Developments in Business Simulation and Experiential Learning, Volume 25, 1998

EXPERIENTIAL EXERCISES OR COMPUTER SIMULATIONS? HOMOGENEOUS, HETEROGENEOUS, SUPPLEMENTARY, COMPLEMENTARY OR NONE OF THE ABOVE?

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ABSTRACT

In an earlier time and place the educators limited choice of pedagogical tools consisted primarily of a text, a piece of chalk, and a slateboard. Today, the pedagogical choices are practically limitless. Computer ancillaries, interactive exercises, data prone cases, audio/visual accessories, and unlimited access to the world wide web are but a few selections from today's pedagogical menu. Staying current with the various methodologies with which to educate consumes almost as much of the educators time and effort as staying current in his or her respective fields of teaching expertise.

It is obvious that no one paper is going to study the relationships, aspects and efficacies of all of the pedagogical tools currently available. Thus, the authors of this paper chose to study the relationship of two commonly used pedagogies with which they have had the most experience: experiential exercises and computer driven business policy simulations. The paper's findings reflect the opinions of the most important variable in the education equation - the student which the authors trust will be of benefit to other educators in their choice of pedagogical tools.

INTRODUCTION

The rise of experience-based learning theory has significantly influenced business school pedagogy, leading to a wide variety of experiential learning devices. Experiential learning requires learners to actively participate in personally meaningful activity allowing practical application of theory and knowledge (Gentry, 1990). Participants should feel a personal sense of commitment to the success of the exercise (Walter & Marks, 1981). In a review of the literature, Bowen (1987) concluded learning is enhanced by a) an optimal level of emotional arousal, b) an environment perceived as safe, and c) sufficient time for the participant to process the learning.

Experiential learning that is epigrammatic in nature, lasts a relatively short time, and is not computer based is generally considered as experiential exercises (Keys & Wolfe, 1990). Although technically a subset of experiential learning, business simulations are typically considered separately. Simulations use simplified environments with a sufficient illusion of reality to invoke attitudes and responses comparable to real world situations. Simulations may be computer based or non-computer based, and may be functional in that they concentrate on a single part of a business (Biggs, 1987) or total enterprise in that they require the strategic integration of decision variables from all major components of an organization (Keys, 1987).

Due to the complexity and duration of many computer based simulations, it is often difficult to accurately determine what participants are responding to and how they are learning. In addition, the actual value of learning from experiential exercises and simulations has been challenged. Wheatley, Hornaday & Hunt (1988) concluded that the literature indicates students enjoyed business games, and that simulations were effective for teaching complex concepts but were otherwise irrelevant to student classroom and career success. In a significant review of 60 studies, Keys and Wolfe (1990) concluded there is a "general yet problematic educational efficacy" (p. 311) from business simulations, and that they are "generally effective and. possess internal validity" (p 316). Within ABSEL, the debate on learning from simulations continues unabated, and Anderson & Lawton (1997c) identified four "camp? whose research streams have produced conflicting conclusions. To address this problem, they (Anderson & Lawton, 1997b) proposed a series of suggestions to guide future research on simulation efficacy.

The rising popularity of simulations has given rise to a number of studies to determine if simulations were superior to other forms of teaching. Studies by Estes & Smith (1979), Kaufman (1976), McKenney (1962, 1963), Raia (1966), and Wolfe & Guth (1975) found simulations superior to the case method on a variety of performance measures.

Evaluating experiential learning has a checkered history and has many problems (Anderson & Lawton, 1997c; Burns, Gentry & Wolfe, 1990). This study accepts that there is sufficient research evidence to conclude that experiential learning does have some validity, and instead investigates the question as to whether simulations are superior to other experiential approaches. Specifically, this study addresses the relationship of students' perceptions of a highly comprehensive computer-based simulation versus highly dynamic experiential exercises.

METHODS

Participants

Participants in this study were 66 students enrolled in a computer simulation driven Business Policy course who had just recently completed a Principles of Management course that emphasized experiential exercises. All participants were junior or senior level students. The classes were reflective of the general student body at the university. Participants were a little older than traditional college age (university average age was 29), and almost all had some full- or part-time work experience. The class was about equally divided with respect to gender. All students were business majors, and most were full-time students holding part-time jobs concurrently.

Procedure

The Team Teaching Methodology Diagnostic Questionnaires (TTMDQ) were distributed to the students in class by the instructor of that class. students were provided class time to respond. Participation was voluntary, but no one refused to participate.

Instrument

The TFMDQ consists of a set of items constructed to assess perceptions of student learning via experiential methods as compared to computer simulations. The items were derived in part from previous research comparing various computer-based simulations (Biggs, Miles, & Schubert, 1990), and previous research studying ways to enhance student team effectiveness (Wheatley & Armstrong, 1997).

All of the questions are included in Table 1 along with their respective descriptive statistics.

RESULTS AND DISCUSSION

Descriptive Statistics

Basac descriptive statistics on all of the items were first generated (see Table 1). The values of the descriptive statistics are relatively consistent even though many of the questions were written to yield reverse responses in order to prevent response bias. The mean response to the items as a set was 4.30 with an average standard deviation for the items as a set of 1.53. The range of mean responses was 2.07 and the range of item standard deviations was 0.39, respectively.

