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Role of Simulations in Student Learning: A Case Study Using Marketing Simulation

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Introduction

Companies and headhunters want to hire business students who have "real-world" skills besides a university degree (Mariani, 1997; Scott & Frontczak, 1996). It is expected that a college graduate should have experienced the complexities, uncertainties, and ambiguities of decision making in an intricate business world. Studies conducted by earlier researchers (Arora & Stoner, 1992; Deckinger, Brink, Katzenstein & Primavera, 1990; Scott & Frontczak, 1996) point out that many students are entering the business world without the necessary knowledge, experience, and skills to solve real-world problems. This lack of experience is likely because students are not exposed to making decisions in uncertain and sometimes ambiguous business environments. Often, employers feel educators of business are focusing more on theory than application, resulting in such deficits (O'Brien & Deans, 1995).

Business educators incorporate simulations into their teaching to increase the students' decision-making and analytical skills, (Alpert, 1993; Pascoe, 1992; Weinstein, 1996). The objective of these simulations is to give students an opportunity to learn and practice decision-

making skills using real-life business scenarios (Cadotte, 1995). Most of these simulations expose students to competitive business environments where the students use their theoretical knowledge and analytical skills to make an array of business decisions.

Over forty years of research on simulations and their effectiveness in business education has produced contradictory and inconclusive findings (Bredemeier & Greenblat 1981; Greenlaw & Wyman, 1973; Miles, Biggs, & Schubert, 1986; Moutinho, 1988; Smith & Boyer, 1996; Vaidyanathan & Rochford, 1998; Wolfe, 1997). The research of Randel, Morris, Wetzel, and Whitehill (1992) examined 68 studies which compared the instructional effectiveness of simulations with other instructional methods. The results of the survey suggest that 56% of these studies did not lead to any difference between simulations and traditional pedagogical methods. 32% of the studies found that student performance is better when employing simulations, while 5% suggested regular instruction results in greater student learning. These inconclusive findings are a primary motivation for the current study which examines students' perceptions about the use of simulations, which like any

instructional tool, must be evaluated for its effectiveness in achieving educational objectives.

Literature Review

A simulation is an implementation of a model over a given period (Qayumi, 2010). When well developed and implemented, a simulation has the potential to bring a model to life and demonstrate how a particular subject or phenomenon will behave. Simulation is a way of increasing capability to understand interpersonal behavior and problem-solving as well as research and teaching (Klein & Fleck, 1990).

The role of simulations in education is noted as early as the 1950s when American business schools were in the forefront of promoting and adopting simulation techniques (Faria, 1998). Traditionally, case studies have been the preferred mode of bringing the real world into the classroom. However, case studies are static snapshots. They lack the fluidity for a student to experience the results of any action taken in response to a real world situation.

Fripp (1997) states that a simulation provides motivation in the sense that it is the most enjoyable means of education and therefore creates interest in learning. It encourages teamwork since students have collaborate while working in different core areas thus serving as a medium to exercise group dynamics. It provides a testing environment in which to consider the perspectives and decisions of either an individual or an organization without taking actual risk. Simulations encourage users to experiment with alternatives without fear of failure which may pose significant threats if tested during real circumstances. It provides a variety of experiential learning opportunities which improve learning

capacity, including feedback about decision making, through experimentation in different areas such as sales, distribution, marketing planning, and plant operations. A disadvantage to the use of simulation is addressed in a study by Storrs and Inderbitzin (2006) who argued that student learning is dominated by the conventional classroom method of attaining knowledge. They think the traditional mode of classroom study is such a powerful medium that it may be difficult for a student to imagine alternate forms of learning such as simulation, a view that challenges liberal education.

Plass, Homer & Hayward (2009) studied the effectiveness of simulations on design and animation, and summarized that the higher the level of interactivity in the imagining of the simulation, the higher the level of learning. Their study shows that learning is aided by increased cognitive engagement which thereby increases the intrinsic motivation to learn. However, even inspired users may find the amount of information required to process and retain in order to use a simulation an overload.

