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ABSTRACT

This report investigates student evaluations of a business simulation game as a learning experience in terms of specific claims which have been made for this kind of teaching technique. Ninety-nine junior college students in introductory business courses answered a questionnaire after playing the fame as an ongoing, semester-long activity. The results support the claims that games are self-judging, increase student motivation, and increase students' understanding in areas related to the game, but not the claim that games have special value for low-achieving students. The students considered the fame experience most valuable for learning relationships and for getting a feel for the real situation. In general, the students' evaluation of the game as a learning experience was positively related to their understanding of the instructor's reasons for using the game. Also, acceptance of the game as self-judging was associated with low tolerance for ambiguity, and reported increases in business understanding were related to the students' course grades and their understanding of the game. (Author/AWW)

Center for Social Organization of Schools

REPORT NO. 121

DECEMBER, 1971

STUDENTS' EVALUATIONS OF A BUSINESS SIMULATION GAME AS A LEARNING EXPERIENCE

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INTRODUCTORY STATEMENT

The Center for Social Organization of Schools has two primary objectives: to develop a scientific knowledge of how schools affect their students, and to use this knowledge to develop better school practices and organization.

The Center works through five programs to achieve its objectives. The Academic Games program has developed simulation games for use in the classroom. It is evaluating the effects of games on student learning and studying how games can improve interpersonal relations in the schools. The Social Accounts program is examining how a student's education affects his actual occupational attainment, and how education results in different vocational outcomes for blacks and whites. The Talents and Competencies program is studying the effects of educational experience on a wide range of human talents, competencies, and personal dispositions in order to formulate--and research--important educational goals other than traditional academic achievement. The School Organization program is currently concerned with the effects of student participation in social and educational decision-making, the structure of competition and cooperation, formal reward systems, effects of school quality, and the development of information systems for secondary schools. The Careers and Curricula program bases its work upon a theory of career development. It has developed a self-administered vocational guidance device to promote vocational development and to foster satisfying curricular decisions for high school, college, and adult populations.

This report, prepared by the Academic Games Program, investigates students' evaluations of a business simulation as a learning experience in terms of specific claims which have been made for this kind of teaching technique.

ABSTRACT

Ninety-nine junior college students in introductory business courses answered a questionnaire after playing a business simulation game as an ongoing, semester-long activity. The results support the claims that games are self-judging, increase student motivation, and increase students' efficacy in areas related to the game, but not the claim that games have special value for low-achieving students. The students considered the game experience most valuable for learning relationships and for getting a feel for the real situation. In general, the students' evaluation of the game as a learning experience was positively related to their understanding of the instructor's reasons for using the game. Also, acceptance of the game as self-judging was associated with low tolerance for ambiguity, and reported increases in business efficacy were related to the students' course grades and their understanding of the game.

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INTRODUCTION

Many books and articles have been written about simulation games for education, and this literature contains an abundance of claims for the value of simulation games as a method of instruction. Although such claims are repeated throughout the literature on the subject of simulation games, the research evidence behind them is neither extensive nor consistent, and is sometimes non-existant. The purpose of the present study was to examine from the students' point of view the validity of four frequently made claims.

The first claim evaluated is that players accept the outcome of a simulation game as being the result of their own actions; i.e., that games are self-judging.

> "Games are self-judging, the outcome decides the winner, and a player knows that he has won or lost by his own actions." (Boocock and Coleman, 1966, p. 219. Also see Gordon, 1970, p. 21.)

To date, no empirical evidence exists to support this claim. In fact the claim does not appear to have been investigated at all.

The second claim studied is that games increase student motivation. The following statement is an example of this claim as found in the literature:

> "The trainee motivation engendered by full involvement--in what often quickly becomes to him a realistic role with realistic tasks to be performed--has become almost legendary among simulation practitioners." (Greenlaw, Herron, and Rawdon, 1962, p. 47. Also see Abt, 1968, p. 81, 1970, pp. 17-18, Kasperson, 1968, p. 118, and Gordon, 1970, p. 19)

A number of studies have investigated the motivation claim using a variety of dependent variables. Boocock (1963) found that high school students who participated in an election campaign game read and talked more about local elections than did students who had not played the game. Cohen (1970) found that attendance increased more in an inner-city junior high class that used the Consumer game than in a comparable class that did not use the game. In addition 93 percent of the students playing the game felt it was more interesting than their regular class work. Cherry-holmes (1965) found that 87 percent of the students playing Inter-Nation Simulation as "the core activity of a six-week unit in international relations" agreed that they enjoyed participating in the simulation, while only 3 percent disagreed. Robinson, et al. (1966) assigned college students in political science courses to "lab sections." Half the section discussed case studies relevant to the course; the other half played the Inter-Nation Simulation. Students in the simulation sections attended class more consistently and punctually but did not visit the professor or use reserved library materials any more often than the students in the case-study sections.