In reviewing the descriptive statistics, only a few questions yielded mean responses which were significantly different than the responses to the questionnaire as a whole. Responses indicated that students enjoyed the computer-based simulation more than they did the experiential exercises [Item 4; mean = 4.77]. Previous research has also indicated a preference for computer simulation may be due to the fact that the technology in developing experiential exercises is not keeping pace with the computer-based simulation technology. A second possible explanation is the perception of the students. Lacking the “scientific” aura of a computer, they may feel that experiential exercises are nothing more than “games.” The exercises may not offer for them the same sense of closure that they receive when participating in a computer-based simulation, which has a clear beginning and end. In other words, they paid their tuition to learn something about managing businesses and not to engage in activities such as “playing with Legos,” which does not provide the same sense of doing something truly business-related. Perhaps students have not yet learned to respect the difficulty presented by the types of interpersonal issues that corporate executives face.

Another finding of note to all educators was that students, as a whole, no longer prefer working by themselves than working in teams [Item 19; mean = 5.28]. Many educators have heard students complain they could have earned a much better grade if they had worked alone. Their tolerance for the group dynamics that must be dealt with while working in a team seems to have increased somewhat over the years. Perhaps as a result of this greater tolerance, teams appear to be pulling together mere than in the past [Item 18; mean = 3.97 and Item 20; mean = 4.82]. Somehow, educators have found a way to convince students that working effectively in teams is important in tenns of career success.

A final area of interest is that students reported preferring activity-based learning [Item 17; mean = 3.26] as compared to “standard” lecture courses. This comes as somewhat of a surprise finding because one would suspect that the many years learning in a rote environment would engender some resistance to change. Particularly given how fast the education times, they are a changing (Dylan, Bob, 1965). However, this is good news for those of us that realize the efficacy of new forms of pedagogy’

Exploratory Factor Analysis

Next, the questions which compared experiential learning to computer simulation were factor analyzed to determine if there was an underlying dimensionality to the items. The items which specifically compared perceptions of learning using experiential-based and computer-based methods (16 of the 20 items) were subjected to a principle factors analysis with varimax rotation. The number of factors extracted was based on two rules. First, the eagenvalue for that factor had to be greater than 1. Second, a Screen test was used. These criteria resulted in two distinct factors. A question was considered to load on a factor if the item loading was greater than .4 and the difference between the absolute values of loadings on the two factors was greater than .3. Table 2 shows the questions, factor loadings, and eigenvalues.

The first factor included six items, and was composed of items that queried the respondent about experiential learning methods as compared to computer-based simulation. Reliability analysis of these six items resulted in a coefficient alpha of .88. The second factor included five items, and was composed of items which queried the respondent about computer-based simulations as compared to experientially-based courses. Reliability analysis of the five items resulted in a coefficient alpha of .74. Five of the 16 items included in the factor analysis showed complex loadings and were not included in further analyses.

Before scale scores were computed, all of the questions comprising Factor 1 were reverse scored, so that high scores on both Factor 1 and Factor 2 indicated a preference for experiential learning methods over computer-based simulation. Scale scores for both Factor 1 and Factor 2 were then computed using unit weighting for all questions comprising the factor.

A paired 1-test was run between the scale scores. The results of this analysis indicated significant differences between the scale scores [$t(65) = 4.85$, $p < .001$]. This difference was found despite the fact that all of the items loading on Factor 1 were recoded, so that high scores on EACH scale represented a preference for experiential learning methods over computer-based simulation. The paired t-test provides results on within-person, not between-person, differences. Thus, it is the SAME respondents who indicate a preference for both computer simulation and computer simulation. The results of the factor analysis combined with the results of the paired 1-test led to the disappointing conclusion that students reported a preference for whatever teaching method was identified first in the item.

That is, both factors may well indicate nothing more than method variance. The items that identified experiential teaching methods first resulted in an apparent preference for that method of teaching, whereas the items that identified computer-based simulation first indicated an apparent preference for that teaching method. And indeed, those preferences co-existed within the same individual, depending on which methodology was identified first in the item!

Thus, as educators, we must be wary of apparent results. While the classic scale development procedures were not carefully followed in this study, very few researchers are willing to spend time on careful scale development. Yet if we are not willing to do so, we may find that we have accumulated results that are not easily interpretable, as in this study. It is doubtful that the existence of method factors is confined to this study. As a result, we must be careful about prescribing pedagogical approaches based on single studies, or even on a cumulation of studies which use differing measurement methods. Although the rewards for careful studies of measurement are not immediately forthcoming, it is important to spend time on measurement issues before proceeding to test substantive questions. Too few among us are willing to make that investment of time.

CONCLUSION

The major purpose of this paper was to investigate the relations, as perceived by our students, between two popular and widely utilized pedagogies -experiential exercises and computer-based simulation. While the study does support some substantive conclusions, one of the major findings was that our students are susceptible to response bias. To the. extent that student responses are used to measure the effectiveness of pedagogy, we must be very careful in the construction of measures and in interpretation of results. To the extent that student responses are used to measure the effectiveness of instructors, we would be well advised to take the results of this study to heart!