Simulations strengthen the traditional learning environment by providing students with an opportunity to learn by doing, that is, experiential learning. Alon and Cannon (2000) suggest there has been an increase in the use of experiential learning techniques in business education, in part because companies have clearly communicated a skills gap between academic preparation and industry demands. The growth of simulation-based training is a step to bridge the training gap. Simulations provide students with an opportunity to apply theoretical models to complex practical situations in a controlled environment with little risk. As students practice working on simulations and receive

constant feedback regarding their decisions, they develop the needed managerial and leadership skills necessary for today's workplace. So, the choice of a simulation which mimics the real world furthers a student's interest by making learning more meaningful and relevant, while simultaneously strengthening analytical skills and bridging the training gap.

Moutinho (1988), Randel et al. (1992), and Smith and Boyer (1996) further suggest that the knowledge learned from a simulation may be integrated into the cognitive structure of students' decision making because their active participation in simulations result in greater retention of key concepts and improve student learning. Faria, Hutchinson, Wellington, and Gold (2009) reviewed 40 years of research topics covered in business education and learning about simulation and gaming. Their research identified nine central themes which explain the benefit of using business simulations as part of an instructional method as follow: the first-hand experience the participants receive in taking part in simulations; improved instruction of strategy; better methods for teaching decision-making; accomplishing course learning outcomes and objectives; promoting teamwork; motivating students; applying theory in a practical fashion; involving students in active learning; and improvements in integrating ideas. Tiwari, Nafees, and Krishnan (2014) built their research on the impact of students' perceptions and active learning. Their study centered on the most referred themes above with an added dimension of perceived knowledge.

Over time, simulations have become more sophisticated and realistic due to changes in technology which have improved simulation and gaming learning

experiences. Developing simulation programs has become attractive, interactive, and realistic with the inclusion of high-speed networks and user-friendly graphics programs. While several pedagogical innovations now lead new ways to use such sophisticated simulations, the fundamental reason academics use simulations has not changed much in the past 40 years, and business simulations remain as influential today as when were first introduced.

With the growing increase of experiential learning and specifically simulation based course content, it is necessary to understand the impact of simulations in course delivery and student learning. This paper examines students' perceptions about the use and impact of simulation with regards to:

1. accomplishing course learning outcomes and objectives
2. effective teaching of decision-making
3. applying theory in a practical fashion
4. the benefit of the knowledge of the subject matter in the students' personal lives and careers

Research Methodology

This study was conducted to evaluate the effectiveness of a simulation in achieving these four goals as compared to other instructional tools. The study included 197 students over three semesters in six sections of a class titled *Principles of Marketing*. The course is offered every semester and open to university students from any academic discipline. Sections chosen for this study were taught by the same faculty in order to address bias. The experimental group consisted of three sections ($n = 113$) in which a marketing strategy simulation was used as a part of

coursework. The control group was composed of the other three sections ($n = 84$), in which assignments and projects with hypothetical situations were used for course work. This allowed a direct comparison of student learning across the two groups.

In the experimental group, students formed groups of five at the start of the semester. Each group selected a team member to serve as a representative called the “Group Lead.” The Group Lead was responsible for giving marketing plans, collecting the reports, and discussing strategies with the faculty member. The class met three days a week. Two class periods a week were dedicated to teaching theory and on the remaining day the students’ only task was to play the simulation.

All students in both the experimental and control groups were administered a single ten item survey at the beginning and end of the course every semester. The questions were designed based on the research objectives of this paper:

1. Accomplishing course learning outcomes and objectives – Q1, Q2, and Q3
2. Effective teaching of decision-making – Q4 and Q6
3. Applying the theory in a practical fashion – Q5, Q7, and Q9
4. Benefit from the knowledge of the subject matter in the students’ personal lives and careers– Q8 and Q10

Also, the students in the experimental group, the classes which used the simulation, were asked to write a reflective paper.

The Simulation

The simulation used in the course was a competitive marketing strategy simulation called *The Marketing Game (TMG)* by Mason and Perrault (Mason & Perrault, 2001). Students act as marketing managers and make hiring and firing decisions about sales personnel, design product features (advanced or basic product), determine prices, forecast production levels, choose the intensity of distribution, and purchase marketing research reports.

