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THE EDUCATIONAL IMPACT OF SUPPLEMENTARY PERSONAL INTERACTION IN COMPUTERIZED BUSINESS GAMES

Vance A. Etnyre
E. M. Wolf, Jr.
University of Houston

INTRODUCTION

During the last few years, computerized business policy games have gained widespread usage in undergraduate business curricula across the country. A 1969 survey by Graham and Gray [3], showed that 91% of 90 responding AACSB and some nonmember schools used business games in their curriculum. Several of the schools used more than one game. Computerized general management or policy games probably account for more than half of the present business gaming activity.

The widespread popularity of simulation gaming stems from a belief on the part of its advocates that the use of management games as teaching tools provides educational benefits other than or in addition to those provided by the more traditional lecture/paper/case/exam environment. Some of the reasons most frequently advanced for the use of computerized business games as teaching tools are:

1. They heighten the levels of student interest and motivation;
2. Student attitudes are more positive toward courses using business simulations than toward those using more traditional educational techniques;
3. Participants of courses using experiential techniques learn more than students exposed only to the more traditional techniques.

Most of the research studies to date have focused attention on the comparison of games with other teaching modes (e.g., case studies). Numerous researchers including Boseman and Schellenberger [1], Fletcher [2], Greenlaw and Wyman [4], and Schriesheim [6], have recently surveyed the results of empirical studies making these comparisons.

Raia [5], reported a study comparing a "simple" game group; a "complex" game group; and a control group that substituted readings for the game. The findings support the hypothesis that a relatively simple game provides essentially the same benefits as one that is more complex. Furthermore, Raia found no significant differences among the groups on learning, as measured by degree of improvement in the understanding of case analysis. However, he did report that all groups expressed a strong preference for games over readings.

The widespread use of business games obviates the need for comparison research as an attempt to justify their continued existence. Although the comparative empirical evidence reported to date is contradictory and inconclusive, it is equally true that

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no evidence exists to show that business simulation games are significantly less beneficial than any other educational aids. Since both gaming advocates and students perceive participation as fun, the continued growth of the activity seems assured. As Fletcher [2], and Greenlaw and Wyman [4], have pointed out, the time has arrived to systematically investigate differences in gaming approaches. The purpose of this paper is to investigate the impact on educational benefits of supplementary personal interaction (SPI) in a computerized business gaming environment.

MEASURING THE EDUCATIONAL BENEFITS OF SIMULATION GAMES

Traditionally, criteria of educational benefit have been concerned with:

1. Level of involvement in the educational process;
2. Degree of understanding of the material which is presented.

Operationally, these criteria have been measured by:

1. Quantity of participants' outputs;
2. Quality of participants' outputs.

In the traditional lecture/paper/exam environment, measures of these criteria have dealt with the degree to which papers are "relevant" and "complete" and the degree to which examination answers are "appropriate" and "correct." In the simulation gaming environment, the standardization of input formats often voids the concepts of "complete" and "relevant." The enormous variety of possible strategies and responses weakens the concepts of "appropriate" and "correct." This has lead some educators to evaluate the benefits of business games in terms of:

1. Measures of participants' performance which are generated within the game itself (e.g. profit or ROI.);
2. Participants' attitudinal responses.

While these measures have certain inherent relevance, the authors have chosen to supplement these with three additional measures

1. Frequency of intergroup transactions;
2. Participation in cooperative ventures;
3. Innovative behavior of participants.

Internally Generated Performance Measures

Computerized business games generate a variety of outputs for their administrators and participants. Measures of company sales, costs and profits are usually included in the output. More sophisticated games also may generate stock prices and overall team performance rankings on a variety of financial ratios.

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It is not clear however that internally generated performance measures accurately reflect either the level of participants involvement or the degree of participants' understanding.

Students with poor internally generated performance measures might learn a great deal from analyzing their actions to find the reasons for low performance indicators. On the other hand, serendipity might generate high performance measures for other students. Certainly, if the game is of a competitive, interactive nature, students are not able to exert complete control over absolute levels of internally generated performance measures.

Attitudinal Responses

Attitudinal responses of participants should not be used exclusively to justify business games. Students like to do things that are unique, challenging, and fun, independent of the educational benefits of such activities (as shown by the recent phenomenon of "streaking") To ignore the opinions of students as to the perceived benefits of various academic activities, however, also would be foolish. Students who sacrifice their tuition money and the opportunity value of their time expect to "get their money's worth from their classes. Mature students who realize that their future job potential might be determined by their mastery of certain business concepts are especially interested in the relevance and quality of the courses they take. Such students are quite willing to express opinions on the benefits of various academic activities.

Intergroup Transactions

Intercompany sales result from negotiations occurring after representatives of one firm contact representatives of another firm. These negotiations may lead to the exchange of goods or services for cash or credit. If these activities are voluntary, then the degree to which groups interact to complete business transactions is one measure of the level of involvement in the gaming situation.