REFERENCES ON REQUEST

TABLE 1
MEANS AND STANDARD DEVIATIONS FOR INDIVIDUAL ITEMS

Question	Mean	Standard Deviation
1. I feel I was more able to apply newly-gained knowledge in the computer-based simulation classes than I was in the experiential exercises classes.	4.73	1.55
2. Computer-based simulation classes enhanced my leadership skills more than experiential exercises classes.	4.08	1.52
3. I feel I gained more insight into my own personal feelings in the computer-based simulation classes than I did in the experiential exercises classes.	4.06	1.42
4. I enjoyed the computer-based simulation classes more than I did the experiential exercises classes.	4.77	1.57
5. For me personally, I feel the computer-based simulation classes have better prepared me for my career than did the experiential exercises classes.	4.56	1.46
6. I feel the computer-based simulation classes offered much more insight into the nature of innovation than did the experiential exercises classes.	4.64	1.53
7. Experiential exercises classes enhanced my communication skills more than the computer-based simulation classes.	4.85	1.52
8. I received more feedback concerning what the learning objectives were in the experiential exercises classes than I did in the computer-based simulation classes.	4.48	1.41
9. I feel I gained more new knowledge in the experiential exercises classes than I did in the computer-based simulation classes.	3.88	1.50
10. I feel my teams dealt with conflict openly and honestly with the intention of being a more effective team in the experiential exercises classes than we did in the computer-based simulation classes.	3.97	1.47

11. Experiential exercises classes enhanced my problem-solving skills more than the computer-based simulation classes.	3.91	1.45
12. Computer-based simulation classes enhanced my planning skills more than experiential exercises classes.	4.53	1.32
13. Computer-based simulation classes enhanced my team-building skills more than experiential exercises classes.	4.45	1.64
14. I found my team members to be more reliable in meeting their share of the course requirements in computer-based simulation classes than they were in experiential classes.	4.30	1.41
15. I feel I was more able to influence my team's decision-making process in the computer-based simulation classes than I was in the experiential exercises classes.	4.50	1.50
16. Experiential exercises classes enhanced my decision-making skills more than the computer-based simulation classes.	3.67	1.49
17. I personally prefer the standard lecture classes more than I do either the experiential exercises classes and the computer-based simulation classes.	3.26	1.71
18. I found that some of my team members spent more energy trying to avoid work than they would have spent doing the work itself in both the experiential exercises classes and the computer-based simulation classes.	3.21	1.83
19. I found the team experiences more beneficial than working by myself.	5.28	1.63
20. I tried to keep all of my communications open and honest in my teams in order not to hurt the other team members' feelings in both the experiential exercises and the computer-based simulation classes.	4.82	1.64

TABLE 2
FACTOR LOADINGS FOR ITEMS COMPARING COMPUTER-BASED AND EXPERIENTIAL LEARNING

Question	Factor 1	Factor 2
1. I feel I was more able to apply newly gained knowledge in the computer-based simulation classes than I was in the experiential exercises classes.	**.668**	-.249
2. Computer-based simulation classes enhanced my leadership skills more than the experiential exercises classes.	**.774**	-.206
3. I feel I gained more insight into my own personal feelings in the computer-based simulation classes than I did in the experiential exercises classes.	**.712**	-.061
4. I enjoyed the computer-based simulation classes more than I did the experiential exercises classes.	**.716**	-.422
5. For me personally, I feel the computer-based simulation classes have better prepared me for my career than did the experiential exercises classes.	**.874**	-.081
6. I feel the computer-based simulation classes offered much more insight into the nature of innovation than did the experiential exercises classes.	**.831**	-.132
7. Experiential exercises classes enhanced my communication skills more than the computer-based simulation classes.	-.319	**.591**
8. I received more feedback concerning what the learning objectives were in the experiential exercises classes than I did in the computer-based simulation classes.	.049	**.726**
9. I feel I gained more new knowledge in the experiential exercises classes than I did in the computer-based simulation classes.	-.287	**.757**
10. I feel my teams dealt with conflict openly and honestly with the intention of being a more effective team in the experiential exercises classes than we did in the computer-based simulation classes.	-.078	**.422**

11. Experiential exercises classes enhanced my problem-solving skills more than the computer-based simulation classes.	-.164	**.805**
12. Computer-based simulation classes enhanced my planning skills more than experiential exercises classes.	.440	.425
13. Computer-based simulation classes enhanced my team-building skills more than experiential exercises classes.	.579	-.371
14. I found my team members to be more reliable in meeting their share of the course requirements in the computer-based simulation classes than they were in the experiential exercises classes.	.214	-.293
15. I feel I was more able to influence my team's decision-making process in the computer-based simulation classes than I was in the experiential exercises classes.	.481	-.390
16. Experiential exercises classes enhanced my decision-making skills more than the computer-based simulation classes.	.482	.560
Eigenvalues	**6.50**	**1.72**
Percent Variance	**40.6**	**10.7**