Not all of the research dealing with the motivation claim has been positive. Livingston (1970) found that 12th grade students expressed less interest in learning about the problems of the poor after playing Ghetto than before. Livingston (1972, in press) found no significant increased interest in politics for junior high school students who played Democracy for two class periods. In addition, the positive results obtained by Boocock (1963) and Cohen (1970) may have resulted from a novelty effect since the game was used for a short period of time.

The third claim investigated in the present study is that games increase students' feeling of control over their environment.

> "Students gain a feeling of control over their environment. Again, the feeling of control is no less real because it is exercised over a hypothetical world.
> . . . . . .
> The sense of efficacy that games permit and encourage . . . is an important educational benefit." (Gordon, 1970, p. 20. See also Nesbitt, 1971, pp. 45-46.)

The importance of control or efficacy for school achievement was first emphasized by Coleman, et al. (1966) in the Equality of Educational Opportunity survey. The relationship between game playing and efficacy was first hypothesized and investigated by Boocock, Schild, and Stoll (1967). In a study using the Life Career Games and Democracy the investigators found no relationship between game playing and increased sense of control. Livingston (1971) conducted two studies investigating the effects of playing Democracy in which the results were equivocal; political efficacy increased in one study but not in the other. Vogel (1971) found that the political efficacy of students who played City Council (a modified version of Democracy) increased more than students who studied similar subject matter via readings and films.

The final claim evaluated in the present study is that games provide a special opportunity for low-achieving students to excel.

> "One of the dominant concerns of education in recent years has been the problem of the 'learning gap' between the 'unsuccessful' student and his more successful peers. We believe that games can be a powerful means to reduce this gap." (Boocock and Schild, 1968, p. 255. Also see Nesbitt, 1971, p. 50; Abt, 1970, p. 25.)

Boocock and Schild (1968) conclude from three unpublished studies that the relationship between learning in a game and performance in the conventional school setting is very weak (p. 256). Braskamp and Hodgetts (1971) found a negative correlation (-.37) between college students' performance in a business game and their grade-point average. However, not all the empirical evidence supports the claim. Fletcher (1971) found that student ability was related to certain types of learning from a simulation game. Edwards (1971) obtained results similar to Fletcher's using a different game and junior high school students. The question of whether low-achieving students react more positively than high achieving students to the simulation experience does not appear to have been investigated.

The purpose of the present study was to find out to what extent the above claims are supported by the students' own perception of their experiences in a simulation game, when the game is a regular weekly activity lasting for a full semester. Presumably, if the claim that games are self-judging is valid, then students should accept the use of their scores in the game as a partial indicator of their performance in the course. Furthermore, the reasons they give for acceptance should indicate that the game outcome is perceived as a result of their effort. If games increase student motivation, students should report that because the game was used they were more interested in the course and did more work in it than they normally would have. If the game increases students' feelings of control or efficacy students should report that as a result of the game, they feel more confident of their abilities to succeed in the real situation which

the game simulates. And if the game offers low achievers a chance to excel, they should agree that the game offered them a better chance to show the teacher they understood the course material than they would have had without the game.

This study also attempted to find out whether differences in students' reactions to a simulation game were associated with five student variables--their understanding of the game, their understanding of the instructor's reasons for using the game in the course, their academic ability, their performance in the course, and their level of tolerance for ambiguity. (The importance of the players' understanding of the educational objectives of a simulation game has been demonstrated by Inbar, 1968; the effects of a simulation game on the players' level of tolerance for ambiguity has been investigated by Lee and O'Leary, 1971.)

The study also included an attempt to find out whether students perceive simulation games as more valuable for some learning outcomes than for other outcomes in comparison with other methods of instruction.

METHOD

The subjects for the present study were 99 college freshmen enrolled in four classes of an "Introduction to Business" course at a community college. This course is required for students majoring in the business curriculum. One of the regular activities of this course is the Introduction to Business Game. This game assumes no background in any business discipline and does not require any special training in mathematics or data processing.

The game simulates a small industry dominated by a few companies, each producing a single product that is an imperfect substitute for the products of the company's competitors. Although the game model is not intended to simulate any one specific industry, in the game the firms are identified as ball-point pen manufacturers. Each firm in the game is a team of two to four students; about five of these competing firms make up one industry. Each class contained at least two industries--that is, at least two separate games.

The teams were required to decide such things as product price, production volume, and investment. They made these decisions once a week throughout the semester, handing in their decisions on Monday and receiving the results--the firm's market performance--on Wednesday. Decisions were made in committee meetings outside of class. An unusual feature of the game is its use of "progressive decision-making," a system in which the students make only one decision (and therefore need only a small amount of information) the first round and progress to making seven differ-

ent decisions (and needing a substantial amount of information) by the end of the sixth week of play.

