Hospitality Review

Volume 19
Issue 2 *Hospitality Review Volume 19/Issue 2*

Article 2

January 2001

Classroom Simulation is Computer Based

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Abstract
The authors review and evaluate the use of a business simulation, specifically he Hotel Operational Training Simulation (HOTS), in the fourth year of a hospitality undergraduate program. Four dimensions were explored: learning experience, alternative method of instruction, critical and analytical thinking ability and delivery time frame, in addition to the student overall satisfaction with the learning experience.

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The rapid developments in, and sophistication of, computer technology have made it increasingly possible to simulate real world situations in a classroom environment. Simulations in the hospitality industry have been around since the late 1960s, with the introduction of the Cornell University CRASE (Restaurant Simulation) and CHASE (Hotel Simulation – primarily a batch processing model with limited student interaction with the computer).[1]

Most recently the Hotel Operational Training Simulation (HOTS) by the Orange Simulation Company (1999) was introduced; a windows-based environment, it allows participating students much more interaction with the computer-based model. The fundamental question to be answered is whether a simulation can provide the students with a more satisfying learning experience while at the same time providing them with a combined academic and practical learning process.

In academic programs there is a perception that students who progress through an undergraduate program with the traditional heavy use of lecture and case study modes often have a problem in applying their area of study in related business situations.[2] Similarly, in the business world there is the perception of an application gap in the education of students with a particular industry focus, such as hospitality. This gap is often attributed to deficiencies in courses and programs, which

traditionally emphasize the lecture and case study modes.[3]

Class is setting

This study was conducted to investigate how well the HOTS program performed in a classroom setting. Was it effective in providing a combined academic and practical learning process? Was it effective in simulating a real world environment in which students were able to apply the principles and concepts of finance, accounting, service quality, marketing, and human resource management developed in previous courses? Was it effective in helping students understand and appreciate the management skills needed to achieve a balanced approach in providing a quality service to customers, while delivering an acceptable financial return to owners? The final objectives of the study were to investigate the effect that level of involvement in the course and overall GPA had on the student's evaluation of the simulation.

Practice is used

Employers and educators realize that students need to have good analytical, problem-solving, and decision-making abilities to operate effectively in today's business environment.[4] They also realize that the educational system has not focused enough on the practical application of the principles and theoretical concepts taught in the courses, leaving students without sufficient experience in solving real world business problems upon entering the workforce.[5]

As the developments in technology have escalated, increasing attention has been devoted to the use of computer simulations as an alternative teaching vehicle and to examining and evaluating their effectiveness.[6] There has also been much attention devoted to their impact on the learning process.[7] Rosenorn and Busk conclude that "...they (simulations) seem to create a suitable environment for organizational learning."[8] Wenzler and Chartier considered whether simulations were worth bothering with, but concluded that "the process of developing and implementing games and simulations is one of the most effective approaches in enabling organizational learning."[9] In a review of current usage levels, Faria found that business simulation game usage in academia and industry has continued to grow over the past 10 years, with expectations for further growth.[10]

This study is a further attempt to help understand the best way to utilize such simulations by examining the student experience at the senior undergraduate level using the state of the art HOTS program.

HOTS module used

The study was conducted during the fall semester of 2000 to assess the effectiveness of HOTS as one of two self-contained modules in the Ryerson Polytechnic University's School of Hospitality and Tourism Management fourth year course—Revenue Management for

the Hospitality Services Industry. The other module was Revenue/Yield Management. The Revenue/Yield module combined theoretical models of revenue management structures with a practical survey of revenue/yield management systems. This module was presented for one half of the 13-week semester and the HOTS module for the other half. There were 44 students divided into two sections. Both modules ran in parallel with one section taking the Revenue/Yield module and one section taking the HOTS module. After half the semester, the two sections switched, so that after 13 weeks, all students had completed both modules.