Students assume responsibility for the development of a marketing strategy for a company that markets “Voice Recognition Devices.” A set of reports from the previous year's operations of the company, which are in the TMG textbook, pave the way with actual descriptions of the company's current situation, including the competition and the nature of the market, and outline the responsibilities of the marketing manager.

Based on the information given, students analyze the firm's opportunities, make several strategic decisions, and develop a marketing plan that in theory should satisfy a target market and earn a profit for the business. Plans are submitted to the instructor and along with plans presented by competing companies, are processed by TMG simulation software. The software provides feedback on the group’s decision making by generating a company-specific report detailing the financial and marketing results of the company's plan for that period. Also, the simulation feedback provides other information such as the marketing budget for the next period and intelligence contained in marketing research reports purchased by the firm. The simulation also produces a summary report for the instructor that outlines and evaluates the

performance of each company. Every business analyzes the feedback report noting its performance, observes the competitors' results, and develops a new plan for the next period. The simulation continues for ten decision periods.

TMG was specially selected for this study because its design ensures high-involvement learning is realized. TMG also reinforces the need to develop a competitive advantage and offer a target market a superior marketing mix. The market situation changes over time as competitors adjust their strategies, and customer preferences evolve. The game brings the competitive nature of marketing decision making to life. At each stage of the game, the individual firm develops its own efficient and profitable marketing strategy. The students acting in the game as the marketing manager decide whether to compete head-on with other businesses or follow a target market with lesser competition. This encourages students to think actively about the profit implications of marketing decisions.

The marketing budget for each firm in each period highlights the marketing spending that marketing managers must make when developing a marketing strategy. A successful marketing strategy must be based on a marketing mix that is consistent with target market needs, but that does not mean it must be a high-cost strategy. The result is a constant focus on the market and necessary, responsive marketing decisions.

The instructor gives a "discretionary budget" to each firm besides their regular marketing budget for each period. Student managers in a company can spend their discretionary budget all at once to support a single decision, save it, or dispense the

monies at different times. This encourages students to think about the issues of "investing in marketing" and the short and long-term trade-offs of spending.

Results

Comparisons between the control group and experimental group were made using independent *t*-tests. Independent *t*-tests were used instead of paired-samples *t*-tests because matched data was not available.

A pre-test comparison was conducted to examine whether any significant differences existed between the control and experimental groups before any treatment (see Table 1). Results from the analysis revealed no significant differences in the first and second research objectives, "accomplishing course learning outcomes and objectives" and "teaching decision-making," respectively.

For the third research objective, "applying the theory in a practical fashion," a significant difference was noticed between the control and experimental groups for the item "I have a good understanding of the relationship between theory and practice." The mean score of the control group ($M = 3.42$) was significantly higher than the experimental group ($M = 3.18$), $t(195) = 2.05$, $p = .042$. A significant difference between the groups was also found with the fourth research objective, "benefit from the knowledge of the subject matter in personal life and career." For the item, "This course will lead to career benefits," the experimental group's mean score ($M = 3.90$) was significantly higher than the control group's ($M = 3.61$), $t(159.38) = -2.02$, $p = .045$.

Table 1

Pre-test Comparison Between Control and Experimental Groups

Item	Control Group		Experimental Group		t	P
	M	SD	M	SD		
<i>Accomplishing Course Learning Outcomes and Objectives</i>						
Q1. This course has enhanced my conceptual knowledge of the business.	3.58	0.89	3.58	0.66	-0.01	0.995
Q2. I have knowledge and understanding of marketing.	3.62	0.76	3.65	0.68	-0.35	0.728
Q3. I feel confident in my ability to apply marketing concepts.	3.40	0.81	3.35	0.79	0.44	0.663
<i>Teaching Decision-Making</i>						
Q4. This course made me question and rationalize my decision-making.	3.27	0.90	3.46	0.80	-1.49	0.138
Q6. I feel more confident in the application of theory as it applies to marketing decision-making.	3.31	0.84	3.19	0.83	1.03	0.304
<i>Applying the Theory in a Practical Fashion</i>						
Q5. I have a good understanding of the relationship between theory and practice.	3.42	0.79	3.18	0.83	2.05	0.042
Q7. This course has facilitated my understanding of how marketing relates to other business functions.	3.60	0.89	3.62	0.70	-0.21	0.831
Q9. This course has enhanced my understanding of how marketing relates society and consumers.	3.61	0.79	3.79	0.77	-1.60	0.110
<i>Benefit from the Knowledge of the Subject Matter in Personal Life and Career</i>						
Q8. This course has contributed to my personal growth.	3.37	0.95	3.29	0.73	0.62	0.538
Q10. This course will lead to career benefits.	3.61	1.09	3.90	0.91	-2.02	0.045

