**USING A BUSINESS SIMULATION
IN THE PRINCIPLES OF MANAGEMENT COURSE --
LEARNING OUTCOMES LID PERCEPTIONS**

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ABSTRACT

The purpose of this paper is to report on the use of a business simulation in a college freshman class entitled Principles of Management(MG 101). A version of the IMAGINIT(2) simulation called "Mini-Imaginit" was devised and implemented in the freshman course. Following a complete semester's use of the simulation, an achievement test was administered to determine test scores on specific management concepts of (1)planning and decision making and (2)organizing for stability and change. Two separate classes were used in the experiment. One class was given a structured approach for group processes; the other was given an unstructured approach. The same instructor was used to implement each of the approaches; thus, the variable of teaching methodology was assured to be controlled.

In addition to measuring learning outcomes, students were given a survey to indicate their perceptions of the management course. The students were asked to indicate their perceptions of the management course. The students were asked to indicate the extent to which they felt the use of the computer simulation (Mini-Imaginit) helped in their understanding of a variety of management topics and its effect on their attitudes toward the management course.

BACKGROUND

A review of the research on gaming has shown several factors studied that could cause outcome effects. Researchers have manipulated such variables as the game's complexity, instructor involvement, prior student associations, game pacing, learning objectives, student preparation, aptitude and cognitive structure, and different team sizes.(13)

This study was an outcome of a favorable response from an initial freshmen group receiving instruction that included a business simulation. However, this researcher was interested in measuring learning outcomes in addition to gaining perceptions on the quality of the course. The vehicle to placing students in groups to measure learning outcomes (dependent variable) would be the use of a business simulation. The independent variable would be instructor involvement. Bigge(3) discusses the relationship between the learner and the instructor, classifying it as authoritarian, laissez-faire, or democratic in nature. Each has specific implications for the degree of learning task responsibility assumed by instructor and learner and the interaction between them. This study tested Bigge's theory by implementing the authoritarian approach (structured) and the laissez-faire approach (unstructured) in the experiment.

Prior research by Waggener(12) revealed that by creating original scenario events, the instructor will not only teach the concepts intended, but will enhance the simulation experience. The simulation will not be a separate part of the course, but an integrating vehicle for the topics to be taught.

Additional research by Taylor(11) indicated that in the administration of games, directness and timeliness are often directly correlated with each other. The more direct the feedback on how a student is doing, the more timely is the response.

With the help of previous research findings, the investigator could build a methodology based on learning theory. The next task was to develop a rationale for the models used for learning outcomes.

INTRODUCTION

Business management literature continues to focus on the four main functions of a manager: Planning, Organizing, Directing and Controlling. This report focuses on the planning and organizing functions of two groups that participated in a classroom experiment. The experiment was to measure students' learning outcomes of the planning and organizing functions of management.

The successful planning function for any group is to concentrate on the following factors:(9)

1. Purpose   --what we are or what we want to become
2. Mission   --our unique aim
3. Objective   --where we are going and when we are going to get there
4. Policy   --how we are getting there
5. Strategic plans --what to do to reach the objectives

Each class was taught to use this model in the beginning stages of participating in the business simulation. The instructor, however, made it mandatory for the structured class that each of its steps to planning be documented and turned in to the instructor as a completed assignment on a due date. The unstructured class was told only to document its steps to planning.

A successful organizing function for the two classes to follow is shown in the model that delineates the five phases of organizational growth. (5)

1. Crisis in leadership...
    Growth through creativity

2. Crisis of autonomy...
    Growth through direction

3. Crisis of control...
    Growth through delegation

4. Crisis of red tape...
    Growth through coordination

5. Crisis of ?…
    Growth through collaboration

Each class was taught to use this model as it progressed through the maturation stages of development as the semester progressed. The instructor, however, made it mandatory for the structured class to document each encountered crisis and the steps to take for growth development, implement its remedies and turn the report in as a completed assignment. The unstructured class was told only to document each encountered crisis and the steps to take for growth development and implement its remedies.