The student's reactions to the game were obtained by means of a questionnaire administered on the last day of class. Understanding of the game was measured by a 35-item test. (This test is reproduced in Appendix A.) Understanding of the instructor's reasons for using the game was measured by asking the students how well they felt they understood the reasons for using the game and, as a check, asking them what they thought the reason was. The students were also asked to report their grade-point average. (See ACT Technical Report, 1965 edition, page 22 for an experimental confirmation of the validity of self-reported grades.)

Tolerance of Ambiguity was measured by a six-item scale adapted from Robinson and Shaver (1969) and Lee and O'Leary (1971). Ambiguity, as defined by this scale, involves situations characterized by novelty, complexity, or insolubility. (The six items for the scale are given in Appendix B.)

Finally, the students' course grades (which were based partly on their performance in the game) were obtained from the instructors.[1]

In addition, the students were asked to evaluate the usefulness of five classroom activities (the methods of instruction) for four types of learning (the learning outcomes). The five activities were making game

[1]A measure of the students' actual performance in the simulation could not be obtained since no permanent record of this information was available.

decisions, discussing game results, lectures, readings, and individual projects (constructed by the game designer to parallel concepts introduced by the game). The four types of learning included learning terminology, interrelationships, what a business man must know, and getting a feel for business.

RESULTS

The claim that games are self-judging was tested by asking the students to indicate their degree of agreement with the statement, "I feel that basing part of my course grade on my firm's performance in the business game is a fair practice." Table 1 presents the distribution of responses to this item. In general, the students felt that grading on game performance was a fair practice. The mean response was significantly different from a neutral response of "undecided" ($z = 4.44$; $p < .001$).

This information by itself would tend to support the claim that games are self-judging. In addition, the students were asked to state the reasons for their agreement or disagreement. The reasons they gave for their answers to this item strengthen the argument. Only 10 of the 99 students said that the firm's performance was not related to learning or effort by the team members. An additional 19 students mentioned that an individual might be penalized for the unwise decisions of his teammates. On the positive side, 13 students stated explicitly that they felt the game was a valid measure of learning, while 26 students said that game performance should be graded because the game activities comprised an important part of the course. This latter type of statement seems to imply a belief that game performance is a valid measure of learning from the game.

The relationships between acceptance of the game for grading and the five student variables are shown in Table 2. Two of these are significant: a positive relationship with understanding of the instructor's reasons for using the game and a negative relationship with tolerance for ambiguity.

TABLE 1

Responses to statement: "I feel that basing part of my course grade on my firm's performance in the business game is a fair practice."

Response	Score	n
Strongly agree	+3	18
Agree	+2	28
Agree somewhat	+1	21
Undecided	0	8
Disagree somewhat	-1	7
Disagree	-2	9
Strongly disagree	-3	8
		99

Mean = 0.83
S.D. = 1.86
z = 4.44, $p < .001$
(H_o: $\mu_o = 0$)

TABLE 2

Relationships Between Acceptance of Evaluation
Based on Game Performance and Five Student Variables

Student Variables	Correlation Coefficient	Standardized Multiple Regression Weight
Understanding of the game	-.05	-.02
Understanding reasons for use of game	.21*	.32
Grade-point average	-.09	-.14
Tolerance for ambiguity	-.30**	-.39
Course grade	-.02	.07
Multiple correlation All five variables	.44	(R^2 = .20)

*p < .05

**p < .01 (two-tailed tests)

The claim that games motivate students was tested by asking the students whether they felt they had done more work and were more interested in the course as a result of the game. Table 3 presents the distribution of responses to this item. In general, the students felt that the game had stimulated their interest and motivated them to do more work. The mean response was significantly different from a neutral response of "undecided" ($z = 5.63$; $p < .001$).

Table 4 shows the relationships between each of the five student variables and motivation induced by the game. The only significant relationship is that with understanding the instructor's reasons for using the game. Students who did not understand why the instructor was using the game were less likely to report increased motivation due to the game.

The claim that games increase the player's feeling of control or efficacy with regard to success in business was tested by means of two items. The first asked the student whether, as a result of the game, he felt more confident about his ability to succeed in the business world. The second item, worded like the first, asked whether he felt less confident. The two items were scored in opposite directions and added together to yield a score representing change in self-confidence. Table 5 presents the distribution of these scores. Inconsistent pairs of responses (produced by agreement with both the "more confident" item and the "less confident" item) have been dropped from the distribution. In general, the students reported an increase in self-confidence as a result of the game. The mean score was significantly different from the zero score which would have represented no change ($z = 4.87$; $p < .001$).

TABLE 3

Responses to Statement: "As a result of playing the Introduction to Business Game during the past semester, I feel that I did more work and was more interested in the course than I normally would have been."

