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A DEMONSTRATION OF THE BUSINESS SIMULATION-GAME AS A CURRICULUM ASSESSMENT DEVICE

Joseph A. Wolfe, The University of Tulsa

ABSTRACT

It has been suggested that a business game can serve as a curriculum evaluation device. This paper outlines the method and results of a demonstration of this type of simulation application. All teaching inputs were held constant over three different business colleges where all subjects had completed their business college core requirements. Differential performance results were obtained and certain departmental quality differences were perceived and contrasted on a comparative basis. The demonstration's results generally reflect admissions criteria and other indices of business school excellence.

INTRODUCTION

Various business-gaming proponents in the early 1960's foresaw and charted much of what was to become simulation's most productive and influential areas. Cohen and Rhenman [6] noted gaming's then-current use for business education and its future applications as social science laboratories and research environments for a wide variety of disciplines. Dill [8] and Dill, Jackson and Sweeney [9], while restricting their vision to the educational sphere, still suggested an ambitious array of business-gaming applications. Whether applied to executive development programs [8] or to business schools in general [9], it was believed that games could be used to stimulate, simulate, teach and test.

The prospects and realities of the "stimulate, simulate, teach aspects have received a great deal of vigorous debate and research attention but the 'test' aspect has remained largely fallow and untapped. To Cohen and Rhenman, testing entailed the use of business games for career guidance or executive assessment [6, p. 165]. Inferential work along this line has been performed by Babb, Leslie and Van Slyke [1], McKenney and Dill [21], Vance and Gray [27], and Wolfe [29] while direct work has been reported or performed by Baldwin [2], Cohen and Rhenman [6], Hunsaker [15; 16], Messmer [22], and Schreier and Komives [23].

This paper, however, is more concerned with Dill, Jackson and Sweeney's [9, p. 1L] use of games for testing not so much to grade students as to determine whether the educational program which they had undergone had satisfactorily achieved its objectives." In this curriculum-evaluation sense, testing emphasizes the institution's performance rather than the individual student's performance in a business game. Given this focus, an institution's game performance could be used (1) within a business college to evaluate certain aspects of its departmental academic output, and/or (2) between institutions to help judge the nature and quality of their overall programs.

METHODOLOGY

It has become common practice to use national tests to evaluate students, judge the quality of the programs to which they have been exposed, and to "level" the differential grading scales that have been applied to them. Standardized tests such as the ACT, GRE, SAT and GNAT have been used as instruments for college admissions decisions [7; L2; L3; 18], the

prediction of professional accomplishment [7; 20], and the evaluation of an academic program's quality [Li; L9; 25]. In the study reported here, a comprehensive, computer-based business decision-making simulation [17] became the instrument through which three different business college degree programs received an external and internal evaluation.

To serve as an unbiased evaluation instrument on both the individual-student and macro-organizational level, It is necessary that the gaming/instrument be capable of testing the respondent's knowledge along the following dimensions:

1. comprehensiveness or variety;
2. depth or assortment; and
3. factual, theoretical and/or skill orientation. The simulation employed in this study had been found to be both comprehensive [34] and functionally and cognitively unbiased (30; 32; 34); it had also been able to sustain motivation and interest over a comparatively long period of time thus insuring deeper and more stable measurements of knowledge [34]. Complex simulations of this type also possess high player face validity and legitimacy as the games have been found to reward rational decision-making behaviors while simultaneously serving as motivating and compelling learning experiences [1; 9; 29; 31; 33; 34; 35].

This study's simulation had previously demonstrated additional internal academic validity characteristics. Wolfe [30] had found that students could meaningfully express and translate their knowledge into profitable forms within the simulation's context where correlations between game profits and various cumulative grade-point-averages (CGPAs) ranged from .373 to .503. This compares with ATGSB score correlations and first-year MBA grades which typically range from .43 to .53 [13, p. 97], CACT scores and overall college grades which are...about .50" [28, p. 614], or SATs and high school grades which have consistently held at about .55 [10, p. 647].

Three midwestern schools were the focus of this study and have been profiled below. Each institution's CACT score and Barron's [3] classification of entrance competitiveness has also been included.

Alpha

A small, private 2,600-student, liberal-arts, dormitory-type school. Alpha is situated in a fairly affluent suburb of a major midwestern city and offers a very active part-time evening program in business administration or accounting. The school recently faced a financial scare which has caused it to (1) emphasize the more-practical and job-oriented disciplines, (2) de-emphasize Liberal Arts and (3) actively seek full-time black students to shore up deteriorating full-time day enrollments. Accepts about 91% of its applicants of which 51% actually enroll; 17% of its Freshmen scored over 25 on the CACT and 15% of its Freshmen were in the upper 10% of their high school classes. CACT = 24, Barron's = Competitive.

