THE IMPACT OF PLAYING A MARKETING SIMULATION GAME ON PERCEIVED DECISION MAKING ABILITY AMONG INTRODUCTORY MARKETING STUDENTS

William J. Wellington
Odette School of Business; University of Windsor
r87@unwindsor.ca

David Hutchinson
Odette School of Business; University of Windsor
dhutch@uwindsor.ca

A. J. Faria
Odette School of Business; University of Windsor
ad9@uwindsor.ca

ABSTRACT

The present study examines how the decision making experience gained during the play of a marketing simulation game impacts game participants' perceptions of their decision making abilities. A pre-test/post-test experimental design was used to measure the change in participant perceptions and attitudes about their decision making abilities in relation to a marketing simulation game experience. The present study sought to determine whether the simulation experience enhanced simulation decision making skills and whether well performing participants reported more improvement in their decision making skills than poorer performing game participants. The study findings, involving 275 students, showed that the simulation experience actually "shook" the confidence of many students in their decision making ability as there was a significant negative change in perception of decision making abilities over the course of the simulation competition among poorer performing students. As expected, good performing students reported a positive and significant change in their perception of their decision making abilities. Well performing students also reported that they developed decision making approaches or systems while this was not the case among poorer performing students. Finally, well performing students reported a stronger understanding of the simulation experience than poorer performers.

INTRODUCTION

Business simulation games have been in use in university classes in North America since 1957 (Watson, 1981). From this start, the number and usage of business simulation games grew rapidly. In 1961 it was estimated that more than 100 business games were in existence in the U.S. alone and had been played by over 30,000 business executives and countless students (Kibbee, Craft and Nanus, 1961). A 1998 survey of AACSB member schools reported that business simulation games were in use in one or more courses in 97.5 percent of the responding schools (Faria, 1998). Most recently, an e-mail survey conducted among 14,497 university business professors in 2004 reported that 47.7 percent of the respondents had used one or more business simulation games during their teaching careers (Faria and Wellington, 2004) with the highest usage being among business policy and marketing professors.

While the large and expanding use of business simulation games can be attributed to many factors, one of the important benefits of business simulations is that they provide decision making experience. This is a benefit not generally provided by traditional lecture and textbook teaching approaches. While cases do provide decision making experience, it is not the same as in a simulation gaming environment in which the decision making participant must live with the results of the decisions made and proceed on to make further decisions over a simulated period covering a number of years. And, after all, the difference between a good business executive and a poor executive is not the number of business principles that can be recalled but the quality of the decisions made by the executive. Through participation in business simulation games, it is hoped that student simulation participants become better decision-makers.

If simulation games are to be a meaningful educational experience, one would hope that decision making skills are improved as a result of the gaming experience. A major problem, of course, is that decision making skills are very

hard to measure in an objective fashion. To date, it has not been conclusively demonstrated that simulation games actually make the game participants better decision-makers.

Most often, when evaluating participant performance in a simulation game, good decision making is ascribed to superior performance. While most game administrators would agree that better simulation performance is the result of better strategies and better decisions, this does not tell us whether game participants improved their decision-making skills through the simulation experience. One could certainly argue that the simulation game simply identified those participants who were better decision-makers entering the competition.

If, through the experience gained from participation in a business simulation exercise, participants believed they improved their decision making, simulation games would clearly offer a meaningful experience and their heavy usage in business classes would be justified.

LITERATURE REVIEW

Despite the widespread use of simulation games in business and marketing courses, an important issue among both simulation game users and non-users is whether or not participation in such simulations provides a meaningful experience. Past simulation gaming research has attempted to explore the meaningfulness of simulations in a number of ways including: (1) the internal and external validity of business simulations; (2) the relative merit of simulation games versus other teaching methods; and (3) the learning, or skills training, benefits of simulation games.