The HOTS module was comprehensive in nature and was designed to provide an all-encompassing application of the theories the hospitality and tourism management students had been studying during the previous six semesters (three years) of the eight-semester (four-year) undergraduate degree program. The simulation consisted of four or five hotels competing with each other using a real-time computer model. Students were assigned to one of these hotels and were presented with a background document outlining the history and location of a 250-room un-rated hotel recently forced into receivership, prior to declaring bankruptcy. The background document indicated that new owners had made a fresh injection of capital, and the task of the student teams was to operate their hotel out of a less than satisfactory starting position to become a viable and profitable property. Each of the student groups was presented with the same hotel configuration with different assigned names.

Students were required to review the background document, the mechanics of the computer hotel (the hotel) operating system, and then develop a business plan. This orientation and business plan development took up the first week of the module. The simulation was operated during the next five and one half weeks during a weekly two-hour in-class (computer laboratory) session with analysis, a one-hour lecture, and outside hotel team meetings in the intervening period. During the weekly two-hour in-class laboratory sessions, the hotels were operated in competition with each other on a real-time basis.

Time is eclipsed

The HOTS computer program is a sophisticated economic model incorporating all of the variables necessary to operate a hotel. A "cycling" system is in place whereby anywhere from two to five minutes constitutes a week in the life of the hotel. Students make decisions regarding such things as room rates, restaurant food and beverage menus and prices, advertising and promotional directions and expenditures, hotel refurbishments and improvements, etc. After several months of operation they are also able to consider adding extra facilities such as mini-bars, business

services, and later conference facilities, hotel shop, health club, and even expansion of rooms and restaurant facilities.

They also have access to market research reports provided by a consulting group, including current economic forecasts, hospitality industry trends and forecasts, conference feasibility studies, competitor information regarding the rated hotels, eating out sector trends, etc. During the simulation students have access to considerable operating data on a weekly, monthly, and quarterly basis. They view key items such as occupancy, average room rate, staff turnover, market share, room revenue, food and beverage revenue, and public awareness of their hotel. They are able to print out this data, as well as cash flows, profit and loss statements, and balance sheets.

Over the six and one-half week time period the student teams take their hotel through three to five years of its life and see if their business plan develops and matures. In the event that the hotel runs into financial difficulties, which is not unusual in the early stages, the administrator (instructor) can provide financing through negotiations with the local bank to enable the hotel to keep operating. After three to five years of operation, the student teams must prepare a report for the hotel owner's board of directors outlining the business plan and the success or lack of success of its implementation.

The HOTS module report represented 30 percent of the course grade. The Yield module also represented 30 percent of the course grade. A final examination accounted for the balance of the 40 percent of the course grade and consisted of two one-hour components. The HOTS component included the analysis of a typical HOTS hotel position. Students were presented with year-end reports and were required to evaluate and recommend a future course of action. This provided an assessment of how much individual students had understood and absorbed the HOTS experience.

Students assess course

The students assessed the simulation and its use in the course using a self-report questionnaire developed by Martin and McEvoy which categorizes questions into four dimensions: learning experience, alternative method of instruction, critical and analytical thinking ability, and delivery time frame.[11] The four dimensions were measured using a Likert scale ranging from 1 (strongly disagree) to 10 (strongly agree).

Questions are addressed

The learning experience questions (Table 1) addressed the following:

- Did the simulation help in understanding the principles of quality service, marketing, finance, accounting, strategic thinking, and human resources as they applied to the problems and issues of hotel operations?