Delta

A 19,000-student, comprehensive, non-dormitory state

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university located in a major American city. Minority- group members are becoming an increasing proportion of the student population. Almost one-half of its graduates transfer-in from nearby colleges. Delta's business college faculty possesses both size and depth, and which, while basically young, has been recruited from the nation's top doctoral programs. The college accepts about 67% of its applicants and 78% of those accepted enroll. 21% of its Freshmen were in the top 102 of their high school classes. CACT 22, Barron's Very-competitive.

Sigma

A medium-sized, 12,300-student, comprehensive, non-dormitory urban, university. Sigma has changed its governance from public/municipal to public/state control and is in the process of up-grading its faculty and facilities since receiving fresh State university-system money. Salary levels are somewhat depressed and the faculty has recently voted in the AAUP as its collective bargaining agent. The school has an open admissions policy where 72% of all admitted elect to enroll. CACT = 19.6, Barron's Non-competitive. 18% of its Freshmen score over 25 on the CACT.

Business administration seniors played the simulation game for credit within a core-required Business Policy course. All teaching inputs were held as constant as possible across all institutions where the instructor, course-level, textbook, reading assignments, simulation, and case assignments were all controlled. The measurement of individual game achievement (to mirror individual achievement as tested in the ACT/SAT/GMAT situation) was accomplished by creating single-member firms in 8-firm industries. Both quantitative and qualitative measures were recorded. Quantitative measurements were in the form of cumulative earnings (CEARN), rate-of-return on investment (ROI) and rate-of-return on equity (ROE). Qualitative measures were taken of the students' perceptions regarding the adequacy of their prior coursework and the theory or skill orientation of that coursework.

RESULTS

The Mann-Whitney U test was employed to determine if differences existed between the performances obtained by each university's students. As presented in Table 1 there were non-significant differences between the profits and rates-of-return generated by Alpha and Delta while Sigma underperformed both at the .001 level. Alpha's earnings ranged by firm from \$302,254 to \$-498,563 with Delta's ranging from \$330,262 to \$-383,209. None of Sigma's firms ever generated overall profits where the best-performing firm lost \$-160,504 while simultaneously obtaining a -7.96% ROE.

Table 2 presents the Likert-type questions used to obtain the perceptual and qualified data used in this study. As presented, the questions have been transformed slightly as the original instrument alternatively posed its questions in a positive/negative sequence. Questions 1-3 found no overall differences as to perceived coursework adequacy despite real performance differences obtained by Sigma. This result was possibly due to the nature of the questions' *form*. As shown by the F-test conducted on Table 3's data, response differences did exist when the same basic question was addressed on a departmental basis. Questions 1-3 were possibly tapping an algebraic sum of evaluations where the strengths of one department's offerings were being counterbalanced by the weaknesses of another's [4; 5].

Question 4 found that no school or department offered

TABLE 1
QUANTITATIVE PERFORMANCES

Performance Indicator	ALPHA (n=22)	DELTA (n=64)	SIGMA (n=42)
Earnings ¹	\$ 23764	\$ 40144	\$ -267408
ROI	.82%	1.84%	-8.03%
ROE	.89%	1.93%	-15.37%

TABLE 2
TRANSFORMED QUESTIONS

1. My previous coursework provided me an adequate preparation to successfully play the game.
2. My previous coursework provided me with an adequate theory-base to successfully play the game.
3. My previous coursework provided me with an adequate opportunity to practice the skills required to successfully play the game.
4. Would you please assess how well your previous coursework in the following areas prepared you to successfully play the game.
 - a. Marketing
 - b. Management
 - c. Finance
 - d. Economics
 - e. Accounting
 - f. Quantitative Methods
5. How well-rounded and challenging did you find the simulation to be?
6. How valuable do you think this Business Policy course will be to you in your career?

¹ Median values displayed for comparative purposes. Mann-Whitney U test for significant differences in ranked arrays.

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TABLE 3
FUNCTIONAL-AREA COMPARISONS: WITHIN-PROGRAM SCORES²

Functional Area	ALPHA	DELTA	SIGMA
Marketing	3.24	3.63	2.56
Management	3.61	3.98	3.07 n.s. p<.001
Finance	2.84	3.50	1.42 p<.01
Economics	3.62	3.41	2.30 n.s.
Accounting	3.33	3.66	2.43 n.s.
Quantitative Methods	2.82	3.41	2.49
F-test	3.26 p<.01	3.60 p<.01	2.38 p<.01