METHODOLOGY

The structured approach given by the instructor represents one of the treatments applied in the study. This approach is characterized by mandatory requirements or tasks to be completed by student members in one of the experimental classes. The requirements focus on a variety of written and verbal assignments with due dates. In Processes in the Classroom, Schmuck and Schmuck state that grouping processes assume that students can teach and learn from each other.(1O) Learning theories indicate that depth of understanding among a group of students varies. But, in working together, group members can exchange what they have learned and communication can be reinforced. When conducting skill development exercises in class, the instructor provided immediate feedback and direction. Other times, the instructor provided written feedback and comments for the group.

The following list provides an example of the structured approach methodology:

1.   Regarding the manager's character type as described by Maccoby in The Gamesman(s), students were asked to assess each other in the group, reach consensus, and prepare individual profiles of each other.

2.   Regarding steps in the formulation and implementation of strategy as described by Andrews in The Concept of Corporate Strategy(1), students were asked to identify their unique team problems when using the nine-step model.

3.   Regarding why managers don't, won't, or can't plan as adapted from Bologna in Managerial Planning (4), students were asked to rank order by first choices their unique stumbling blocks to planning. They would be asked to meet with the instructor for a brief oral presentation describing their findings.

4.   Regarding functional organization charts, students were asked to prepare a chart for each of the four simulated years of operation. Names and titles were rotated annually.

5. Regarding performance appraisals, students were asked to rate each other after each simulated year on an appraisal form.

The unstructured approach methodology given by the instructor represents one of the treatments applied in the study. This approach is characterized by tasks to be completed by student members in one of the experimental classes, but the tasks are not mandatory. They are not required to be turned in for instructor approval. The tasks focus on the same variety of written and verbal assignments given to the structured class but without mandatory due dates and times. The unstructured class was directed to use the reports and findings during group meetings. Emphasis from the instructor was placed on the group to decide its direction. Minimal feedback was provided.

One assignment, however, that was mandatory for all participants in the simulation to complete was the annual business report. Rationale for decisions and financial statements were included in the report.

Mini-Imaginit

A version of the THE IMAGINIT MANAGEMENT GAME was& devised for use in Principles of Management(MG 101) at Bryant College, a course normally taken by freshman students. The version of the game was named "Mini-Imaginit" due to the lower level of game complexity needed for freshman undergraduates. However, the main objectives of the simulation remained intact. Groups of student teams made decisions that guided their firm into the future. Necessary actions were taken on a list of issues including changes in plant size, marketing philosophy, research investment, and whether to offer bonds or shares of stock to raise capital.

The students made the same two types of element decisions found in the IMAGINIT game: (1) those that apply to individual products, and (2) those that affect the overall operations of the firm. However, parameters denoted in dollar amounts for the following decisions were provided for the students: price, materials inputs per unit, expenditures for salesmen and advertising, and investment in product research and development. Specifically, the factors that make Mini-Imaginit less complex than IMAGINIT are the use of the direct selling market (no distribution channel inventories), the use of one product line (B-i only), and the absence of time weights on decisions that take effect in the next simulated periods (variations turned of f).

Although several alternative ways to Judge winners were possible, profit after tax for four cumulative years was used in Mini-Imaginit. Freshman students can relate to this figure very easily and quickly. At this point, that particular measurement makes for keen competition and high motivation.

PROCEDURES

The set of data for this study was gathered at Bryant College, Smithfield, Rhode Island, during the Spring semester of the 1984-85 academic year. The sample consisted of 64 students from a total enrollment of 139 students taking Principles of Management (Mg 101) using aversion of The IMAGINIT MANAGEMENT GAME, named Mini-Imaginit. The selection of the two classes participating in the study was based on instructors who would be teaching at least two sections of Principles of Management. The only instructor was the researcher of the study. The assignment of the treatments was done randomly. Class 1 received the structured treatment (Method 5); class 2 received the unstructured treatment (Method U).

After fourteen weeks of instruction and participation in the simulation, a post-test was administered to the two classes. The post-test was an achievement test of student comprehension on specific management concepts of (1) planning and decision making and (2) organizing for stability and change. In addition to measuring learning outcomes, students were given a survey to indicate their perceptions of the management course.

Each experimental treatment was constructed on the basis of the common syllabus for the Principles of Management course (MG 10I). To insure that the instructional variable of content instruction remained experimentally constant and was uniformly conducted in the classes, each lesson was detailed concerning the factors of time, homework, and in-class exercises.

