

**ADAPTIVE RULE CHANGES IN COMPUTER SIMULATION GAMING -
A MEANS OF PEDAGOGICAL REACTIVE INTERCHANGE**

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This paper deals with methods and procedures of responding more flexibly to the educational needs of the classroom situation. A computer simulation game usually provides a specified set of rules indicating competition procedures, permissible actions and criteria for payoffs. Generally, this established set of rules defines a finite number of options for the game player or student. Once these options are mastered, the computer simulation game often becomes susceptible to sensitivity analysis, linear programming, and other quantitative manipulations. At this point, the game may achieve the level of an elegant mathematical puzzle, distorting the pedagogical goals of the exercise. The exceptional student wins by his quantitative skills, while the average student is frustrated and loses the desire to learn the intended lessons.

Depending on the business school's educational goals and objectives, courses using computer simulation games are generally structured to teach students to become effective decision- makers in complex, dynamic and uncertain environments. In a simulation game which is not sufficiently adaptive and reactive to student behavior patterns, a student may learn how to cope as a technician-analyst but not as an effective risk taker and manager.

In teaching real estate investment management courses at Georgia State University, traditional pedagogical techniques were found to be inadequate in conveying concepts of risk and uncertainty to the students. Neither a textbook/lecture approach nor a case discussion/problem solving approach was found to be sufficient to handle the task of helping the student appreciate the complexity and uncertainty of the real estate investment environment. Risk and uncertainty deal with the future, whereby traditional approaches to education deal with a description and analysis of the past.

The experience with the Land Investment Development Game¹ (hereinafter referred to as LID) used at Georgia State University over the past three years has shown the game to be a fruitful approach to teaching these concepts to students. Through the use of adaptive rule changes in LID, various emerging educational objectives of student groups have been

¹ The author acknowledges the contribution of Dr. Geoffrey Churchill who inspired the development of LID while the author was a doctoral student of his at Georgia State University.

satisfied. The adaptations have been used both as a motivation device to stimulate differential learning among students, and as an additional medium of communication between the instructor and the game participants.

THE CONCEPT OF ADAPTIVE RULE CHANGES

Conventional definitions of “games” and “gaming” suggest reasonably rigid adherence to rules. Rules are used to define the nature of the game, establish methods of play and methods of evaluating performance with certain tangible or intangible payoffs resulting. The essence of most games is some form of competition, either man against man, man against nature or the environment, or man against himself. These rules are usually established a priori. Fairness and the retention of credibility suggest that the essential structure of the game not be arbitrarily modified by changing the rules in mid-play of the game. However, since a motivation for operational gaming is often to acquaint the player with means of coping in an environment of some verisimilitude, strict adherence to all rules established a priori would frustrate this goal. The economic world of human affairs does not strictly adhere to predictable rules. Life is not a game, though some may wish to treat it as if it were. The desire on the part of the pedagogue to reasonably transmit his lessons in a gaming format must therefore be effectuated by seeking a balance between the conventional game and uncertainties of reality.

A second motive which may stimulate the need for a rule change is the playing group’s learning curve. As the players learn the fundamental rules and parameters of the game, it may be useful to add new parameters and complexity. New options may be added to allow the players to experiment and set their own learning objectives. A successful gaming strategy developed by players at one point in the game may no longer be appropriate in the new environment. Adaptability and flexibility on the part of the players are thereby encouraged.

In order to put players on notice that rule adaptations may take place throughout the game, it is appropriate to insert in the game rules a disclaimer which is similar to the following:

As the game progresses, the game moderator reserves the right to change certain rules, parameters and complexity of the game. The rule changes are limited to reasonable occurrences analogous to real world changes in laws, economic and environmental conditions. The player is advised to plan a strategy to cope with the unexpected.

A third motive in allowing certain rule adaptations is to demonstrate that the economic environment may be partially

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manipulated through the political process. While a single player may not directly be able to change rules, a group large enough may. The ability to change certain rules by the players in the game is limited by the constraints imposed by the computer software. Certain innovations should, however, be permitted when the changes are reasonable, realistic and do not tamper with the educational mission of the game. A rule which might encourage such innovations might be written as follows:

Within certain limitations defined by the computer software and moderator, the rules of the game may be modified by group political process. Players in the game may suggest certain innovations to the moderator, who upon approval will submit the proposed innovation to the entire group for its consideration and vote.

In order to insure maximum creativity on the part of the individual players, it is important to keep the game as open and flexible as possible. It may be appropriate to include a rule similar to the following:

Players may make any business decision and enter into any transactions so long as these actions are based on logic and sound assumptions which co-exist with the game model. The moderator reserves the right to disallow any actions which frustrate the spirit of the game.

