

Developments In Business Simulation & Experiential Exercises, Volume 17, 1990

FACTORS AFFECTING STUDENT PERCEPTIONS OF LEARNING IN A BUSINESS POLICY GAME

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A recent survey by Faria (1987) revealed that some 200-business games have been adopted by over 8,500 instructors in approximately 1,900 colleges having business programs. The broad use of simulations has spawned an extensive body of research into their effectiveness as pedagogical tools. (For a comprehensive review, see Greenlaw & Wyman, 1973, and Wolfe, 1985.) Although Faria's survey also reported that business school deans and teachers using games rated their effectiveness highly compared with other teaching methodologies, most researchers point out that measuring learning and business gamings effects on learning is an extremely difficult task. Wolfe (1985), Greenlaw and Wyman (1973), and Miles et.al.(1986) have noted that the difficulty of stating generalizations about the effectiveness of simulations stems from the variety of classroom practices and differences among games. In this study we have analyzed the impact of a number of variables on student perceptions of simulation usefulness in learning business policy course material. These factors may be organized into four categories: course structure, game parameters, student characteristics, and student effort and performance. We have confined our investigation to an analysis of student perceptions for the following reason: Inasmuch as perceptions of effectiveness include components of satisfaction and motivation, and inasmuch as motivation is important to learning, perceived learning may have some correlation Co actual learning.

METHODOLOGY AND FINDINGS

Data on the determinants of student perceptions of business simulation usefulness was collected through the administration of a written survey (available from authors on request). The survey was completed by 482 students divided into 65 companies in 18 industries. The simulation used was *The Business Policy Game* by Richard Cotter and David Fritzsche (second edition). The simulation was part of an undergraduate business policy course taught by five different instructors. The game was centrally administered by a faculty member with the assistance of a team of students who had previously played the simulation

Students generally found the simulation to be a useful tool for learning the material in the business policy course. Students were asked to rate the usefulness of the simulation on a 5 point Likert scale ranging from 1 (Not at all useful) to 5 (Extremely useful) Students were also asked to compare the usefulness of the simulation to other pedagogical methods, including lectures, case studies, textbook readings, examinations, presentations, and written reports. Finally, students were asked if they would recommend the simulation to a classmate in selecting a section of the business policy course. Although the policy course is required for all business majors, the simulation is not used in every section. The simulation has therefore become one of the decision criteria in choosing which class to take.

The overall rating of the simulation was fairly high. This is a similar finding to earlier investigations by Wolfe (1977), and Remus and Jenner (1981), Brenenstuhl (1975), Wolfe and Guth (1975) , Sugges (1982), and Kaufman (1976). When asked to rate the usefulness of the simulation on a five point scale, the mean response was 3.7. On a five point scale ranging from 1 (Would not recommend) to 5 (Would highly recommend), the mean rating was 4.0. Further analysis was conducted to determine what factors account for the favorable rating of the simulation.

COURSE STRUCTURE

The simulation was used by different instructors with varying emphasis on the game versus other pedagogical approaches. The courses varied in size as well as the weighting placed on the simulation for calculating final student grades. Statistical analysis of these factors showed a significant impact on student perceptions of simulation benefits from varying the course context. Instructors were interviewed about the relative amount of course time spent on the simulation during class meetings. The professors were then scaled from 0 (no class time spent on the simulation-the game was treated as an outside laboratory) to I (the simulation was extensively integrated into the course on a daily basis). This variable was Chen correlated with student ratings of usefulness and the strength of recommendation. The correlation coefficients for usefulness (.136) and strength of recommendation (.135) were both significant at the 99% level of significance. It appears that the game is better received if it can be explicitly linked to course materials. This supports Wolfe and Guths (1975) contention that business simulations can be exciting and relevant teaching tools with structure and support from the instructor.

The simulation also fared well relative to other pedagogical approaches. As shown in Table 1, the simulation was regarded as slightly superior to lectures, case discussions, case reports, and textbook readings. Exams, presentations, and other written assignments were considered slightly superior to the use of the simulation. None of these differences were

Table 1
Simulation Ratings Relative to
Other Teaching Approaches

How would you rate the effectiveness of the simulation in helping you learn the material in business policy in comparison to other class assignments?