One assessment instrument was used to measure students achievement of managerial concepts. The instrument was constructed from the test file designed to test students' comprehension of materials presented in Management, Second Edition, by James A.F. Stoner, 19s2, Prentice-Hall, Inc. The attitude survey was used to gather perceptions on the extent to which the use of the computer simulation helped in student understanding of a variety of management topics and its effect on attitudes toward the management course. This instrument was constructed by Dr. Robert Giacolone, Assistant Professor of Organizational Behavior, Southeast Louisiana University.

Treatment of Data

The two classes in this study were tested for differences in achievement after the prescribed period of instruction. A post-test only experimental design was used in the study. The analysis of variance was used for the purpose of testing hypotheses of no differences among several groups of items.(6) Regression analysis was used to estimate empirically a specified relationship that is assumed to exist between variables. The .05 level of significance was selected as the probability required for rejecting the null hypothesis for this study.

Results of Achievement Tests

To determine if any achievement differential occurred among students experiencing the two methods of instruction, individual scores were compiled and compared. The following linear regression model is assumed to explain the score for each student.(7)

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    y = a + bx
 where y = dependent variable (Test score)
       a = constant
       b = slope
       x = independent variable (Method)
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Once individual scores were compiled, differences in achievement between groups could be compared. Thus, the comparison of Method S (structured) to Method U (unstructured) was made on the TOTAL score, which comprised PART 1 (planning and decision making) and PART 2 (organizing for stability and change).

Table I
Regression Analysis for Overall Achievement
Analysis of Variance

Source of Variation	DF	Sum of Squares	Mean Square	F
Regression	1	71.52	71.52	4.11
Error	62	1078.96	17.40	

As indicated in Table I, the analysis of variance in multiple regression analysis appraises the overall significance of the regression equation. It tests the null hypothesis that all of the true population regression (slope) coefficients equal zero.

On the basis of an F test in this analysis of variance for 1 and 62 degrees of freedom, an F value of 4.00 was found at the .05 level of significance. Since the computed F value shown in Table I was 4.11, the null hypothesis was rejected. Thus, differences in TOTAL achievement scores comparing Method S mean score (24.67) with Method U mean score (22.54) were found to be significant at the .05 level.

TABLE II
Regression Analysis for Part 1
— Planning and Decision Making
Analysis of Variance

Source of Variation	DF	Sum of Squares	Mean Square	F
Regression	1	21.44	21.44	3.77
Error	62	352.00	5.68	

As indicated in Table II, the computed F value was 3.77. When an F teat was applied in this case, an F value of 4.00 was found at the .05 level. Thus, differences in PART 1 achievement scores comparing Method S mean score (12.42) with Method U mean score (11.25) were not found to be significant. The null hypothesis of no significant difference between the methods on PART 1 was not rejected. Statistical analysis indicated a significant difference at the .10 level.

Table III
Regression Analysis for Part 2
Organizing for Stability and Change
Analysis of Variance

Source of Variation	DF	Sum of Squares	Mean Square	F
Regression	1	14.65	14.65	2.07
Error	62	438.46	7.07	

As indicated in Table III, the computed F value was 2.07. When an F test was applied in this case, an F value of 'L.00 was found at the .05 level. Thus, differences in PART 2 achievement scores comparing Method S mean score (12.25) with Method U mean score (11.29) were not found to be significant. The null hypothesis of no significant difference between the methods on PART 2 was not rejected.

Other findings showed that 13.9% of the students receiving Method S scored 30 and above on the TOTAL achievement test while zero percent of the students receiving Method U scored 30 and above. Regarding PART 1 findings: 16.67% of the students receiving Method S scored 15 and above on Part 1 of the achievement test while 3.57% of the students receiving Method U scored 15 and above. Regarding PART 2 findings: 19.45% of the students receiving Method S scored 15 and above on Part 2 of the achievement test while 17.85% of the students receiving Method U scored 15 and above. Students receiving Method U totaled a higher percentage on scores of 10 or below in PART 1, 2, and TOTAL achievement of the post-test.

Results of Attitude Survey

On the final day of class, each group was asked to complete the attitude survey. The intent was to determine the extent to which the students felt the use of the computer game (Mini-Imaginit) helped in their understanding of a variety of management topics. Table IV indicates the percentage of students that answered "helped" or "helped a great deal," regarding their understanding of management topics.