Table 1
Means and standard deviations of key measures

	N = 44	M	SD
Learning experience			
Understanding of strategic thinking		8.36	1.38
Hands on experience was worth while		8.36	1.69
Understand the factors that contribute to operating a successful hotel		7.98	1.44
Challenging learning environment		7.93	1.73
Dynamic learning experience		7.86	1.65
Understanding of marketing principles		7.70	1.49
Understanding of financial principles		7.41	1.57
Understanding of accounting principles		7.27	1.62
Helps prepare student for entry into work force		7.14	2.04
Six week lab simulation was effective		7.05	2.16
Understanding of quality service principles		6.91	1.64
Understanding of human resource principles		6.89	1.92
Presents a realistic model		6.82	1.93
Test knowledge of hotel operations developed in previous courses		6.48	2.11
Alternative method of instruction			
Provides an exciting alternative to a case study course		8.84	1.55
Provides and exciting alternative to a lecture course		8.82	1.65
More effective than a straight lecture course		8.77	1.49
More effective that a straight case study course		8.57	2.05
Simulation should be a required element of course in future		8.41	1.99
Critical and analytical thinking ability			
Provides a good test of decision making ability		8.11	1.54
A good test of problem solving ability		7.95	1.60
Simulation requires a high degree of involvement		7.91	1.85
Delivery time frame			
Simulation should be presented over entire semester		8.41	5.46
Time frame of six weeks was sufficient		5.98	2.64
Simulation required very little work between sessions		4.55	2.43

- Did the simulation provide a dynamic and challenging learning experience?
- Did the simulation help in preparation for entry into the workforce?

The alternative method of instruction questions addressed the following:

- Did the simulation provide a more exciting and effective alternative to a straight lecture or case study course?
- Should the simulation be a required element in the course?

The critical and analytical thinking specific questions addressed the following:

- Did the simulation test the student's decision-making and problem-solving abilities?
- Did the simulation require a high degree of involvement?

The delivery time frame specific questions addressed the question if the amount of laboratory time allocated to the simulation was sufficient in conjunction with the work required between sessions.

A final set of measures (Table 2) considered whether the students were satisfied with the simulation and its effectiveness. The satisfaction questions related to recommendation of the simulation to other students, the learning experience, and effectiveness of the simulation materials. These questions were measured using a Likert scale ranging from 1 (strongly disagree) to 10 (strongly agree). The satisfaction question relating to the learning experience was used as the dependent variable in a regression model to determine which of the four dimensions (learning experience, alternative method of instruction, critical and analytical thinking ability, delivery time) were predictors of satisfaction. The effectiveness questions were rank-ordered allocating a total of 100 points to four questions relating to the simulation as a teaching vehicle, as a test of analytical thinking, as a reflection of the reality of hotel operations, and as an evaluation of comprehensive knowledge. These measures were used to evaluate the relative importance of the students' perceptions of the simulation.

Ratings are high

Table 1 shows the mean ratings and standard deviations for the learning experience, alternative method of instruction, critical and analytical thinking ability, and delivery time frame specific questions. The data show that students gave the simulation the highest mean ratings on the alternative method of instruction specific questions. For example, they more than agreed that the simulation provided an exciting and effective alternative to straight lecture and case study courses and that it should be a required element of the course in the future. They also felt strongly that the simulation provided good hands on learning

Table 2
Means and standard deviations for satisfaction and rank-order measures

	N = 44	M	SD
Satisfaction			
I would recommend this simulation module to other students		8.50	1.77
Overall I was satisfied with the learning experience		8.14	1.68
I was satisfied with the effectiveness of the simulation materials		7.52	1.50
Effectiveness			
As a teaching vehicle		19.78	6.98
As a test of analytical thinking		19.21	7.63
As a reflection of the reality of hotel operations		15.85	8.32
As an evaluation of comprehensive knowledge		15.43	6.26

experience that was challenging and dynamic, demonstrated their understanding of strategic thinking, and provided a good test of their decision-making and problem-solving ability.

