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THE PEDAGOGICAL UTILITY OR A MANAGEMENT SIMULATION GAME IN A BUSINESS POLICY COURSE

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ABSTRACT

This study examined whether a game resulted in changes in tolerance for ambiguity and risk orientation, and examined student perceptions of cases versus games. The subjects included 76 students enrolled in four sections of an undergraduate Business Policy class at a medium sized southern university. There were no significant changes in the overall tolerance for ambiguity and risk orientation scores. However, some individuals experienced large changes in their scores. These students perceived the cases as having a higher pedagogical value than the game. A game used in conjunction with the cases may be the most effective way to teach a business policy course.

INTRODUCTION

The American Management Association introduced the first practical business game in 1957-- -TOP MANAGEMENT DECISION SIMULATION. The use of games as a pedagogical tool has expanded enormously ever since. Faria (1987) has reported that 200 business games are being used by approximately 8,500 teachers at over 1,700 colleges offering business programs. Simulation games are available for various functional areas- - -Marketing, Finance, Accounting, and Production. Rut computer-based games that simulate business policy decision-making environments require students to integrate concepts and skills developed in courses in the functional areas. A number of business policy games are available that differ in their complexity, based on the number of decisions the player makes. These business policy games have been the object of more comprehensive research.

An increasing number of empirical studies have been performed in the area of management simulation. These studies involve identifying factors that affect simulation performance, the pedagogical benefits of this form of instruction, and the pedagogical benefits of games compared with other methods.

Researchers have investigated a number of factors that could possibly affect game performance. Variables include personality characteristics of teams (Rotter, 1966; Sims et al., 1974; Rue et al., 1974; Butler and Parasuraman, 1977; Brenenstuhl and Badgett, 1977); size of teams (Shaw, 1971; Remus and Jenner, 1979; Gentry, 1980; Newgren et al., 1980; Wolfe and Chacko, 1983; Faria, 1986); team organization structure (Edge and Remus, 1984); the manner teams were formed (Hsu, 1984); academic record of participants (Dill, 1961; McKenney and Dill, 1966; Vance and Gray, 1967; Gray, 1972; Rowland and Gardner, 1973; Wolfe, 1978; Roderick, 1984); ethnic characteristics of participants (Loveland et al. 1979; Moorehead et al. , 1980; Faria, 1986); work experience of participants (Trinkaus, 1981); and percentage of grade assigned to game (Faria, 1986).

Some studies have examined the pedagogical benefits of simulation games. Variables studied include analytic skills (Faria and Nulsen, 1976; Hall, 1987); behavioral and interpersonal factors (Cangelosi and Dill, 1965; Chisholm, 1979); information processing capabilities (Philippatos and Moscato, 1969; Greenlaw and Riggs, 1974; Biggs, 1975; Biggs and Greenlaw, 1976); and development of economic concepts (Edwards, 1987). Philippatos and Moscato (1969) found no significant differences between the "informed" and "ignorant" team levels of performance as measured by the similarity of each team's average decision level during the game. However, Biggs and Greenlaw (1976) speculate that abundance of information facilitates synergies between a simulation's functional areas which lead to superior performance. These conflicting findings suggest that tolerance for ambiguity may be a variable affecting decision-makers. This is one of two factors explored by this study, the other being risk orientation.

The relative advantages of business games versus other teaching methods has been another area that has been the focus of business simulation research. Most of these studies have compared games to cases because cases have been the primary pedagogical tool in business policy classes. The results from these studies have been analyzed in four review articles. Greenlaw and Wyman (1973) concluded that there existed little clear evidence to indicate that business games were a superior method of instruction. Keys (1976) reviewed studies that based comparison of instructional approaches on some form of end-of-course examination. In six studies that used a final essay examination, the simulation section students scored higher in four instances, the case section students scored higher in one instance, and no difference was found between simulation and non-simulation sections in the other. A case group, however, outscored the simulation group in a study that used a multiple-choice final examination. Keys was thus unable to conclusively state the superiority of the business game. Wolfe (1985) updated Greenlaw and Wyman's review but could not reach any definite conclusions about the effectiveness of games because of the wide variety of study conditions. Miles et al (1986) studied the players' perception of games versus cases. Students, in most of the studies reviewed, believed that they learned as much or more from simulation games as from cases. The results are mixed, however, and interpretation and comparison is difficult because of the wide

variety of study environments.

The objective of this study was to examine further the pedagogical utility of simulation games. In particular, we wanted to examine whether a simulation game resulted in changes in tolerance for ambiguity and risk orientation, and we wished to study student perceptions of cases versus games as learning tools.