Response	Score	n
Strongly agree	+3	14
Agree	+2	37
Agree somewhat	+1	18
Undecided	0	4
Disagree somewhat	-1	16
Disagree	-2	6
Strongly disagree	-3	4
		99

Mean = 0.95
S.D. = 1.68
z = 5.63; $p < .001$

(H_o: $\mu_o = 0$

TABLE 4

Relationships Between Degree To Which
Student Was Motivated By Game And Five Student Variables

Student Variables	Correlation Coefficient	Standardized Multiple Regression Weight
Understanding of the game	.21	-.15
Understanding reasons for use of game	.43**	.42
Grade-point average	.03	.16
Tolerance for ambiguity	-.03	.12
Course grade	.14	.06
Multiple correlation - All five variables	.47	(R^2 = .22)

** $p < .01$ (two-tailed test)

TABLE 5

Responses to Statement: "As a result of playing the Introduction to Business Game during the past semester, I feel more/less confident of my ability to succeed in the business world."

Score	n
6	6
5	6
4	17
3	9
2	9
1	9
0	14
-1	6
-2	5
-3	0
-4	7
-5	1
-6	1
	90

Mean = 1.48
S.D. = 2.92
z = 4.81
p < .001
($\hat{H}_o$ μ = 0)

Table 6 presents the relationships between increase in self-confidence and each of the five student variables. Gain in self-confidence correlates significantly with understanding of the instructor's reasons for using the game. It also correlates substantially with understanding of the game and with the grade received in the course. All three of these correlations are positive.

The claim that simulation games offer students who are normally low achievers a chance to excel was tested by asking the students whether they felt the game gave them a better chance than they would otherwise have had to show the teacher they understood the course material. Table 7 presents the distribution of responses to this item, with separate tabulations for low achievers, average achievers, and high achievers. Only the average achievers showed a tendency to agree; both the low achievers and the high achievers were about as likely to agree as to disagree.

The students' ratings of the usefulness of the five main activities of the course (game discussion, discussion of game results, lectures, non-game reading, and individual projects) are reported in Table 8. These ratings were obtained separately for each of four types of learning. These were "learning the basic terminology of a business firm," "learning how various aspects of a business firm affect one another," "getting a feel for how the business world operates," and "learning what a successful businessman must know." The students were asked to rank the five activities from "most helpful" to "least helpful" for each type of learning; a response of "most helpful" was scored as five points, while "least helpful" was scored as one point. Thus the ratings of the five activities

TABLE 6

Relationships Between Gain in Confidence
Resulting From Game and Five Student Variables

Student Variable	Correlation Coefficient	Standardized Multiple Regression Weight
Understanding of the game	.43*	.45
Understanding reasons for use of game	.39*	.25
Grade-point average	-.10	-.40
Tolerance for ambiguity	.07	-.19
Course grade	.33*	.29
Multiple correlation All five variables	.64	(R^2 = .41)

*$p < .05$ (two-tailed test)

TABLE 7

Cross-Tabulation of Grade-Point Average with Response to Statement: "I feel I had more of a chance to show the teacher I understood the course material playing the game than if I were graded on tests and term papers alone."

	Grade-Point Average				
Response:	2.0 or less	2.1-3.0	3.1-4.0	No GPA Reported	Total
Strongly agree	2	7	2	4	15
Agree	2	10	5	9	26
Agree somewhat	3	6	0	5	14
Undecided	2	6	0	3	11
Disagree somewhat	1	3	1	1	6
Disagree	2	9	2	6	19
Strongly disagree	2	0	4	1	7
Total	14	41	14	29	98
Means	0.14	0.63	0.21		

TABLE 8

Mean Student Ratings of Five Classroom Activities
For Each of Four Different Types of Learning

	Type of Learning			
Activity	Terminology	Interrelationships	Feel for Business	Knowledge
Game decisions	2.96	3.95	4.06	3.77
Discussion of game results	2.64	3.63	3.13	2.94
Lectures	4.34	3.40	3.60	3.85
Non-game reading	3.40	2.56	2.61	2.91
Individual projects	1.63	1.49	1.59	1.49

for each type of learning sum to fifteen. For three of the four types of learning the activity "making game decisions" was rated well above the overall mean rank of 3.00; two of the four rankings for the activity "discussion of game results" were above 3.00. The students evidently felt that the game activities were especially valuable for learning the interrelationships of the various aspects of a business firm and for getting a feel for business. For the more factual types of learning, students rated the lectures highest. The students considered the game less helpful for learning terminology than for any other type of learning. None of the student variables correlated significantly with the rankings students gave for the five activities.

DISCUSSION

The findings of the present study tend to support most of the claims commonly made for using simulation games as a teaching technique. The students' reactions to the game were generally positive, though not uniformly so. The students considered the game most valuable for gaining a feel for business and for learning the interrelationships among aspects of a business firm. These are the types of learning for which other authors have recommended the use of simulation games. (See Abt, 1970, pp. 21-22; Boocock and Schild, 1968, pp. 111-112; and Gordon, 1970, pp. 41-43.)

It is interesting to note that the individual projects activity was consistently ranked as being least helpful. These activities were constructed by the game designer to parallel certain aspects of the game. For example, when the players were introduced to the organizational structure of their firm via charts, the related project was to propose alternative organizational structures. It may be that the projects were poorly received by the students because they required individual work on concepts that were being treated in a much more interesting way via the the game. Consequently, the projects suffered by contrast.