Initial differences between the control and experimental groups were not expected, so follow-up analyses were conducted. A 2x2 Independent ANOVA was performed to test if a relationship existed between the differing items and college affiliation (College of Management/Non-College of Management) and if the student had previously taken a course that used simulations (Yes/No).

There was a significant main effect on students who had been enrolled in a course that used simulations on understanding the relationship between theory and practice, $F(1, 192) = 9.57$; $p = .002$, $r = .20$. Students who had taken a course that used simulations reported having a better understanding of the relationship between theory and practice. There was a non-significant main effect of college affiliation on the understanding between theory and practice, $F(1, 192) = 0.07$, $p = .788$, $r = .02$. The interaction between college affiliation and previous experience with simulations was also nonsignificant, $F(1, 192) = 0.25$, $p = .618$, $r = .06$.

For the item "This course will lead to career benefits," college affiliation had a significant main effect, $F(1, 192) = 4.27$, $p = .038$, $r = .13$. College of Management students indicated the course would lead to greater career benefits than non-College of Management students. There was a nonsignificant relationship between whether a student had previous course experience with a simulation and if they believed the course would lead to career benefits, $F(1, 192) = 0.18$, $p = .664$, $r = .06$. There was also a nonsignificant interaction between college affiliation and previous experience with simulations and ratings on if the course would lead to career benefits, $F(1, 192) = 0.21$, $p = .652$, $r = .06$.

Post-test comparisons between the control and experimental groups revealed no significant differences (see Table 2). Post-test results suggest that while college affiliation and previous exposure to simulations may be an influencing factor at first, once the simulation is completed these factors play less of a role. Mean score differences between the pre-tests and post-tests were compared to examine overall differences between the control group and experimental group. Within research objective one, "accomplishing course learning outcomes and objectives," mean score differences ranged from 0.00 to 0.10. For the item "I have knowledge and understanding of marketing," the control group and experimental group scores both increased from the pre-test to the post-test by 0.12. The item with the largest mean score difference between the two groups was "I feel confident in my ability to apply marketing concepts." The mean score difference between the pre-test and post-test for the experimental group was 0.15, as opposed to 0.05 for the control group. These results provide support for the notion that student learning is improved with simulations.

"Teaching decision-making" (research objective two) items mean score differences varied considerably. The item "This course made me a question and rationalize my decision-making," had a mean score difference of -0.02 between the control and experimental groups. The control group's mean score increased by 0.05 from the pre-test to post-test, whereas the experimental group's mean score increased by 0.03. Of the ten items on the questionnaire, "I feel more confident in the application of theory as it applies to marketing decision-making" was the item