DESCRIPTION OF THE LID GAME

LID is a computer simulation teaching game which allows a player to experiment with various real estate investment strategies. The game is played by a number of individuals who are each given limited resources to invest in various types of assets and to develop different land uses in a simulated market environment. Typically a player makes the following simulated decisions in attempting to gain sufficient wealth to purchase part of his grade:

- a. determines cash and credit available for investment
- b. purchases undeveloped land
- c. has land properly zoned for development
- d. determines whether to influence players in the system to vote to build more roads, sewers, schools, or to institute a job training program for the unemployed
- e. determines how much land to develop and the use -
 - (1) single family detached houses
 - (2) apartments

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- (3) retail stores
- (4) office buildings
- (5) industrial parks
- f. determines whether to insure property against risk of loss and the extent of the coverage
- g. determines whether to contribute land for parks
- h. determines whether to lend or borrow money from other players
- l. determines whether to buy or sell political influence
- j. determines capital structure of the enterprise
- k. sets rental rates
- l. determines whether to buy or sell developed land and from what source
- m. determines whether to seek capital gains treatment or to seek maximum tax shelter
- n. determines whether to seek alternative forms of investment other than real estate
- o. determines whether to buy or sell options in the stock market
- p. decides whether to form other entities with competing players for the purposes of capital formation

The player is able to engage in various investment strategies based on his perceptions of risk and his willingness to act under conditions of uncertainty. As he plays the game more information becomes available to him. The game is somewhat biased to reward highly leveraged positions and to reward the risk taker. While the risk taker increases his chances for gain, he also increases his chances for bankruptcy. A player who sits back in a conservative posture until he acquires enough information about his environment suffers significantly from opportunity loss. The game is designed to emphasize certain paradoxes which often occur in the real world. For example, the final payoff is the right of the player to use his net worth at the end of the game to purchase bonus points to add to his grade. The higher a player's position is relative to everyone else in the game, the more points he is able to purchase for a lesser cost. This gives the player incentive to compete fiercely and exploit the other players in the game. However, the maximum number of points available for purchase is based on a schedule determined on how well all players cooperated with each other in restricting excessive profits and developing low yielding, but socially desirable housing. This reward system provides each player with a dilemma which must be resolved in the course of the game.

The game emphasizes both conflict and cooperation. This dilemma provides the context which allows for rule adaptations and inter-personal reaction among the players and moderator.

RULE ADAPTATIONS AND REACTIVE INTERCHANGE

Rule adaptations classified according to type might include the following:

1. Rules affecting resources available to players. The game moderator may increase or decrease certain types of resources available to players. For example, the game may allow for increases in credit to each player. The rate of this increase may change. Resources which were once fixed may become variable or variable resources may become fixed.
2. Rules imposing constraints on players in certain categories. The moderator may wish to impose constraints on players who have achieved a high level of performance in order to stimulate new thinking. For example, limitations may be set on the reserves that players of certain borrowing capacity would have to maintain, or limitations might be set on the percent of certain types of assets that a player's portfolio could contain.
3. Rules changing parameters. The moderator may wish to increase or decrease certain parameters or constraints on a system wide basis. Costs may be modified or requirements may be established which affect all players in the game uniformly. The moderator of the game might be motivated to encourage group decision making in a game where most decisions are made individually.
4. Rules expanding or constricting opportunities. The moderator may add new investment opportunities or cut off old investment opportunities in the game. The goal of the moderator might be to demonstrate the evanescence of opportunities.
5. Rules changing certain procedures. It may be appropriate to add or subtract accounting and reporting procedures in the game. For example, the moderator could simulate the Securities Exchange Commission requirement of financial data and analysis from the players and impose a monetary penalty to those players who fail to properly file.
6. Ad hoc rules. Events such as labor strikes or temporary restraining orders might be staged in order to place players in advocacy positions to defend their actions.

Rule adaptations are designed to solve problems or to meet specified needs in the classroom situation. A change in rules without a specific purpose is a profitless exercise which needlessly wastes both the students' and instructor's time and efforts. Rule changes should be made in order to increase learning opportunities, to increase competition and playability of the game, or to solve certain stress situations which may occur.

Increasing learning opportunities

The playing behavior of different student groups offers many opportunities for the instructor to illustrate certain fundamental concepts and stimulate thinking on the part of the students. The game playing experience, by itself, is of little value unless students are motivated to observe the effects of their decisions in the game environment and to question the results.