Managers are often called upon to make decisions based on very little or incomplete information. It's rare that this information manifests itself in an unambiguous manner. Also there is an element of risk inherent in any decision and the greater the expected payoff from the decision, the greater the associated risk. Managers should have a significant tolerance for ambiguity, as well as be prepared to adopt necessary risks while making decisions. Thus one of the pedagogical goals of a business policy course is to develop these attributes to prepare the student for a managerial role. A second goal of the course is to help the student develop skills to integrate various concepts learned in the functional areas and make better decisions. Various pedagogical tools such as case analysis, game simulation and lectures help achieve this goal.

The pedagogical utility of simulation games was therefore examined from two distinct perspectives. First, we studied the influence of game participation on the two decision-making attributes- - -the student's risk perception, and tolerance for ambiguity. Second, we examined the students' perception of the teaching value of the game versus the cases. Three hypotheses were formulated to address these two issues.

i) The students' tolerance for ambiguity will increase at the conclusion of the game.

ii) The students' risk orientation will increase at the conclusion of the game.

iii) The students will perceive cases and games as tools of equivalent pedagogical value.

METHODOLOGY

The subjects included 76 students enrolled in four sections of an undergraduate business Policy class at a medium size southern university. The students were seniors, and majoring in either Accounting, Finance, General Business, Management or Marketing. Two of the sections met three times a week during the morning, one met twice a week in the morning, while the fourth was a once a week night class. All four sections played a simulation game, presented case studies exemplifying various elements of strategic management, and discussed core concepts and issues in class. Ten percent of the total grade was based on the student's game performance and fifteen percent on a game report due after the end of the game. The cases constituted forty percent of the grade. The balance was based on two regular exams and points assigned for class participation.

Instructors assigned students into groups of four or five for the simulation and case analysis. This was to ensure that the groups were relatively well matched on the basis of academic abilities and a mix of majors where possible. A majority of the students in all the sections did not have any previous work experience. For the simulation, each section operated as a distinct industry with four or five teams competing only against rivals within their respective sections.

The simulation used was The Executive Game (Henshaw & Jackson, 1990), a simulation of low to moderate complexity, as defined by Wolfe (1978). Players made various production and marketing-related decisions every week. The instructors used two or three class sessions to explain the aspects of the game to the participants. The participants were permitted two trial runs before the start of the game, which was played over a period of nine weeks. A single indicator, the return earned on investments, was used to evaluate team performance.

We administered two standardized instruments to the 76 students to measure two underlying student attributes: their tolerance for ambiguity and their risk orientation. To measure the ambiguity dimension, we used Budner's test for Tolerance-Intolerance for Ambiguity (All instruments are available on request from the authors.). The development of this instrument and the associated reliability and validity tests have been discussed elsewhere (Budner, 1962). The test consists of eight positively worded items and eight negatively worded items. The respondents were instructed to check off one of six response categories for each item: strongly, moderately, or slightly agree, and strongly, moderately, or slightly disagree. On the negatively worded items, strong agreement was scored 7, moderate agreement, 6, slight agreement, 5, slight disagreement, 3, moderate disagreement, 2, strong disagreement, 1. Scoring of the positive items was in the reverse direction. All omissions were scored 4.

We measured risk orientation using the Kogan-Wallach Social Risk Preference (SRP) questionnaire. The development and testing of this instrument has been discussed elsewhere (Kogan and Wallach, 1964). The SRP questionnaire consists of twelve items, each a choice dilemma of a social nature. The respondent has to choose between two alternative courses of action: a risky choice and a non-risky one. If the respondents choose the risky alternative, they must also decide the minimum odds of success, which they would demand, prior to choosing that alternative. On all twelve questions, the risky alternative, if successful, yields a better outcome than the non-risky choice. The respondent indicates preference for higher risk by choosing the risky alternative with low odds of success. The lowest risk is indicated by the choice of the non-risky alternative. The questions cover a wide range of dilemmas from building a plant to making a marriage decision. The riskiest choice was assigned the highest score of 6, and the least risky choice was scored 1.

We also administered a twenty-item Skills Acquisition Questionnaire to determine student perceptions of the pedagogical value of the game and the cases. We adapted a questionnaire used by Miles et al. (1986). Their instrument was based on work by Chisholm et al.(1978) and Byrne (1979). These questionnaires deal with perceived learning of concepts relevant in a senior-level capstone course in business policy.

They also contain questions of an evaluative nature asking what the student liked or disliked about the two teaching methods. The respondents were instructed to check off one of five response categories for each item, first for the case and then for the game. The response categories were strongly agree, slightly agree, do not know, slightly disagree and strongly disagree. The scoring was on a scale of 1 to 5 with strongly agree being scored 1 and strongly disagree scored 5.