The internal validity of simulation games has been examined in three ways. The first approach states that if a simulation exercise is to be internally valid, better students should outperform poorer students. A number of studies have supported this view of the internal validity of the simulation games tested (Gray, 1972; Gosenpud, Miesing and Milton, 1984; Gosenpud and Wolfe, 1988; Miesing ,1982; Vance and Gray, 1967; Wolfe, 1985; Wolfe and Roberts, 1986; Wolfe and Chanin, 1993; and Wolfe and Roberts, 1993). A second view of the internal validity of simulation games examines whether participant decisions in a simulation competition, over time, conform to the environment of the simulation. While the dynamics of the simulation and the actions of competing companies will certainly influence participants' decisions, the simulated environment too must be considered and, *ceteris paribus*, participants' decisions should reflect or adapt to this environment. If this type of adaptive decision making does occur, the simulation can be said to be internally valid. Several studies of this nature have been supportive of the internal validity of the simulations examined (Dickinson, Faria and Whitely, 1990; Faria, Dickinson and Whiteley, 1992; and Whiteley, Faria and Dickinson, 1991). The third approach to internal validity examines whether logical, systematic strategies formulated by real participants will be superior to random strategies generated by a computer. This view of internal validity has also been supported (Dickinson and Faria, 1997).

The external validity of a simulation model is a measure of how well the model matches its real world counterpart industry (Carvalho, 1991; Green and Faria, 1995; Mehrez, Reichel and Olami, 1987; Stanislaw, 1986; Watson, 1981; and Wolfe and Roberts, 1986). In a classroom setting, three approaches have been used to investigate external validity. The first approach has focused on the correlation between a business executive's simulation performance and his/her real-world performance. If the simulation is externally valid, a successful business executive should also be successful when participating in the simulation competition. A number of studies of this nature have supported the external validity of the simulations examined (Babb, Leslie and van Slyke, 1966; McKinney and Dill, 1966; Vance and Gray, 1967; and Wolfe and Roberts, 1986). The second approach to measuring external validity uses a longitudinal research design. In this approach, a student's business game performance is compared to some measure of subsequent business career success (e.g., number of promotions, salary level, etc.). This measure of external validity has also been supported (Wolfe and Roberts, 1986 and Wolfe and Roberts, 1993). The third approach to external validity examines whether the results from a simulation competition match the results reported from the PIMS (Profit Impact of Marketing Strategies) project operated by the Strategic Planning Institute. A number of studies have supported this measure of the external validity of simulation games (Faria and Wellington, 2004; Faria and Wellington, 2005; Green and Faria, 1995; Wellington and Faria, 2006; and Faria and Wellington, 2008).

The merit of simulation games versus other teaching approaches has been investigated by a number of researchers and several comprehensive reviews of these comparative studies have been published (Greenlaw and Wyman, 1973: Hall, 1987; Keys, 1976; Miles, Biggs and Schubert, 1986; Randle, Morris, Wetzel and Whitehill, 1992; Snow, 1976; Spect and Sandline, 1991; Waggener, 1979; Washbush and Gosenpud, 1991; Wolfe, 1985; Wolfe, 1997). Across all of the reported studies, simulation games were found to be more effective teaching tools, as measured by performance on common course final exams, than conventional instructional methods (generally cases and lectures) in 75 of the research comparisons, conventional methods of instruction were found to be superior in 27 of the comparisons, while no differences were reported in 58 of the comparisons.

Research into the skills training or learning aspects of business simulations dates back to the first uses of business games in university classes. The reported types of learning brought about by the use of business games includes goal setting and information processing; organizational behaviour and personal interaction skills; sales forecasting; entrepreneurial skills; financial analysis; basic economic concepts; inventory management; mathematical modeling;

personnel skills such as hiring, training, leading and motivating; creative skills; communication skills; data analysis; and formal planning and report preparation among others. Faria (2001) provides a history and complete list of references covering research on learning and skills training through the use of business simulation games.

While not directly related to the current research, past simulation research has also examined the relationship between student performance in simulation competitions and a wide range of variables. Among the variables examined have been numerous personality characteristics, locus of team control, achievement motivation, previous academic performance, time pressure, ethnic origin of team members, gender, team size, previous business experience, team organizational structure, method of team formation, and grade weighting (see for example Anderson and Lawton, 1992; Brenenstuhl and Badgett, 1977; Butler and Parasuraman, 1977; Chisholm, Krishnakuman and Clay, 1980; Edge and Remus, 1984; Faria, 2001; Gentry 1980; Glomnes, 2004; Gosenpud, 1989; Gosenpud and Miesing, 1992; Hergert and Hergert, 1990; Hornaday, 2001; Hsu, 1984; Moorhead, Brenenstuhl and Catalanello, 1980; Newgren, Stair and Kuehn, 1980; Patz, 1990; Roderick, 1984; Walker, 1979; Washbush, 1992; Wheatley, Anthony and Maddox, 1988; and Wolfe, Bowen and Roberts, 1989).