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There are several ways that the instructor may react to student behavior patterns in order to stimulate further learning. He may modify constraints or parameters in the game in order to promote individual quantitative problem solving. Philosophical and moral dilemmas posed by the instructor encourage debate and group response. Reporting and presentation requirements stimulate learning of fundamentals and communicative skills.

After a rule change, it is advisable for the instructor to indicate to the players his motivation for the change. This indication may occur through hints or casual remarks, through a class discussion, or through a test question. It is important in order to reinforce learning that the time span between the rule change, the application of the rule in play, and the explanation for the change be as short as possible.

Increasing competition and playability of the game

The game must be fun. If not, it adds little to the learning environment. If one player, due to chance, is far ahead of his peers, interest will lag. If players are performing poorly because they initially failed to grasp the intricacies of game procedures, they often become listless and intellectually drop out of the competition. It is the responsibility of the instructor to maximize the competition and playability of the game. An assumption is made that the game used is not inherently defective. Pretesting and calibration of the game model is essential. Where the game itself is weak, the instructor should either modify it significantly or not use it.

Various devices may be used to improve the playability of the game. In using the LID game, the author has often competed as a player. The author's performance did not count in the rankings but by competing with the students he was able to use his new role to offer deals and opportunities to the other players. Another device was to bring in an experienced player of the game to act as a stooge. Like the instructor-player the stooge would attempt to entice student players to make good or bad deals as the circumstances seemed to warrant.

Solving stress situations

Occasionally stress situations will occur in the play of the game, which if not properly handled would cause ill will between players and disrupt the intent of the game. Stress situations generally occur from cheating, misunderstandings or contractual disputes, and mistakes.

The problem of cheating in a game is not as prevalent as it might be in other classroom situations. It is generally not as easy to cheat in the LID game because of certain software safeguards, and required documentation. Where cheating does occur, the moderator often calls it something else in the LID game, such

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as embezzlement or tax fraud. The announcement of such an occurrence is publicly made and construed by the instructor to be a “mistake”. However a heavy economic penalty is imposed in the nature of a court fine or loss of political influence. Because cheating is treated as a “mistake” the student is not emotionally threatened. Yet because of the manner in which a penalty is imposed, cheating is adequately deterred.

The problem of disputes between players is more complicated. One way to anticipate disputes is to require all agreements be written in order to be enforceable. Where a dispute does occur, experience has shown that real world dispute settling procedures are effective in a game situation. In one contractual dispute in the LID game, the settlement occurred in a formal two hour trial before a mock judge and jury. Evidence was presented, witnesses were heard and arguments were made. An interesting sidelight to this case was that the author, who is a member of the Georgia Bar, represented one side of the dispute. At the beginning of the case, he made a preliminary objection that the student speaking for the plaintiff was not authorized to represent the other side without showing he met the licensing requirements of the state. The student promptly pulled out his wallet and showed that he had been a practicing attorney for the past twenty years.

The problem of mistakes may result because of software problems, input errors by the instructor or student, or misunderstanding on the part of the student. A possible solution is to allow the entire group to suggest and vote on a remedy. Often, a simple mechanical adjustment to the student’s financial statements will correct the problem. Under some circumstances, it may be necessary to rerun the game turn.

COSTS, BENEFITS AND LIMITATIONS

The major costs attributable to a strategy of adaptive rule changes is the increased administration time required of the game moderator. There may also be some loss of objectivity in evaluating the performance of students in the game. It is very difficult to remain aloof, when the instructor is interacting with the students in the classroom.

The benefits resulting from the procedures suggested in this paper include a more stimulating learning environment, a more responsive game and increased enthusiasm from the students. The learning objectives are more readily understood and accepted by the students playing the game. Adjusting the game to meet the needs of the students, rather than adjusting the students to meet the limitations of the game provides for a more constructive pedagogical experience.

In order to maximize acceptance of the game, the following limitations on rule changes are suggested:

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1. The rule should apply uniformly. It should apply to the entire class or to all players in a similar category.
2. The rule change should be reasonable.
3. The player should have been able to anticipate the type of change and have designed a strategy to cope with the possible change before it occurred.
4. The rule change should not give unfair advantage to any specific player.
5. The rule change should be clearly announced and explained. (One device which has been used in LID is the publication of a newspaper with each game turn).

CONCLUSION

Adaptive rule changes have been used successfully over a three year period in real estate investment management courses at Georgia State University. Participants in this conference are urged to consider building in similar flexibility in the games that they use at their universities. "Try it -- You'll like it".

REFERENCES

1. Ordway, Nicholas, Land Investment Development Game, (Atlanta: Georgia State University, 1973).