We classified the twenty items into four categories: Skills, Learning, self-analysis, and Process. Six items which tapped students' perception of skill acquisition from the simulation and cases were categorized as a Skills dimension. The Learning dimension included five items that evaluated perceptions of concepts learned from the game or case. The self-analysis dimension examined four items asking the extent to which students thought the game or case contributed to personal introspection. The Process category included three items, which evaluated whether students thought they understood the mechanics of game or case analysis.

The Ambiguity and the SRP risk instruments were both administered twice to each student, once before the first game decision was due and then after the final game results were returned. We administered the perception questionnaire after completion of the game and cases. The scores on each item for both ambiguity and risk were added to obtain composite scores for each student. Thus two composite scores - - before game and after game, as well as a difference score - -were obtained for each instrument. We also summed each student's scores for the perception questionnaire for each of the four categories, and for the total of all the four, for both the game and the case.

FINDINGS

Tables I and II provide the mean and standard error of the before and after scores, by section, for tolerance for ambiguity and risk orientation, respectively. A positive ambiguity difference score indicates that students became more tolerant of ambiguity, over the nine-week period during game play. A negative ambiguity difference score indicates students developed less tolerance for ambiguity. Similarly a positive risk difference score indicates that the students increased their risk orientation, whereas a negative risk difference score implies that students became more risk averse.

As can be seen in Tables I and II, based on a t-test of the before-and-after scores for the groups as a whole, there appears to be no significant change in the two attributes over the nine weeks of game participation. Nonetheless, on an individual basis, the difference scores for risk ranged from -14 to 25, and scores for tolerance for ambiguity ranged from -16 to 22. Hence some individuals did experience a major shift in their risk orientation and/or tolerance for ambiguity, in both directions.

We averaged the difference scores for both ambiguity and risk perception scores for each team, and then compared that to the team's performance (rank order based on ROI). Table III displays results. In all the sections, the fourth-placed teams appeared to have increased their risk orientation. Most of the second-placed teams appeared to have become less tolerant of ambiguity at the end of the game. Most of the bottom placed teams appear to have become more risk-averse at the end of the game.

The mid-placed teams appear to have become more risk averse and less tolerant of ambiguity at the conclusion of the game. However none of these findings were significant at the .05 level.

Table IV shows the mean and standard error of the perceptual scores of the students on the game and cases' pedagogical value.

The perceptual scores of the game utility (total) ranged from 24 to 95 (possible range 20 to 100); scores for the case utility (total) ranged from 41 to 97 (possible range 20 to 100). Higher scores imply that the game or case was perceived to have high utility; lower scores imply that the perception was of low or no utility. Typically, total scores above 60 implied that the student perceived the case or game to have a high or very high pedagogical value.

The scores for individual categories can be similarly interpreted. The students generally perceived cases to be superior to the game as a teaching tool. These results were all significant below the .01 level except for SELF-ANALYSIS where the results were significant at the .1 level. However, the students do perceive the game to have considerable pedagogical value. Eighty-one percent of students scored above 60 on the game utility, implying that they perceived the game to have a high or very high pedagogical value. Ninety-two percent of students scored above 60 on the case utility implying that they perceived cases to have a high or very high pedagogical value.

For the individual dimensions, 82 percent of the students perceived the game to have a high or a very high utility in developing their decision-making Skills. The corresponding figure for the cases was 94 percent. Eighty-three percent of the students perceived the game had a high or very high usefulness for Learning - - developing their concepts to facilitate decision-making; the corresponding figure for cases was 94 percent. On the Self-analysis dimension, 93 percent of the students perceived the cases to have a high or very high influence in their ability to better understand themselves and their decisions. For the game the corresponding figure was 78 percent. As far as understanding the mechanics of business decision simulation and case analysis is concerned (Process), 89 percent perceived the game to have a high or very high utility, while the figure for the cases was 86 percent.

DISCUSSION

Although there appears to be no statistically significant change in the overall tolerance for

TABLE I COMPARISON OF BEFORE AND AFTER AMBIGUITY SCORES

SECTION	MEAN SCORE AFTER	MEAN SCORE BEFORE	DIFF	STD. ERROR	p-VALUE (t-test)
1	55.5238	53.8571	1.6667	2.168	.451
2	53.6522	54.9565	-1.3043	1.503	.396
3	57.0000	54.6667	2.3333	1.869	.232
4	50.5294	52.4118	-1.8824	2.047	.371
ALL SEC.	54.1316	54.0263	0.1053	0.958	.913

TABLE II COMPARISON OF BEFORE AND AFTER RISK SCORES

SECTION	MEAN SCORE AFTER	MEAN SCORE BEFORE	DIFF	STD. ERROR	p-VALUE (t-test)
1	39.6190	39.2381	0.3810	1.204	.755
2	40.3043	41.3913	-1.0870	1.336	.425
3	42.7333	42.2000	0.5333	2.255	.816
4	36.7647	37.8824	-1.1176	1.624	.501
ALL SEC.	39.8026	40.1711	-0.3684	0.766	.632