Compared to...	The simulation was...					
	Much Less Useful		About the Same		Much More Useful	
	1	2	3	Mean Response	4	5
Class Lectures	1	2	3	3.1	4	5
Case Discussions	1	2	3	3.1	4	5
Case Reports	1	2	3	3.0	4	5
Case Prsntatns	1	2	2.8	3	4	5
Exams	1	2	2.8	3	4	5
Textbook Readings	1	2	3	3.2	4	5
Other Wrtn Rptrs	1	2	2.9	3	4	5

statistically significant at a 95% confidence level. This is consistent with earlier work by Strother et. al. (1966), Raia (1966), Anderson et. al. (1964), Anderson and Woodhouse (1984), Boseman and Schellenberger (1974), Wolfe and Byrne (1976), and Roberts and Field (1975). These findings differ

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somewhat from those of Miles et. al (1986) and Sugges (1982), whose subjects perceived cases as equal or superior to simulations. Wolfe (1977) found a much higher rating of simulations relative to other teaching approaches.

The weight placed on the simulation towards final course grade also proved to be a significant determinant of student satisfaction. The weights placed on the game varied between 10% and 33% for the five instructors. The correlation of grade weights with usefulness (.255) and strength of recommendation (.241) are both significant at the 99% confidence level. It appears that placing too small a weight on the simulation can reduce student perceptions of learning, perhaps by undermining their commitment to the game. The role of class size was also investigated to see if the game works better in smaller classes. The correlation between class enrollments and perceived usefulness (.072) as well as strength of recommendation (.055) were not statistically significant. Finally, a correlation analysis was done between student perceptions of simulation benefits and their overall rating of the faculty member as an instructor. Although the correlations between instructor rating and perceived usefulness (.181) and strength of recommendation (.165) are statistically significant at the 99% level, the causality of this relationship is very much open to question and must be interpreted with care.

PARAMETERS OF THE GAME

In addition to modifying course structure to take maximum advantage of a simulation, and instructor can also vary certain parameters of the game. The variables manipulated in this study were the number of team members per company, the number of worlds (industries) per class, the strength of the economy for the game (as measured by growth in real GNP), the volatility of the economic environment (as measured by the standard deviation in economic growth) and the number of decisions students were asked to make during the semester. Table 2 presents the correlations between the rating of simulation usefulness and the parameters of the game, which were manipulated by the instructor. A similar analysis was performed for the determinants of how likely students were to recommend the game to their peers.

Table 2
Correlations of Simulation Rating to Game Parameters

	Usefulness Rating <u>Correlation</u>	Recommendation Rating <u>Correlation</u>
Number of team members	-.155*	-.126*
Number of worlds	.084	.049
Economy strength	.020	.100
Economy volatility	.083	.072
Number of decisions	.006	.040

Note: * indicates significance at the 99% confidence level

The correlations in Table 2 reveal some interesting patterns about student perceptions of simulation usefulness. The only significant variable related to group size. Students rated the simulation more highly if they were on a smaller team. It is likely that smaller group size implies greater responsibility and effort for each individual. The greater effort may produce greater learning and a higher perceived usefulness. Other parameters of the game had a less direct bearing on student satisfaction. The simple correlation coefficients for number of worlds, economic characteristics, and number of decisions were insignificant. However, these variables were analyzed in more depth and shown to be significant when other effects are controlled for. The results of this analysis

appear at the end of this section in a regression model of student perceived learning.

STUDENT CHARACTERISTICS

The perceived benefits of the game may also depend on the individual characteristics of the participants. Data was collected on previous academic achievement (CPA), expected grade in the business policy course, and major field of study. A positive and significant correlation between expected grade and perceived usefulness (.147) and strength of recommendation (.154) was observed, although the fact that the simulation constitutes a part of the course grade makes this relationship a bit difficult to interpret. As will be seen later, students who do well at the game tend to rate it more highly. These students will also expect a higher course grade and it may be incorrect to assume that the simulation appeals to the better students. Further evidence of this is the fact that there is no significant correlation between overall CPA and game rating.

