.
3	P	Ap, Bl, D	D on Blue's Ap, D on Green's DE. Received payoff of 6 any. Used all 6 any on project.
4	G	Ch, Bl, D	C on Blue's DE. Received payoff of 6 any. Used all 6 any on project.
5	P	Ch, Gr, D	D on Blue's PM. Received payoff of 5 any. Used all 5 any on project.
6	G	PM, Gr, D	Received payoff of 1 any. Used 1 any on project.
7	P	Ch, Gr, C	D on Green's Ap. Received payoffs of 2 any and 1 project. Used 2 any on project.
8	G	DE, Bl, C	Received no payoff.
9	P	Ch, Bl, C	Received payoff of 1 project.
10	P	Pass	Received no payoff.
11	P	Ch, Gr, D	D on Blue's Ap. Received payoff of 2 any. Used 2 any on project.
12	G	DE, Gr, D	D on Blue's PM, D on Green's Ch. Received payoff of 2 any. Used 2 any on game.
13	P	PM, Bl, D	D on Blue's Ap, D on Green's Ch. Received payoff of 2 project, 3 any. Used 3 any on project. Used remaining 4 Ch, 2 PM, and 3 Sl to lower Blue's project 3, Green's game 2, and Green's project 4.

Player / Color: Red
Game: Blind Game 2

Date: April 23rd, 2002

After The Game
Please answer the following questions:

Which sort of strategy did you use? One that was more logical, or one that was "just playing"? Why did you choose this strategy?

Initially, my only strategy was to develop a strategy, since I had no idea what to expect. After I determined what was effective and what was not, I adjusted my action accordingly. I chose this strategy with the objective of not being last in either Project or Game, and perhaps being first.

What were the best methods of action to take for the following action cards:

- Project Meeting
  Defecting will always allow you benefit at least as much as your opponent, and possibly more.

- Apathy
  Defecting will always benefit you more than Cooperation here.

- Deadline Extension
  Same as Project Meeting, but mutual Cooperation yields more benefit. I marked Defect as the preferred action here, but it can be iffy.

- Chicken
  Difficult to assess. Cooperation is the least risky, but if you DIDN'T initiate this challenge (and thus didn't waste a card on it) your best option is to Defect, since you stand to gain a lot, and even if you gain nothing, your opponent gains nothing and also loses his action card.

Do you think these methods of action gave you an advantage over the other players?

Not necessarily. It's just the method that struck me as best for my style.

Can you recognize any parallels between the action cards and other real life situations?

None come to mind, but I'm sure there are many.

Did you enjoy the game or not? Why?

I enjoy any activity that allows me an insight into the motives of others.

Did you learn anything from the game? If so, what?

Backstabbing pays.

Do you think this subject matter makes a board game? Why or why not?

I can imagine that some people would enjoy playing this game, yes. But there is no universal formula for a "good" board game. I would play it again, and that's the best I can do for an answer.

Were your decisions affected in any way by knowing the players beforehand?

Not in the slightest. I needed to learn how to handle them as the game progressed.

Do you think that you would have acted differently were this a real situation instead of a game?

I really don't know.

References

Budescu, David V., Ido Erev, and Rami Zwick. Games and Human Behavior. Lawrence Erlbaum Associates, 1998.

Crawford, Vincent P. Introduction to Experimental Game Theory. http://weber.ucsd.edu/~vcrawfor/IntroEGTSym.html

Howard, Nigel. Paradoxes of Rationality: Theory of Metagames and Political Behavior. MIT Press, 1971.

Huizinga, Johan. Homo Ludens, a study of the play element in culture. Beacon Press, 1949.

Poundstone, William. Prisoner's Dilemma (John Von Neumann, Game Theory, and the Puzzle of the Bomb. Doubleday Publishing, 1992.

Ross, Don. Stanford Encyclopedia of Philosophy, Game Theory. http://plato.stanford.edu/entries/game-theory/

Roth, A.E. "Comments on Tversky's 'Rational Theory and Constructive Choice'," The Rational Foundations of Economic Behavior, K. Arrow, E. Colombatto, M. Perlman, and C. Schmidt, editors, Macmillan, 1996, 198-202.

Roth, A.E. Individual Rationality as a Useful Approximation. http://www.economics.harvard.edu/~aroth/rational.html

Rubinstein, Ariel. Experience from a Course in Game Theory. http://www.princeton.edu/~ariel/99/gt100.html

de Boer, et. al. Rationality, Coordination, Cooperation (RaCoCo): assumptions of a theory. http://www.hum.uva.nl/~racoco/index.html