The degree to which skills learned through gaming can be transferred to real situations is an important criterion of gaining effectiveness. When students initiate transactions with firms in their own industry, they must evaluate the impact of the transaction from the perspective of both the buyer and the seller. They must initiate contacts, set terms and negotiate from those terms. These activities, when performed in realistic settings provide valuable experiences for the participants.

Cooperative Ventures

In some games, there are many instances in which two or more companies may interact cooperatively to improve their positions in the industry or to improve conditions in the industry as a whole. Students faced with unionization or the prospect of labor negotiations may form industry-wide

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bargaining groups. Firms with excess production capacity can produce goods under contract to be sold by other vendors and thus maintain a sufficient flow of goods. Firms with excess capital can finance plants in expanding market areas to be operated and later sold to other firms. Several companies may bid together for a particularly large contract.

Participation in cooperative ventures requires a level *of* analysis and coordination beyond that normally required by the business game. Thus, participation in these activities is a measure of involvement in the simulation exercise.

Innovative Behavior

The format for participation in most business games is strictly defined. However, if participants are given wide latitudes in the nature of transactions they may implement, some groups will become so interested in participating they will discover new and extraordinary ways to achieve success within the framework of the game. If the buying and selling of stock is allowed, teams may form clever subterfuges and covert agreements in order to gain controlling interest in a particular company. A team might initiate intergroup transactions using superficially high or low prices in order to manipulate the value of a company's stock. Intracompany transactions of subsidiaries can be used to influence profitability, stock prices or tax liabilities. The amount of time and effort required to perform these activities successfully is very large. Hence, the frequency of these transactions is a measure of the company's involvement in the course.

The modes of participation mentioned in the last three sections indicate high degrees of interest and involvement in playing business games. They are indications that students are willing to go beyond the minimum requirements of the classroom situation in order to gain further insights into the mechanisms which they are using. To engage in these voluntary activities, students must analyze and structure complicated situations and evaluate complex sets of alternatives. Most important, this type of behavior indicates that students have taken the initiative in order to gain as much benefit as possible from their participation in the course.

DESCRIPTION OF EXPERIMENTAL PROJECT

In order to measure the effectiveness of role playing by course outsiders, the authors compared educational performance measures of student groups participating in a complex business game. The criteria used to measure effectiveness of the games attempted to show:

1. The level of participant involvement within the simulation study, and
2. The degree of participant understanding of the simulated situation.

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The independent variable used in this study was the amount of supplemental personal interaction (SPI) given to the participants as they played a large, competitive, computerized business game.

The facility used for performing the experiment was the undergraduate senior business policy course (Management 490) at the University of Houston. This course, the last element in the required core sequence for all undergraduate business students, is built around a large computerized business policy game, an extension of the INTOP (INternational OPerations) game designed by Thorelli and Graves [7].

Each firm in the simulated economy may manufacture various products for sale in three areas of the world. Products are differentiated by grades as well as by product type. Firms are responsible for product research; market research; promotion; pricing; production and transportation of the various products.

A firm might make as many as thirty decisions each period for each geographical area. Additionally, each firm might specify as many as fifteen decisions each period in the home office (a non-operating area).

All teams in the simulation start with identical conditions. The students assume the operations of a slightly profitable three- year-old company with limited operations in only one area. This configuration requires one set of decisions for the area, plus one set of decisions for the home office each period of play.

The teams may submit a variable number (from zero to twenty- four) of intracompany sales forms each period. Each of these forms requires decisions concerning unit; price, number and type of units to ship and the mode of transportation to be used. Additionally, each team may submit forms to buy or sell shares of stock in any of the companies in the simulation.

The teams may enter into several types of intercompany transactions. Goods may be shipped between companies; money loaned from one team to another; patent rights on product improvements may be sold, or licensed to other firms. All terms of intercompany transactions, or contracts, are negotiated by the involved teams.

It is difficult to specify the number of decisions required by two teams which enter into an agreement. Clearly, however, the complexity of the tasks performed by the participants increases with the number of intercompany transactions.

Two class sections, made up of 85 students, were exposed to business world professionals and faculty not teaching the course who played the roles of investment bankers, labor negotiators, bankers, judges, and consultants, where conditions warranted. These two sections were designated as the "SPI" group. All 16 teams in this group carried out extensive negotiations to obtain intermediate and permanent financing, and a labor contract. Additional negotiations were entered into by several teams involving short term financing, consulting studies, SEC investigations, and one Chapter 11 bankruptcy action.

Two other class sections designated the "control" group, and made up of 41 students (eight teams) had no personal interactions with outsiders. All communications and decisions concerning

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financing and labor costs were carried out through written communications.

Four instructors? "team taught" the four sections at four different times. Each instructor taught both a SPI and a control group to negate differences between instructors. Although students could not be randomly assigned to sections, differences due to class assignment were not felt to be significant. No prior announcements or communications of the experiment were published, and no opportunity for changing sections existed after differences became apparent. Neither the instructor nor the students were aware that inter- and intra-company transactions were monitored for use in the experiment.