Student major was also investigated as a potential determinant of simulation rating. A one-way analysis of variance was run on student major versus perceived usefulness and strength of recommendation. The ANOVA did not detect any difference in simulation rating between students of differing backgrounds.

GAME EFFORT AND PERFORMANCE

The final area of investigation related to the roles of student effort and success in determining how positively the game was perceived. Variables measuring both individual as well as team effort and performance were collected and analyzed. Students were asked how much time they spent on the simulation each week. The mean for this variable was 5.23 hours per week. However, this variable was not significantly correlated to either perceived usefulness (.092) or strength of recommendation (.083). Students were also asked to submit an organization chart with their title and responsibilities on it. An earlier study by Rowland and Gardner (1973) found that job position in a simulation affected student perceptions of the game. We performed a one-way ANOVA to see if type of responsibilities affected simulation rating. The ANOVA indicated that job title did have a significant affect on simulation rating, so a set of pairwise t-tests were run to investigate what positions in the game seemed most satisfying. The results of this analysis appear in Table 3.

Table 3
Job Responsibilities and Simulation Ratings

	Mean Rating	Mean For All Others	t Value	Sig. Level
CEO/President	3.72	3.65	.73	.532
VP Finance	3.46	3.71	2.13	.966
VP Marketing	3.89	3.62	2.31	.979
VP Production	3.76	3.65	.84	.601
VP Forecasting	3.50	3.68	.94	.530
Controller	3.86	3.66	.91	.637

As shown in Table 3, students with responsibility for marketing gave the simulation the highest overall rating. Their mean rating was significantly higher at a 95% confidence level. Of course, this conclusion is closely linked to the nature of the specific simulation used in the study. In his analysis of total enterprise games, Keys (1987) found that *The Business Policy Game* by Cotter and Fritzsche was more marketing oriented than other business games. This may account for the relatively high rankings by students responsible for the marketing function. A similar conclusion can be drawn for the students

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responsible for finance. Keys also concluded that *The Business Policy Game* did not emphasize financial concerns. This may account for the significantly lower ratings of the simulation by financial managers. It is also interesting to note that the ratings by students who served as CEO/President were not significantly higher than the rest of the participants. Previous studies (Dill and Doppelt, 1963) have found that higher levels of responsibility are generally associated with greater satisfaction. Although the mean rating for CEO/Presidents is higher than for other job titles, the difference is not significant.

Team effort and performance were also analyzed to see how they affected simulation ratings. Several authors have found that students who do well in simulations tend to rate them more highly (Dill and Doppelt, 1963, Remus, 1977, Porter and Lawler, 1968), although Dill et. al. (1961) found no relation between game performance and satisfaction with the game. Our sample showed a significant positive correlation between company financial results and both perceived usefulness (.173) and strength of recommendation (.174). Team commitment to the simulation was measured by the number of group meetings held per week and the use of decision support tools to improve decision-making. Students were asked if they used spreadsheets, word processing, and graphics software as a part of their decision making process. The use of these decision aids has grown dramatically in recent years. Earlier studies by Wolfe (1976) and Philippatos and Moscato (1969, 1971) indicated that students do not use decision-making aids or analyze background or historical information to a significant degree. However, a 1988 study by Keys et. al. found that students who used a decision support system had more positive overall attitudes toward game play than students that did not use a DSS. Our study showed that 69% of the students used spreadsheets, 71% used word processing, and 67% used graphics software to aid decision making. The correlation coefficients for these measures of team commitment are shown in Table 4.