Table 2

Post-Test Comparison Between Control and Experimental Groups

Item	Control Group		Experimental Group		<i>t</i>	<i>p</i>
	M	SD	M	SD		
<i>Accomplishing Course Learning Outcomes and Objectives</i>						
Q1. This course has enhanced my conceptual knowledge of the business.	3.63	0.81	3.70	0.78	-0.49	0.623
Q2. I have knowledge and understanding of marketing.	3.74	0.91	3.77	0.66	-0.20	0.843
Q3. I feel confident in my ability to apply marketing concepts.	3.45	1.00	3.50	0.83	-0.30	0.763
<i>Teaching Decision-Making</i>						
Q4. This course made me question and rationalize my decision-making.	3.32	0.89	3.49	0.78	-1.19	0.235
Q6. I feel more confident in the application of theory as it applies to marketing decision-making.	3.33	0.94	3.60	0.84	-1.72	0.089
<i>Applying the Theory in a Practical Fashion</i>						
Q5. I have a good understanding of the relationship between theory and practice.	3.33	0.93	3.44	0.80	-0.72	0.473
Q7. This course has facilitated my understanding of how marketing relates to other business functions.	3.72	0.89	3.84	0.68	-0.92	0.359
Q9. This course has enhanced my understanding of how marketing relates society and consumers.	3.74	0.94	3.88	0.76	-1.26	0.209
<i>Benefit from the Knowledge of the Subject Matter in Personal Life and Career</i>						
Q8. This course has contributed to my personal growth.	3.40	0.98	3.53	0.85	-0.77	0.440
Q10. This course will lead to career benefits.	3.55	1.00	3.67	0.89	-0.72	0.475

with the largest mean score difference between the two groups. The control group's mean score changed by 0.02 from the pre-test to post-test, with the experimental group's mean score changing by 0.41, representing a difference of 0.39 between the two groups. This provides extra support suggesting that simulations positively impact students' confidence in the practical application of knowledge.

The mean score differences for items within the third research objective, "applying the theory in a practical fashion," had a range of 0.33 from the control group to the experimental group. The item with the smallest mean difference (0.02) was "This course has enhanced my understanding of how marketing relates society and consumers." Scores from the pre-test to the post-test increased by 0.09 for the control group and 0.11 for the experimental group. The item "I have a good understanding of the relationship between theory and practice" had the second largest mean score difference between the control group and experimental group (0.35) of the ten items on the questionnaire. The mean score difference from the pre-test to post-test was -0.09 for the control group and 0.26 for the experimental group further suggest that simulations are strengthening student learning.

Mean score differences between the control group and experimental group

ranged from -0.17 to 0.21 for items within research objective four, "benefit from the knowledge of the subject matter in personal life and career." For the item, "This course has contributed to my personal growth," the mean score difference between the pre-test and post-test was 0.03 for the control group, and 0.24 for the experimental group. Pre-test scores were higher than post-test scores for the control group (-0.06) and experimental group (-0.23) for the item "This course will lead to career benefits."

The ten-item questionnaire (see Appendix 1) was used as a framework to conduct a thematic analysis of the student reflection papers to find out the relative weight students gave each research objective in their response (see Table 3). NVivo was used to code comments according to the related item. More than a third of the comments (34.6%) pertained to the third research objective, "applying the theory in a practical fashion." Half of the comments coded within research objective three (17.3%) pertained to the item "This course has facilitated my understanding of how marketing relates to other business functions." The item with the most coded responses (17.7%) was "I have knowledge and understanding of marketing." The item receiving the least notoriety was "This course will lead to career benefits", with 5.3% of comments related.

Table 3

Thematic Analysis of Student Reflection Papers

Item	Sample Comment	% Total
<i>Accomplishing Course Learning Outcomes and Objectives</i>		30.5 %
Q1. This course has enhanced my conceptual knowledge of the business.	<p>"I feel with this experience I have gained a bigger insight into how a company operates and how they promote their product around the world."</p> <p>"Looking back at my Marketing Game experience, I would say that it gave me a better grasp of how a business performs."</p>	7.0 %
Q2. I have knowledge and understanding of marketing.	<p>"I learned about different marketing strategies that our group used to sell the voice recognition device."</p> <p>"After completing the marketing game, I feel much more knowledgeable about the marketing world."</p>	17.7 %
Q3. I feel confident in my ability to apply marketing concepts.	<p>"During the game, I learned how to manage, distribute, and adjust from period to period as we were trying to beat out our competitors, EZTalk, Samsung, and TalkTech, in sales and profit."</p>	5.8 %
<i>Teaching Decision-Making</i>		22.6 %
Q4. This course made me question and rationalize my decision-making.	<p>"It challenged me to think critically on multiple levels."</p> <p>"We learned from our mistakes and as a group, we made decisions promptly and efficiently."</p> <p>"I learned that you have to think more about what marketing means and how the slightest error may affect your results in the end."</p>	10.7 %
Q6. I feel more confident in the application of theory as it applies to marketing decision-making.	<p>"I found out that just because we may have started off aiming at one segment, it may not be practical, and we may need to change our target market, rather than changing how to market to the targeted segment."</p>	11.9 %
<i>Applying the Theory in a Practical Fashion</i>		34.6 %
Q5. I have a good understanding of the relationship between theory and practice.	<p>"The marketing game was an entertaining and intriguing way to connect what we had learned throughout the semester in the classroom and put our skills into action."</p> <p>"I felt like the simulation was as close to the real thing as possible and it gave everyone a good insight on what it's like to market a product out in today's world."</p>	8.2 %
Q7. This course has facilitated my understanding of how marketing relates to other business functions.	<p>"Something else that I learned was money spent on advertising directly affected how many units were sold."</p> <p>"One of the major strategies I learned was that your company needs to have advertising for your business to be successful."</p>	17.3 %