Although the two sample sizes were of greater disparity than desired, it would have been less desirable to balance class sizes and not control for the effects of different teachers. Hence, the sections were designated as "SPI" or "control" on the basis of administrative exigency.

In order to measure levels of involvement and degrees of understanding, the authors collected data on students' attitudes, knowledge of the simulated environment, frequency of intergroup transactions, and number of voluntary intracompany transactions. A questionnaire was administered during the last week of the course to determine students' perceptions of benefits; involvement; attitudes; and knowledge of profitable game strategies.

DISCUSSION OF RESULTS

Table 1 shows the aggregate responses of both groups to five questions dealing with the level of student involvement in course related activities. Students in the SPI group generally perceived their level of involvement to be slightly higher, although their reported level of class attendance was somewhat lower. A Chi-Square test applied to the responses on each question indicates that no statistically significant differences exist between the two groups.

Table 2 shows responses to two questions about students' attitudes toward the course. Again, a Chi-Square test indicates there is no significant difference between the two groups.

Table 3 shows the scores of the two groups on five multiple choice questions concerning the game environment. The questions dealt with knowledge of profitable strategies; market potentials; manufacturing cost functions; and general awareness of exogenous environmental events. The mean score, corrected for guessing, of the SPI group is higher than that of the control group (significant at the .01 level).

A measure of the actual level of student involvement in the course was obtained by counting the number of voluntary intra- and intercompany transactions engaged in by each team throughout the semester. Table 4 shows the average number of these voluntary transactions completed per team for each of the groups. The average firm in the SPI group engaged in a greater number of both forms of voluntary transactions throughout the semester (both significant at the .05 level).

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TABLE 1
Questions Dealing with Degree of Student Involvement

	<u>SPI</u>	<u>C</u>
1. The workload in this course was:		
1. excessive	36	15
2. high	43	22
3. about right	5	4
4. light	1	0
5. insufficient	0	0
\bar{x} =	1.66	1.73
2. Compared with the effort I usually put into a course, the effort I put into this course was:		
1. far above average	49	16
2. more than average	25	16
3. about average	9	6
4. less than average	2	3
5. way below average	0	0
\bar{x} =	1.58	1.90
3. What percentage of classes did you attend?		
1. 91 to 100	62	34
2. 81 to 90	15	7
3. 71 to 80	4	0
4. 61 to 70	2	0
5. 60 or less	2	0
\bar{x} =	1.44	1.17
4. About how many hours a week outside of class did you devote to activities related to this course?		
1. 1 - 3	2	6
2. 3 - 5	25	15
3. 5 - 7	24	6
4. 7 - 9	16	5
5. over 9	18	9
\bar{x} =	3.27	2.90
5. On the average, how many hours a week outside of class do you devote to a required course?		
1. 1 - 3	34	16
2. 3 - 5	31	19
3. 5 - 7	12	4
4. 7 - 9	4	0
5. over 9	4	2
\bar{x} =	1.98	1.85

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TABLE 2
Attitude Toward Course

	<u>SPI</u>	<u>C</u>
1. Compared with all the courses I have had in college, this course was:		
1. the best	12	2
2. one of the best	54	32
3. average	12	7
4. below average	7	0
5. the worst	0	0
\bar{x} =	2.16	2.12
2. Compared with other courses in the required core, this course was:		
1. the best	17	6
2. above average	53	28
3. average	7	4
4. below average	7	2
5. the worst	1	1
\bar{x} =	2.08	2.12

TABLE 3
Scores on Five Questions
About Game Environment

<u>GROUP</u>	<u>Mean Examination Score (adj)</u>
SPI	.794
CONTROL	.275

TABLE 4
Average Voluntary Transactions
Per Team for The Semester

<u>TRANSACTION TYPE</u>	<u>SPI</u>	<u>GROUP CONTROL</u>
Intracompany	10.5	7.75
Intercompany	13.1	9.5

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CONCLUSIONS

The data indicate that students who experienced supplementary personal interaction throughout the semester exhibited a higher level of involvement in course activities (measured by the number of voluntary extra transactions completed) than students who interacted only with their instructor and the game. Further, students in the supplementary personal interaction group had a higher degree of comprehension of the true nature of the game environment (measured by scores on a multiple choice test based on characteristics of the simulated environment).

This study supports the concept that students who participate in simulation games which have provisions for role playing by outsiders will receive more educational benefits from the experience than students who only "play the game." A higher level of student involvement was exhibited by the group which experienced supplementary personal interaction, although the students' perceptions of effort expended was not statistically different. Further, there was no discernible difference between the groups in the popularity of the course, so that extra student effort was achieved with no deterioration of student attitudes. Simulation gaining advocates should note then that important motivational benefits may be derived from activities external to the simulation model itself. How the game is administered may be as important as which game is used.

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