The claim that games are self-judging has been questioned by Fletcher (1971):

> Many games have a luck or uncertainty factor which occasionally rewards poor play or penalizes good play. To the degree that luck is a factor, to that degree a player does not win or lose "by his own actions." . . . Even more, if there is in fact a direct relationship between action and payoff, is this fact known to the players, or are the calculations done in secret by the teacher or by some other mysterious "black box" calculator?

> To the degree that such facts are hidden, to that degree it would seem possible for a player to excuse poor performance by blaming it on other factors. This is particularly true if some of the regularities are probabilistic.
>
> In the face of these possibilities the claim that simulation games are self-judging seems very much a hypothesis to be tested.

The findings of the present study support the claim. Most of the students accept the use of game scores to determine part of their course grades. Some explicitly stated that the game score represented a fair appraisal of their learning performance:

> "Firm performance shows to a great degree an understanding of business practices."
>
> "If one listens in class and looks at the game his firm should be competitive."
>
> "The firm's performance depended on our decisions and calculations . . ."

Others felt that game participation should be graded because the game was an important part of the course and required considerable time and effort:

> "Since the game was part of the course, any test of the students' ability to play the game should be a reasonable part of their grade."
>
> "Because the game is just as much a part of B.A. 100 (Introduction to Business) as reading the book was."
>
> "Because I think the game was the backbone of B.A. 100."

The students who gave responses of this type had no objection to the use of their firms' performance as an indication of their own learning. Some students did object, on the grounds that an individual's grade depended on the competence and cooperation of his teammates:

> "It's unfair because part of the firm members work and others contribute nothing. Grades should be individual because many times the committee doesn't work as a whole."

"The majority of the people on my team didn't work--the decisions were made on guesses."

"My decisions weren't used that often, because the captain thought his were better--not always true."

The preceding three categories account for most of the students' reasons for objecting. However, there were those who felt the game was not a fair test of their learning. Some of these responses reflect false beliefs about the game:

"The firm's position was a matter of luck and contained no ability at all.

"I think the game was fixed, and you only came out where they wanted you to."

Finally, some of the students' responses concentrated on particular aspects of the game--its zero-sum nature or the importance of good decisions in the first few rounds:

"After the 3rd or 4th week it was impossible for a firm in 4th or 5th place to take over 1st place. More importantly, only one firm can win 1st place and conversely someone has to end up in last place."

"It's fair but if you bomb out early in the game, you've had it."

The results of the study also tend to support the claims that simulation games increase the students' motivation and their sense of control or efficacy (in this case with regard to business). A majority of the students reported that they were more interested and did more work in the course than they would have without the game. A majority also expressed greater confidence in their ability to succeed in business, as a result of having played the game. However, in each case, a substantial minority disagreed.

An unexpected source of information for evaluating the claim that games increase motivation was the reasons students gave for accepting or

rejecting games for evaluation. The statements centered around the realism engendered by the game:

> "Helps to understand the trials and tribulations of running a business."
>
> "The course introduces you to business and the game gives you on-the-job training. This should let you know if you're business oriented."
>
> "Our firm's performance was an aid to our gaining experience involving various aspects and practices (in business)."
>
> "The only way you can learn about business is to have some practice with it."
>
> "I don't think just giving tests will make a better businessman out of me. I think the game is the real experience."

The above responses are especially interesting in view of the fact that they were made in response to an item that didn't even mention interest or motivation. The students were not likely to be saying what they thought the instructors wanted to hear.

One claim that is <u>not</u> supported by the present study is the claim that simulation games offer low achievers a chance to excel. This study did not test the objective truth of that claim, but instead tested the students' perception of the truth of it, after they played the game. The low achievers were no more likely to agree than to disagree that the game had given them a special opportunity. Their responses to this statement were similar to those of the high achievers and slightly less positive than those of the average achievers.

An investigation of the relationships between several student variables and the students' responses to the game yielded some interesting

and perhaps surprising results. General academic achievement, indicated by the student's previous grade-point average, was not related to the students' responses on any of the questions involving their reactions to the game. This result tends to confirm the statement by Boocock and Schild (1968, p. 260) that " . . . the single teaching technique of simulation gaming can appeal to both the very able and to the non-achieving student." However, the results of this study also suggest that games can fail to appeal to both types of students.

One expected finding was the positive relationship between understanding of the game and increased efficacy resulting from the game. On the other hand, a finding that came as a surprise was the negative relationship between tolerance for ambiguity and acceptance of the use of game results for grading. Apparently, the game was seen as a less ambiguous means of evaluation than ordinary grading procedures. This finding provides strong additional support for the claim that games are self-judging.