Table 2 shows the mean ratings for the satisfaction specific questions and the rank-order questions on effectiveness. The results show that students were satisfied with the learning experience and agreed that they would recommend the simulation module to other students. The students also indicated that the HOTS simulation was most effective as a teaching vehicle and as a test of their analytical thinking ability. To further investigate which factors contributed to the students' overall satisfaction rating with the simulation, regression models were developed and tested. A stepwise regression model was run with the measure "overall I am satisfied with the learning experience" as the dependent variable and each summated scale "learning experience," "alternative method of instruction," "critical and analytical thinking ability," and "delivery time frame" as predictors. The result of this regression was a significant model ($F=17.99$, $p<.001$) in which three of the four variables, learning experience, alternate method of instruction, and critical and analytical thinking ability, were used to predict overall satisfaction with the learning experience. The four variables in the model accounted for 64.9 percent (R-squared .649) of the variance in overall satisfaction ratings.

The standardized beta coefficients and significance values (demonstrating the relative strength of the relationship between each of these variables and the dependent variable overall satisfaction) for each predictor were

as follows: learning experience b = .437, p = .029, alternate method of instruction b = .464, p = .006), and critical and analytical thinking ability b =.288, p = .056.

Students learn more

An *a priori* speculation was that students who were more involved with the simulation would learn more and would perceive the simulation to be a beneficial learning experience. On the 10-point Likert scale, indicating the degree of student involvement with the simulation, the lowest rating was 1, the highest was 10, and the most frequent rating was 8 (25.3 percent). Based on this information, the group was divided into those who were highly involved (rating 8 to 10, n = 29) and those not as highly involved (rating 1 to 7, n = 15). The mean scores between each group were significantly different from each other (8.9 vs. 5.7, t=11.96, p< .001) supporting this median split.[12] Table 3 shows that the students' degree of involvement with the simulation had a significant effect on three of the four dimensions (learning experience, alternative method, and critical and analytical thinking) as well as all three satisfaction ratings.

One possible explanation for the findings was that better students may be more involved with a course, thereby affecting their evaluation of the simulation. To test this assumption, a t-test for independent samples was run on the students' GPA by level of involvement (high and low). The results showed that there was no significant difference in the

Table 3
Means ratings resulting from the degree of involvement

	Degree of Involvement		
	Mean		Sig
	High (n =29)	Low (n=15)	
Learning experience 7.96	6.42	.001	
Alternative method of instruction	9.29	7.49	.001
Critical and analytical thinking ability	8.65	6.71	.001
Satisfaction			
I would recommend this simulation module to other students	8.39	6.57	.001
Overall I was satisfied with the learning experience	7.93	6.37	.001
I was satisfied with the effectiveness of the simulation materials	7.46	5.92	.001

students' GPA between those who were highly involved and those who were not as highly involved.

Effectiveness established

The results of this study suggest that the simulation used in this course seemed to perform effectively in a classroom setting. By taking advantage of developments in windows-based technology and using a deep economic model, the simulation was rated effective as a learning experience in helping students to apply the principles and concepts of finance, accounting, service quality, marketing, and human resource management developed in previous courses. It was also rated effective as an alternative method of instruction to lectures and/or case studies, as well as being effective in testing critical and analytical thinking ability. Further, the degree of student involvement significantly affected their perceptions of the simulation's learning effectiveness.

The study also found that there was no relationship between the students' GPAs and their evaluation of the simulation. This finding suggests that stronger and weaker students respond equally positively in a computer-simulated environment. These results are consistent with the expectation that senior students in an applied program would be able to effectively perform in an environment that simulated the operation of a hotel. Whether students enrolled in a more theoretical university program would find the simulation just as effective remains to be tested.

Though this simulation was perceived as an effective tool, it is necessary to point out the following limitations to this research. First, it is one in a series of exploratory studies and the sample size limits the degree of confidence in making generalizations from the results. Second, the results of this study are specific to this simulation and this course and its objectives. Therefore, while this study shows that simulations can be an effective alternative method of instruction, the projection of the results to other simulations is not advised, as all simulations are not of equal quality and effectiveness. Third, the study did not test the effect that the delivery sequence of the two modules (HOTS simulation and Revenue/Yield Management) may have on the students' evaluation of the simulation. Finally, the results do not show whether the students could have learned more from some other method of instruction.

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