While the evidence from past research would suggest that business simulation games do offer a meaningful education experience, one characteristic conspicuously lacking across past research studies is the impact of simulation games on decision making ability. The present study seeks to examine perceived decision making ability and whether it changes over the course of participation in a marketing simulation game and whether it is related to simulation game performance. While we know something about the characteristics of successful simulation game performers, there is virtually no reporting on simulation usage and self reported decision making ability.

PURPOSE AND HYPOTHESES

The purpose of the present study is to determine

TABLE 1
PRE-TEST AND POST-TEST MEASUREMENT SCALE RELIABILITIES

Scale	N	Number of Items	Alpha Reliability
Pre-test Simulation Attitude	275	5	.790
Post-test Simulation Attitude	275	5	.872

TABLE 2
PAIRED COMPARISON T-TEST FOR H1, H2 AND H3

Comparison of Changes T-Test	N	Pre-test Mean	Post-test Mean	t-score	Sig.
H1: Pre-test vs Post-test Decision Ability[1]	275	2.67	2.88	-2.24	.026*
H2: Pre-test vs Post-test Decision Thought[1]	275	2.32	2.88	-5.67	.000*
Pre-test vs Post-test Decision Time	272	94.01	49.21	7.15	.000*
H3: Pre-test vs Post-test Attitude[1]	275	16.46	17.68	-2.79	.006*

[1]Note: Perceptual measurement scale items were 1-7 point, with lower numbers meaning more decision ability, more decision thought and a more positive attitude towards the simulation competition (final scale was a 5 item additive scale).

* Significant at the .05 level.

whether the experience of participating in a business simulation game will have an effect on the self-reported decision making ability and attitude of the game participants. Based on past research findings, and some amount of logic, the following eight hypotheses will be tested:

H1: As a result of simulation game participation, students will report an improvement in decision making ability over the course of the simulation experience.

H2: As a result of gaining experience through simulation game participation, students will report devoting less time to their decision making over the course of the simulation experience.

H3: As a result of simulation game participation, students will become more positive towards the simulation by the conclusion of the competition than they were at the beginning.

H4: Well performing students will report a greater improvement in decision making ability over the course of the simulation competition than less well performing students.

H5: Well performing students will report putting more thought and more time into their decision making over the course of the simulation experience.

H6: Well performing students will have a more positive attitude towards the simulation competition than less well performing students.

H7: Well performing students will report having developed a decision making approach or system more often than less well performing students.

H8: Well performing students will report understanding how their decisions translated into the results they achieved more often than less well performing students.

METHODOLOGY

The subjects for the research to be reported here were

TABLE 3
ANOVA RESULTS FOR H4 THROUGH H8

Variable	N	High Performer Mean	N	Low Performer Mean	F-Value	Sig.
Beginning Perceived Decision Ability	148	2.57	127	2.79	2.357	.126
H4: Ending Perceived Decision Ability	148	2.33	127	3.51	56.98	.000*
Beginning Planned Decision Time	148	88.61	125	99.88	.659	.417
H5: Ending Reported Decision Time	147	52.21	127	45.79	1.37	.242
Beginning Thoughtfulness Intentions	148	2.36	127	2.28	.337	.562
H5: Ending Thoughtfulness Intentions	148	2.67	127	3.13	7.182	.008*
Beginning Competition Attitude	148	16.51	127	16.40	.023	.881
H6: Ending Competition Attitude	148	14.74	127	21.10	58.168	.000*
H7: Developed a Decision Making System	148	2.75	127	3.79	29.927	.000*
H8: Understanding of How Decisions Translated into Results	148	3.09	127	3.98	17.992	.000*
Beginning Expected Ranking	148	2.31	127	2.55	1.849	.175
Ending Expected Ranking	148	1.84	126	4.10	253.11	.000*
Participation Grade out of 5	148	4.21	127	4.080	.902	.343
Midterm Grade Out of 34	148	23.81	127	22.28	10.81	.001*
Final Exam Grade Out of 40	148	27.10	127	25.15	12.46	.000*