The student variable which was most important in determining the students' responses to the game was their understanding of the instructor's reasons for including the game in the course. Students who understood why the game was being used were more likely to report increased motivation as a result of the game, more likely to report increased self-confidence as a result of the game, and more likely to accept the use of the game results for evaluation. For the classroom teacher, these findings emphasize the importance of making sure that the students understand why a simulation game is being used.

The present study did not include objective measures of the benefits students indicated they derived from playing the business simulation game. The primary criterion for judging the validity of the claims made for simulation was the convergence of student and expert (game designers') opinions. As indicated in the above discussion, the perceptions of the majority of the students and the experts did converge. However, the opinions of a substantial minority of students were not consistent with the claims of experts. The results of the study showed that the students who are likely to disagree with these claims can be identified, to some extent, by certain student variables. In future studies it would be desirable to develop more objective measures of game impact. For example, measures of attendance and information seeking could be used as indications of motivation. The development of such measures presents a substantial challenge to the ingenuity of the researcher. Until research results based on such measures are available, practitioners will have to be content to "take the students' word for it."

REFERENCES

Abt, Clark. Games for learning. In Boocock, Sarane and Schild, E. O. (Eds.) Simulation Games in Learning. Beverly Hills, California: Sage Publications, 1968.

Abt, Clark. Serious Games: The Art and Science of Games that Simulate Life. New York: The Viking Press, 1970.

ACT Technical Report, 1965 Edition, Iowa City, Iowa: American College Testing Program, Inc.

Boocock, Sarane S. Effects of an Election Campaign Game in Four High School Classes. Unpublished paper, Department of Social Relations, Johns Hopkins University, Baltimore, Maryland, 1963.

Boocock, Sarane A. & Coleman, J. S. Games with simulated environments in learning, Sociology of Education, 39 (Summer): 215-236, 1966.

Boocock, Sarane S. & Schild, E. O. Simulation Games in Learning. Beverly Hills, California: Sage Publications, 1968.

Boocock, Sarane S.; Schild, E. O.; Stoll, C. S. Simulation Games and Control Beliefs. Technical Report No. 10, Center for Social Organization of Schools, The Johns Hopkins University, Baltimore, Maryland, 1967.

Braskamp, Larry A. & Hodgetts, Richard M. The Role of an objective evaluation model in simulation gaming. Simulation and Games, 2 (June): 197-212, 1971.

Cherryholmes, Cleo H. Developments in simulation of international relations in high school teaching, Phi Delta Kappa, 46 (January): 227-231, 1965.

Cohen, K. Effects of the Consumer Game on Learning and Attitudes of Selected Seventh Grade Students in a Target-Area School. Technical Report No. 65, Center for Social Organization of Schools, Johns Hopkins University, Baltimore, Md., 1970.

Coleman, J. S., et al. Equality of Educational Opportunity. Washington, D.C.: U.S. Government Printing Office, 1966.

Edwards, K. J. The Effects of Ability, Achievement, and Number of Plays on Learning in a Simulation Game. Technical Report No. 115, Center for Social Organization of Schools, Johns Hopkins University, 1971.

Fletcher, Jerry L. The effectiveness of simulation games as learning environments: a proposed program of research. Simulation and Games. 2 (December) 1971, in press.

Gordon, Alice K. Games for Growth: Educational Games in the Classroom. Palo Alto, California: Science Research Associates, 1970.

Greenlaw, Paul S.; Herron, Lowell W.; Rawdon, Richard H. Business Simulations in Industrial and University Education. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962.

Inbar, Michael. Participating in a simulation game. Journal of Applied Behavioral Science 6 (No. 2): 239-244, 1970.

Inbar, Michael. Individual and group effects on enjoyment and learning in a game simulating a community disaster. In Boocock, Sarane and Schild, E. O. (Eds.) Simulation Games in Learning.

Kasperson, Roger E. Games as educational media. Journal of Geography, 62, 1968.

Lee, Robert S. & O'Leary, Arlene. Attitude and personality effects of a three-day simulation. Simulation and Games 2(No. 3), in press.

Livingston, Samuel A. Simulation Games and Attitude Change: Attitudes Toward the Poor. Technical Report No. 63, Center for Social Organization of Schools, Johns Hopkins University, Baltimore, 1970.

Livingston, Samuel A. Effects of a simulation game on the political attitudes of junior high school students. Simulation and Games, 3(March) 1972, in press.

Nesbitt, William A. Simulation Games for the Social Studies Classroom. Foreign Policy Association, 1971.

Robinson, James A.; Anderson, Lee F.; Herman, Margaret C.; and Snyder, Richard C. Teaching with inter-nation simulation and case studies. The American Political Science Review, 60 (March): 53-66, 1966.

Robinson, John P. and Shaver, Phillip P. Measures of Social Psychological Attitudes, Survey Research Center, Institute for Social Research, The University of Michigan, Ann Arbor, Mich., 1969.