Table 4
Team Commitment and Simulation Ratings

	Usefulness Rating <u>Correlation</u>	Recommendation Rating <u>Correlation</u>
# of meetings per week	.174*	.146*
Use of Spreadsheets	.153*	.157*
Use of Word Processing	.174*	.200*
Use of Graphics Software	.149*	.201*

Note: * indicates significance at the 99% confidence level

All of the variables measuring team effort appeared to have a significant impact on perceived satisfaction with the game. This is interesting in light of the earlier finding that individual commitment (as measured by number of hours

spent on the game per week) did not seem to affect perceived benefits.

The final statistical analysis performed was to build a regression equation, which integrates the previously examined variables into a multivariate model of student perceived learning. Regressions were run for both perceived usefulness (USEFUL) and strength of recommendation (RECOMMEND). The results of this analysis appear in Table 5.

The results in Table 5 are consistent with the correlations reported earlier, although several new variables become significant in a multivariate format. The two most important determinants of student satisfaction are company performance (PERFORM) and simulation weighting in determining course grade (WEIGHT). The use of decision support tools was significant for both equations in Table 5, although the use of spreadsheets proved more significant for determining perceived usefulness, while word processing and graphics were significant in the equation for strength of recommendation. The simple correlations for economic variables were not significantly related to simulation ratings, but became significant in the equation for strength of recommendation. The negative sign on economic volatility would indicate that the uncertainty created by operating a company in a turbulent economy leads to student dissatisfaction with the game. This does not support Cohen and Rehnman's (1966) conclusion that increasing the dynamics of the game situation should result in increased excitement and enjoyment of play. Similarly, strong growth in the economy leads to better operating results for all participants and consequently higher simulation ratings. Surprisingly, the number of worlds per class (WORLDS) entered the equation for perceived usefulness with a positive sign. This would indicate that students find games relatively more worthwhile in classes where more than one industry is being run simultaneously.

CONCLUSIONS

Student perceptions of simulation usefulness can be significantly linked to a variety of factors in a business game. We found that determinants of perceived learning can be grouped into four areas: course structure, parameters of the game, student characteristics, and game effort and performance. Of these categories, the first two can be directly manipulated by an instructor. Our study indicates that students perceive greater simulation benefits if the simulation is explicitly integrated into course content and if a relatively high weight is placed on the simulation in determining final course grades. We found that simulations were generally well received and were rated about equal to other teaching approaches. By manipulating game parameters instructors can also increase perceived learning.

Table 5
Regressions on Determinants of Perceived Learning

DEPENDENT VARIABLE	CONSTANT	WEIGHT	PERFORM	SPREAD SHEETS	NUMBER OF MEETINGS	NUMBER OF MEMBERS	WORLDS
USEFUL	3.259 (10.64)	.021 (3.43)	.0036 (4.33)	.210 (2.26)	.074 (1.99)	-.120 (2.58)	.088 (2.03)
R Squared= .134							
				WORD PROC.	ECONOMY STRENGTH	GRAPHICS SOFTWARE	ECONOMY VOLATILITY
RECOMMEND	2.51 (12.58)	.035 (4.97)	.0042 (4.46)	.326 (2.73)	.154 (3.07)	.232 (2.05)	-.241 (2.04)
R Squared= .144							
Note: t statistics in parentheses							

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found that smaller team sizes and strong but stable economies led to the highest student ratings.

Although student characteristics, performance, and commitment are harder to influence, we found they had a significant bearing on simulation ratings. Students who met more frequently with their groups and who used decision support tools appeared to find the simulation more useful. Students who expected to do well in the course also rated the simulation more highly, but this relationship has questionable causality. We also found that job responsibilities in the simulation affected game rating, although this finding may be unique to the specific simulation under investigation.

Perceived learning and actual learning are not the same thing. Other authors have attempted to relate simulation characteristics to actual learning with mixed success. Assessing and controlling for actual learning present substantial empirical difficulties. This study relied on measures of perceived learning as a proxy for simulation effectiveness. Although it is an imperfect measure of effectiveness, at the very least it provides an index of student interest and motivation. Simulations which students find motivating and interesting are more likely to enhance commitment and learning from the experience. We have found that the context in which a simulation is used can have a direct affect on how students rate the use of a game.

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