* Significant at the .05 level

TABLE 4
PRE-TEST/POST-TEST PAIRED T-TEST COMPARISON RESULTS BY PERFORMANCE GROUP

Comparison of Changes t-test	Performance Group	N	Pre-test Mean	Post-test Mean	t-value	Sig.
Pre-test vs Post-test Decision Ability	Hi	148	2.57	2.33	2.25	.026*
	Lo	127	2.79	3.51	-5.24	.000*
Pre-test vs Post-test Decision Thought	Hi	148	2.36	2.67	-2.11	.029*
	Lo	127	2.28	3.13	-6.27	.000*
Pre-test vs Post-test Decision Time	Hi	147	89.01	52.21	6.61	.000*
	Lo	125	99.88	45.69	4.54	.000*
Pre-test vs Post-test Simulation Attitude	Hi	148	16.51	14.74	3.14	.002*
	Lo	127	16.40	21.10	-8.75	.000*
Pre-test vs Post-test Performance Expectation	Hi	148	2.31	1.84	3.56	.000*
	Lo	126	2.56	4.10	-8.78	.000*
1st Decision versus 7th Decision Actual Performance	Hi	148	2.82	1.90	6.91	.000*
	Lo	127	4.69	5.30	-4.80	.000*

545 students who completed a Principles of Marketing course from the same instructor in two different semesters. The simulation used in the class was *Merlin: A Marketing Simulation* (Anderson, Beveridge, Lawton and Scott, 2004). The *Merlin* participants played as single member companies divided into industries of seven companies each and participated in a seven period competition.

The study design was a basic pre-test versus post-test quasi-experiment where students were asked to complete two self-report questionnaires at the beginning and at the end of the seven simulation decision periods. The first questionnaire contained measures of participant performance expectations, the time they planned to devote to the simulation, a self-assessment of decision making ability and participant attitudes towards the upcoming simulation competition.

The final questionnaire contained the same attitude measures as the first questionnaire plus two additional attitude questions asking whether respondents had developed a decision making system and whether they understood how their decisions or strategies translated into the results that they achieved. The participants' attitudes toward the simulation competition were measured on a 7 point Strongly Agree to Strongly Disagree scale. The alpha reliabilities (Table 1) for the pre-test and post-test simulation attitude scales were considered acceptable.

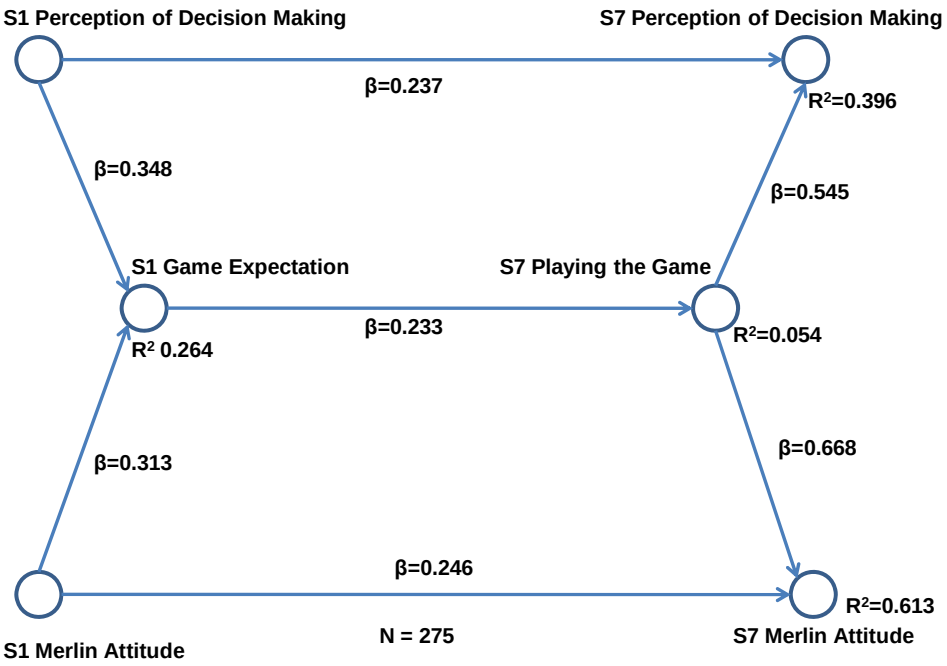
Students were told that the nature of their responses would not affect their grade in the course. Only students who returned both the pre-competition and post-competition questionnaires with no missing attitude data were included in the data analysis. This resulted in a final usable sample of 275 students which represents 50.5 percent of the students participating in the simulation exercise.