In addition, a test for difference between proportions (two-tailed) was performed. Table IV shows the Z values obtained when comparing two population proportions on each management topic. When using a .05 level of significance, .025 of the area under a normal]. curve lies above a Z value of +1.96 and thus the same percentage lies below Z -1.96. Calculations revealed a Z = -3.44 when comparing population proportions on "problem solving" and a calculation of Z = -2.25 on the management topic of "making control effective". Thus, the null hypothesis in each of these two cases was rejected. A significant difference was found in the attitudes of the unstructured group compared to the structured group that indicated the computer game "helped" or "helped a great deal" in their understanding of "problem solving" and "making control effective".

Table IV
Attitude Survey on
Understanding Topics

Topic	S Group	U Group	Z Value
General Management	89	100	-1.85
Strategic Planning	89	100	-1.85
Making Planning Effective	89	100	-1.85
Problem Solving	69	100	-3.44
Decision Making	89	100	-1.85
Productivity	67	79	-1.09
Groups and Committees	83	75	-0.80
Leadership	69	75	-0.55
Financial Control	86	79	-0.78
Making Control Effective	56	83	-2.25

(S = structured; U = unstructured)

Students were asked to respond to two additional questions regarding the quality of the course that uses a computer simulation as part of the course. In Table V, the percent column represents the percent of student responses that indicated a or 5 using a scale of 1 (not at all) to 5 (totally) for each question. The mean column represents the average of the students response using the same scale.

Values for Z were obtained when comparing two population proportions regarding the questions on course quality. Calculations revealed a Z = -6.5 to the response "makes the course more difficult" and a calculation of Z = -10.5 to the response "helps you to remember concepts better". Thus, the null hypothesis in each of these two cases was rejected. A significant difference was found in the attitudes of the unstructured group compared to the structured group that indicated the use of the computer game "makes the course more difficult" and "helps you to remember concepts better".

Table V
Attitude Survey on Course Quality

Structured Percent	Mean	Unstructured Percent	Mean	
				1. To what extent did the use of the computer game:
69	3.8	71	3.8	enhance learning
56	3.2	67	3.8	enhance your enjoyment of the course
78	4.1	88	4.3	make the course more realistic
45	3.4	58	3.5	make the course more difficult
42	3.1	63	3.6	help you to remember concepts better
				2. To what extent could you recommend that this course be taught by using the computer game?
67	3.8	67	3.8	

CONCLUSION

Based upon the statistical analysis of the data, the following conclusions were drawn concerning the effectiveness of the two methods included in this study:

1.   Students who receive instructions that includes use of the Mini-Imaginit simulation and requires assignments be graded by the instructor and given back to the students (Method 5) appear to gain greater achievement of specific management concepts than students who are not required to turn additional assignments in to be graded (Method U). This study indicated that when instructors enforced additional assignments such as team members preparing individual profiles on each other, team members identifying unique team problems by using a strategic formulation model, team members ranking unique stumbling blocks to planning and giving a brief oral presentation describing their findings, team members rotating functional responsibilities and duties as depicted on an organizational chart, and team members rating each other's performance following each simulated year on an appraisal form TOTAL mean scores (Part 1 and 2 together) on the achievement test between methods differed significantly.

2.   Management instructors may select Method S (structured) with expectations of gaining higher mean scores for each part on the achievement test (Part 1 and 2 separately). This study indicated that when an instructor used Method 5, mean scores measuring (1) Planning and Decision Making and (2) Organizing for Stability and Change were higher than when an instructor used Method U (unstructured). However, mean scores between methods did not differ significantly.

3.   Students who receive instruction that includes use of the Mini-Imaginit simulation felt to a high extent that the use of the computer game helped in their understanding of a variety of management concepts. The attitude survey indicated a "helped" or "helped a great deal" response from 56% to 100% on different management topics. A significant difference was found in the attitudes of the unstructured group regarding "problem solving" and "making control effective".

4.   Students under study responded positively to survey questions regarding the quality of the course that used a computer simulation as part of the course. For example, 70% felt that the game enhanced learning while 62% felt the game enhanced their enjoyment of the course. A significant difference was found in the attitudes of the unstructured group regarding the use of the game "makes the course more difficult" and "helps you to remember concepts better".

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