TABLE 4
FUNCTIONAL-AREA COMPARISONS: ACROSS-PROGRAM SCORES³

Functional Area	ALPHA	DELTA	SIGMA
Marketing	3.24	3.63	2.56 p<.05
Management	3.61	3.98	3.07
Finance	2.84	3.50	1.42 p<.001 p<.01
Economics	3.62	3.41	2.30 p<.05 p<.05
Accounting	3.33	3.66	2.43 p<.05
Quantitative Methods	2.82	3.41	2.49 p<.05
Mean	3.26 p<.001	3.60 p<.001	2.38 p<.001

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an academic focus that was differential as to its technical/skill/theoretical orientation. Given this result, each school's departmental score was averaged between its technical and theoretical orientation to produce an overall score regarding the degree each department's courses prepared the student for successful game play. Table 3's F-test found that different departmental variances existed between programs and that each school prepared its students differently for the simulation on a departmental basis. In Sigma's case, the within-school departmental differences were so extreme that statistically-significant differences were found. Based on measures of perceived game preparedness, Sigma's Management department was ranked highest; the Marketing, Economics, Accounting and Quantitative Methods departments occupied the second rank; the Finance department occupied the lowest rank.

Table 4 presents the same data after being subjected to an inter-organizational, across-department analysis.* Given the quality of preparedness afforded by previous departmental coursework, Sigma's Finance and Economics departments were inferior to Alpha's and Delta's while all Management departments were of equal quality. Delta's Marketing, Accounting and Quantitative Methods departments were superior to Sigma's; no statistical statement can be made regarding Alpha's respective departments. Overall, Alpha and Delta's departments were perceived to be of equal value and while Sigma's was inferior to both.

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DISCUSSION

In discussing the business simulation as a curriculum evaluation device, it is best to delineate those aspects which are unique to simulations as evaluators versus those aspects that generally apply to all evaluation instruments. Turning first to evaluation instruments in general, no device employed in an 'after-only' sense without a pre-program measure of knowledge could determine how well the institution performed given the quality of students it was able to enroll. It would also be practically impossible to design an instrument that could tap all the elements that make up a college education. Accordingly, any instrument is only a partial barometer of an institutions output. Additionally, no instrument can determine the sufficiency or adequacy of a program without some type of external reference point.

Within the context of this demonstration, it was methodologically implied that each university's students perceived and reacted to the simulation and the qualified examination in a uniform fashion. A partial test for this disqualifying factor was made in Question 5 and 6. In this case all students, regardless of the institution, rated the game and the course equally as a well-rounded, challenging, and useful experience. Respective game and course scores were 4.41 and 4.21 on a 5.0 scale.

It must also be assumed that the students enrolled in the simulation were a representative sample of the university's output. During the two years covered by this study, the instructor's class enrollments represented

² All mean differences within programs non-significant unless otherwise noted.

³ Average of technical and theory scores. All differences between means across programs non-significant unless otherwise noted.

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73.1, 44.9 and 38.0 percent of those schools' Business Policy students. Demographic information collected on the enrollments found no significant within-differences between those enrolled in the experimental and non-experimental sections by age, sex, academic major, GPA, and hours of outside employment. Significant demographic differences did exist between institutions and these differences might have been presumed from the profiles presented earlier.

It could be expected that glaring differences would exist between Delta and Sigma given the Barron's label of "very-competitive" versus non-competitive." Student self-selection decisions and admissions officers' acceptance criteria reflect the (1) give-and-take and relative degrees of competitiveness for students, (2) adequacy of the high school student's preparation, and (3) presumed degree of rigor that can be demanded of the students during their college years. Sigma, which accepts 100% of its applicants, is in turn rejected by 28% of those it accepts. This could indicate Sigma's relative weakness in the market for highly-qualified and geographically mobile students.

One should wonder, however, why the simulation did not detect similar differences between Alpha and Delta. which generates a relatively-low "yield rate" of 49% (the ratio between eventual' student enrollment and applications accepted), and possesses a relatively unspecialized business faculty in a liberal arts-dominated school, could be expected to underperform Delta's product [26]. It could be surmised that Alpha was performing a superior job on possibly inferior students, or that its (mostly part-time) students had augmented their academic studies with valuable life-experiences which were being expressed in the simulation [29].

Conclusion

This paper has described the use of a comprehensive business game as an inter- and intra-organizational curriculum device. Certain quantified and qualified program differences were noted. It is still a matter of conjecture as to whether (1) one could have more simply reached the same conclusions on an inter- organizational basis from publicly-available college directories, or (2) a comprehensive simulation of the type used here measures all that an educator would wish a student to know after four years of college. More positively, the simulation appears to be discriminating at the intra-organizational level of analysis. Statistical differences were found in the quality of Sigma's departmental offerings and more cogent instruments could have possibly pinpointed the specific sources of program variance detected at Alpha and Delta.

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