TABLE III TEAM RANKINGS WITH AMBIGUITY/RISK DIFFERENCE SCORES

SEC.	POSITIONS	1	2	3	4	5
1	TEAM #	2	1	5	3	4
	AMB. DIFF.	-2.75	-2.60	-0.50	16.33	2.40
	RISK DIFF.	3.25	-2.80	1.50	-3.67	2.80
2	TEAM #	4	3	1	5	2
	AMB. DIFF.	4.25	0.60	-4.60	-2.40	-3.75
	RISK DIFF.	-1.25	0.60	1.40	-6.20	0.25
3	TEAM #	1	2	3	4	5
	AMB. DIFF.	9.33	-3.00	-1.75	7.50	2.67
	RISK DIFF.	0.33	-1.67	3.50	-7.50	4.33
4	TEAM #	4	1	3	2	
	AMB. DIFF.	-0.67	-4.25	-0.33	-2.50	
	RISK DIFF.	2.00	1.00	1.75	-5.50	

TABLE IV CASE AND GAME PERCEPTUAL SCORES

CATEGORY	CASE MEAN	GAME MEAN	MEAN DIFF.	STD. ERROR	p-VALUE
LEARNING	21.4474	18.7632	2.6842	0.505	.000
SKILLS	33.4079	29.7632	3.6447	0.745	.000
SELF-ANALYSIS	14.8158	13.4211	1.3947	0.356	.000
PROCESS	10.7105	10.3816	0.3289	0.329	.088
TOTAL	80.3816	72.3289	8.0526	1.579	.000

ambiguity and risk orientation scores, some individuals did experience large changes in their individual scores. Personality changes are often a more gradual process extending over a prolonged period. Hence, for the nine-week period, the overall changes were not significant. However, the fourth-placed teams and most of the second-placed teams experienced a change towards higher risk. A possible interpretation is that they became prepared to make riskier decisions since they may have been dissatisfied with the level of risk that they had started out with while making their decisions. They may have associated higher risks with better performance. Most of the second placed teams may have made some of their decisions based on incomplete information, which may have adversely affected them in any one period. Because of this, their tolerance for ambiguity decreased as they became uncomfortable with incomplete information. They may have associated better performance as being a consequence of possessing more complete information. This is in opposition to the findings of Philippatos and Moscato (1969) but in line with the speculation of Riggs and Greenlaw (1976). The bottom place teams may have been badly burned because of the level of risks that they may have adopted in their decisions. They may have associated their dismal performance as a consequence of their making riskier decisions. They may therefore have decided that their risk orientation was inappropriate, and became less risky in their response to the SRP risk instrument. While some of the students may not have experienced a change in their decision-making characteristics, they may have at least become more aware of their risk orientation and their tolerance for ambiguity. To the extent that these developments did occur, the teaching objectives of the game were partially satisfied.

These students perceived the cases as having a higher pedagogical value as compared to the game. However this does not necessarily imply that the games are an inferior tool when compared with cases. Perceived utility scores were fairly high for both cases and the game overall. In this study, cases constituted 40 percent of the grade, while the game -- including the report - - constituted 25 percent. A bias may have been introduced in favor of the cases. However, Wolfe and Roberts (1985-1986) did not find any relationship between grade weights and learning levels. The students perceived both the game and the cases to have a high or very high pedagogical value. Despite its moderate complexity, the game may have been perceived to be complex, involving an interplay of many factors. Hence, some teams may have lost interest, especially if their performance in the first few periods was not satisfactory. McKenney and Dill (1966) found differences in team ability to be related to differences in performance, satisfaction and learning. They also found that teams of moderate and low ability were able to see the obvious bias in team composition and became dissatisfied with the game as it progressed. Wolfe and Chacko (1983) found team size positively related to profits and the number of options and decisions exercised until membership exceeded three. The team size in this study was, on an average, four and dissension may have crept in, leading to dysfunction. However, Gentry (1980) found dissension to be inconsistently related to performance. Newgren et al. (1980) concluded that one-member teams on an average required less time to make a decision, but they may not have been acquiring as much business policy knowledge. Wolfe and Chacko (1983) also found that the three and four-member teams increased their business policy knowledge the most. Learning sources changed somewhat with team size, with two-member teams citing lectures as equal to the game in importance. Thus the issue is not one of proving that the game is the most effective learning tool. Raia (1966) asked three different student groups to rank their preference among six different combinations of games, cases, and readings that could be used in the course. All three groups (two gaming and one control) chose a combination of the case method and a game for the course. Thus the game used in conjunction with the cases may be the most effective way to teach a business policy course.

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