Vogel, Rex, Wm. The Effect of a Simulation Game on the Attitude of Political Efficacy of Sixth Grade Students. Unpublished master's thesis. University of Alberta, Edmonton, Alberta, Canada.

APPENDIX A

Understanding the Game Test

(b) 1. In The Introduction To Business Game, the quarterly rate of depreciation is: (a) 1%, (b) 2%, (c) 3%, (d) 5%, (e) none of the above.

(b) 2. In The Introduction To Business Game, the Administrative Expense per quarter is: (a) 10% of the Cost of Goods Sold, (b) 10% of the Cost of Production, (c) 10% of Sales, (d) $.10 per unit sold, (e) none of the above.

(b) 3. In The Introduction To Business Game, the Interest Expense on Loans per quarter amounts to: (a) 1%, (b) 2%, (c) 3%, (d) 4%, (e) none of the above.

(e) 4. In The Introduction To Business Game, the Interest Expense on Emergency Loans per quarter amounts to: (a) 1%, (b) 2%, (c) 3%, (d) 5%, (e) none of the above.

(c) 5. In The Introduction to Business Game, the quarterly rate of taxation amounts to: (a) 10%, (b) 25%, (c) 40%, (d) 60%, (e) none of the above.

(b) 6. In The Introduction To Business Game, Inventory Carrying Cost is how much per quarter: (a) .30 percent per unit, (b) $.30 per unit, (c) 10% of the value of all pens in inventory, (d) .30% of the value of all pens in inventory, (e) none of the above.

(b) 7. Plant Net Book Value always equals: (a) Plant At Cost minus Depreciation Expense, (b) Investment In Plant plus previous Plant At Cost minus previous Allowance for Depreciation minus Depreciation Expense, (c) previous Plant At Cost minus Allowance for Depreciation plus Depreciation Expense, (d) previous Plant At Cost minus Depreciation Expense plus Investment In Plant, (e) none of the above.

(a) 8. Dividends paid are: (a) subtracted from Net Earnings to arrive at the Addition To Retained Earnings, (b) subtracted from Sales, along with the other expenses, to arrive at the Gross Earnings, (c) added to the Net Earnings to arrive at the Addition To Retained Earnings, (d) subtracted from the Addition To Retained Earnings to Determine the new Retained Earnings, (e) none of the above.

(c) 9. In The Introduction To Business Game, each unit of productive capacity is worth: (a) $5, (b) $10, (c) $15, (d) $20, (e) none of the above.

(e) 10. In business, what determines the market share for the individual firm to the greatest extent: (a) the price and marketing of the firm, (b) the change in the time of the year, (c) the price and marketing of competitors, (d) the change in economic activity, (e) the relationship of price and marketing of all firms in an industry to each other.

(d) 11. The Expense incurred by the business firm as machinery, buildings, fixtures, and other equipment wear out is called: (a) Obsolescence Expense, (b) Inflation Expense, (c) Allowance for Depreciation, (d) Depreciation Expense, (e) two of the above.

(c) 12. Dividends are paid to stockholders from: (a) Total Expenses, (b) Gross Earnings, (c) Net Earnings, (d) Addition to Retained Earnings, (e) none of the above.

(d) 13. A business firm's sales will equal its market potential: (a) in almost all situations, (b) only when its current production volume equals or exceeds the market potential, (c) only when its inventory of finished goods equals or exceeds the market potential, (d) only when its current production volume plus its inventory of finished goods equals or exceeds the market potential, (e) none of the above.

(b) 14. Cash Disbursements on the Statement of Cash Receipts and Disbursements do NOT include which of the following: (a) Administrative Expense, (b) Depreciation Expense, (c) Cost of Production, (d) Interest Expense, (e) all of the above are Cash Disbursements.

(d) 15. When the Economic Index goes up from 103 in quarter 1 to 110 in quarter 2, we may assume: (a) that industry sales will increase, (b) that individual firm sales will increase, (c) that individual market potentials will increase, (d) nothing without considering the time of the year, (e) all of the above.

(b) 16. Given the following data, calculate the Investment In Plant for quarter 3, using the same methodology as that which is used in The Introduction To Business Game:

Depreciation RATE = 5% per quarter

Plant Net Book Value for quarter 2 = $6,000,000
Plant Net Book Value for quarter 3 = $6,500,000
Plant Net Book Value for quarter 4 = $7,000,000

The Investment in Plant for quarter 3 was: (a) $825,000, (b) $800,000, (c) $850,000, (d) $830,000, (e) none of the above.

(b) 17. In business, profits or earnings are never used for: (a) paying Dividends, (b) management salaries, (c) increasing the plant capacity, (d) increasing Retained Earnings, (e) profits are used for all of the above.

(d) 18. Which of the following items would never appear on a Statement of Financial Position: (a) production machinery, (b) finished goods inventory, (c) cash, (d) sales income, (e) all of the above would normally appear on the statement.

(c) 19. The amount of dividends paid to the owners of a company is determined by: (a) stockholders, (b) law, (c) management, (d) stock exchanges, (e) none of the above.