Q9. This course has enhanced my understanding of how marketing relates society and consumers.	<p>“We realized that students could be extremely price sensitive, and our prices couldn't be too high but not too low either because we needed to make a decent profit.”</p> <p>“I also learned how important it is to understand your target market thoroughly. Without knowing their needs, wants, desires, and completely understand their lifestyle you can't market.”</p>	9.1 %
<i>Benefit from the Knowledge of the Subject Matter in Personal Life and Career</i>		12.3 %
Q8. This course has contributed to my personal growth.	“...it also challenged me to make quick and efficient marketing decisions in a competitive, fast-paced environment within a group setting of a classroom.”	7.0 %
Q10. This course will lead to career benefits.	“With my summer job I will be selling golf clubs, and I believe I can bring what I learned here to help better the company succeed in the ever declining economy.”	5.3 %

Conclusions

Results reveal the use of simulation as a pedagogical tool in comparison to other traditional pedagogical tools did not clearly impact learning objective achievement with regards to the variables studied in this research. The first research question, about accomplishing course learning outcomes and objectives, concurs with the study of Clichot (2001) where the students were often enthusiastic learners. Similar enthusiasm is confirmed by the student reflections as noted in Table 3. Data from research questions about decision-making, practical application of theory and the benefit of knowledge and skill for the students clearly indicate simulation is seen as an effective educational tool, which supports earlier studies of Parks and Lindstrom (1995). The students also learned to solve complex problems in an integrated manner which supports future application of theory in a practical fashion, in tune with the findings of the studies of Cadotte (1995), and Lamont (2001). While the results of this experiment using simulations do not explicitly suggest the simulation improved

the student learning experience, the reflective statements written by the students do show some advantages offered by simulations.

Simulation engages students in active learning about events, concepts, and emotions connected to principles of marketing. Simulation provides an opportunity to deliver instruction in various manners, as well as teach and link theory to numbers which arise from the simulation. Simulation provides an opportunity for the student to practice what is taught in a classroom by experimentation. Students can freely decide, as the simulation removes the element of danger or risk of the situation. Simulation engages students in “deep learning” as opposed to “surface learning” and improves student motivation and interest. As pointed out in earlier studies, simulation produces longer-term learning benefits from making later course work more meaningful. By giving students the ability to decide, simulations might improve the employability of students, as employers look for individuals who are decision makers. Further, simulations also increase student-student interaction.

It must be recognized that incorporating a simulation does entail an investment of time, effort, and a learning curve. Potential hindrances regarding the inclusion of simulations follow:

1. Simulations need intensive lesson preparation by the instructor.
2. Simulations reduce course lecture time as the instructor has to allocate time for playing and for explaining the results of the simulations.
3. In certain situations, the simulations might potentially contain errors in simulation design—leading to obstacles in learning.
4. Use of simulations in a classroom can be expensive. Even though simulations offer an experience which is close to real life, it cannot replace real experience in its entirety.

Fundamental premises of teaching and learning shift and create engagement when simulations replace traditional lecture methods. During a simulation students self-guide the application of theory in a complex structured environment. This allows learners the opportunity to make managerial decisions in a dynamic framework that closely mimics real world scenarios which they will encounter in their professional lives.

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