(e) 20. In The Introduction To Business Game, the new Plant Capacity In Units for the next quarter will always equal: (a) previous Plant Net Book Value plus Investment In Plant for the quarter, (b) previous Plant Capacity In Units plus Investment In Plant minus Depreciation Expense, (c) previous Plant Capacity In Units minus the Allowance for Depreciation plus the current Investment in Plant, (d) previous Plant At Cost minus the Allowance for Depreciation plus the current Investment in Plant, (e) none of the above.

(b) 21. In The Introduction To Business Game, the most efficient level of utilization of plant capacity was (a) 100%, (b) 90%, (c) 80%, (d) 70%, (e) none of the above.

(a) 22. In The Introduction To Business Game, the least expensive per unit cost of production could be obtained from a plant with a capacity of how many units: (a) 300,000, (b) 350,000, (c) 250,000, (d) 280,000, (e) none of the above.

(c) 23. In The Introduction To Business Game, what percentage of "stockouts" will be regained the next period by the business firm? (a) 100%, (b) 80%, (c) 50%, (d) 20%, (e) none of the above.

(a) 24. In The Introduction To Business Game, Collection On Accounts Receivable will equal: (a) previous quarter's Sales, (b) current quarter's Sales, (c) previous quarter's Sales Volume In Units, (d) current quarter's Scales Volume In Units, (e) none of the above.

(b) 25. In The Introduction to Business Game, Taxes Payable will equal: (a) current Taxes, (b) previous quarter's Taxes, (c) any unpaid previous quarter's Taxes, (d) any unpaid current quarter's Taxes, (e) none of the above.

(c) 26. In The Introduction To Business Game, the Total Units Available For Sale equals: (a) the current Production Volume, (b) the current Finished Goods Inventory In Units, (c) the current Production Volume plus the previous Finished Goods Inventory In Units, (d) the previous Production Volume plus the previous Finished Goods Inventory In Units, (e) none of the above.

(b) 27. In The Introduction To Business Game, the Cost of Goods Sold: (a) equals the Cost of Production, (b) depends upon the calculation of an average cost per unit and the total units available for sale, (c) depends upon the calculation of the Cost of Production and the Total Units Available for Sale, (d) is usually the second largest expense of the individual business firm, (e) none of the above.

(c) 28. How many shares of stock were issued and outstanding to the owners of your firm in The Introduction To Business Game: (a) 3,000,000, (b) 2,547,867, (c) 60,000, (d) 65,478, (e) none of the above.

(a) 29. When does a stockout exist for a business firm: (a) when market potential is greater than total goods available for sale, (b) when market potential is greater than production volume, (c) when sales are greater than market potential, (d) when production volume is greater than sales, (e) none of the above.

(d) 30. Profits are earned by the business firm by: (a) charging high prices for its products, (b) charging low prices for its products, (c) minimizing expenses, (d) balancing expenses and revenues, (e) emphasizing volume sales.

(e) 31. Decisions involving plant capacity and additional investment in the plant must consider: (a) future demand for the product being produced, (b) additional costs incurred such as increased depreciation expense, (c) optimal levels of plant capacity, (d) optimal levels of plant capacity utilization, (e) all of the above.

(a) 32. In The Introduction To Business Game, a 10% decrease in product price will: (a) be just as effective in increasing sales as a 40% increase in marketing expenditure, (b) increase sales about 20%, (c) increase sales 20% if competitors do not do the same thing, (d) two of the above are true, (e) all of the above are NOT true.

(b) 33. Success in business depends mainly upon: (a) the quantity of resources available to management, (b) the skill with which resources are used, (c) the amount of capital available, (d) the uniqueness of the product or service involved, (e) all of the above.

(b) 34. A visual device that shows how the various departments of the business relate to one another is the: (a) span of control, (b) organization chart, (c) line graph, (d) line and staff manual, (e) none of the above.

(a) 35. The Earnings statement equation is: (a) revenue minus expense equals earnings, (b) assets equal liabilities minus owners' equity, (c) assets equal liabilities plus earnings, (d) assets equal liabilities plus capital stocks, (e) earnings equal liabilities plus expenses.

APPENDIX B

TOLERANCE OF AMBIGUITY SCALE*

	Tolerance Score	
	Low	High
It is essential for learning or working effectively that our teacher base outlines in detail what is to be done and how to do it.	Agree	Disagree
The sooner we all acquire similar values and ideas the better.	Agree	Disagree
The best kind of life is an even and regular one where you always know what to expect.	Agree	Disagree
People who insist on a yes or no answer just don't know how complicated things really are.	Disagree	Agree
An expert who doesn't come up with a definite answer probably doesn't know too much.	Agree	Disagree
A good job is one where what is to be done and how it is to be done are always clear.	Agree	Disagree

*From Robinson and Shaver (1969), adapted by Lee and O'Leary (1971).