The questionnaire items were factor analyzed using the principal components factoring technique and a varimax rotated solution to establish discriminant validity among the measures and to validate the simulation attitude measurement scale for both the pre-test and post-test measures. In undertaking the factor analysis, it was found that the attitude toward the simulation competition measures loaded very heavily on its own factor and the decision making questions loaded on a separate factor.

In the *Merlin* simulation competition, performance is measured using a ranking based on an index of company sales, earnings, return on sales and forecast accuracy. These indexes were weighted 5%, 85%, 5% and 5%, respectively, resulting in each participant/company being ranked from first place to last place within their industry (e.g., from first to seventh position).

H1 through H3 were tested using a paired t-test procedure to compare the decision making ability perception measure, the decision making time, the decision making thought measure and the simulation competition attitude scale ratings for the whole group at the beginning of the simulation competition and at the end of the simulation competition.

FIGURE 1
PLS PATH ANALYSIS OF PERCEPTION OF DECISION MAKING AND SIMULATION ATTITUDE



H4 through H8 were tested using a t-test procedure by ranks and ANOVA. It must be acknowledged that the performance data were ordinal and involved the following: high and low dependent variables for game rank order performance versus the rank order independent variables of beginning and ending perceived decision making ability; beginning and ending expected rank order performance; beginning and ending intentions to put a great deal of thought into simulation experience; beginning and ending attitudes toward the simulation experience; ending indication of whether participants had developed a decision making system; and ending indication of how well participants understood the degree to which their decisions translated into the results achieved. As such, it can be argued that it would be most appropriate to use a non-parametric procedure such as the Kruskal-Wallis One-Way Analysis of Variance by Ranks test for the rank order data. However, when samples are large as is the case with this study (275 students and at least 127 individuals in each performance ranking group), "parametric tests are robust to deviations from Gaussian distributions. . . . Unless the population distribution is really weird, you are probably safe choosing a parametric test when there are at least two dozen data points in each group" (Motulsky, 1995). Consequently, the parametric ANOVA procedure was used to compare all of the measured perceptual variables and attitude toward the competition versus a two group collapsed high and low competition rank order performance as a factor variable.

In addition, the impact of the simulation experience on the participants' perception of their decision making and attitude towards the simulation was examined using a partial least square structural equation modelling program, PLS Graph® 3.0, a component based software package developed by Chin (Chin, 2001). This program assesses data in relation to conceptual models using multiple regression and confirmatory factor analysis techniques. The Partial Least Squares (PLS) statistical analysis method was developed by Wold (1982) for the latent variable conceptual models with multiple constructs and indicators. An advantage of PLS programs is their ability to accommodate a complex model in exploratory studies.

FINDINGS

The overall findings with respect to H1, H2 and H3 were tested using a paired t-test and are reported on in Table 2. These findings support the acceptance of H2 and the rejection of both H1 and H3.

To test H1, the average for the participant responses to the question on their perception of their decision making ability on the pre-test questionnaire was compared to the average of their responses on the post-test questionnaire. As shown in Table 2, the average level of agreement with this question decreased and the difference was highly significant. These results provide overwhelming support for the rejection of H1. The simulation experience did not make

TABLE 5
EFFECT OF THE INDEPENDENT LATENT VARIABLES (LV)
ON DEPENDENT LATENT VARIABLES

Construct	Paths Remaining	Latent Variable R^2	Path as Predictor* of Dependent LV
Decision Making (DM)	Playing Game to S7 Decision Making (Path 1)	0.341	Large Effect Size of Path 1; Small to Medium Effect size of Path 2
	S1 to S7 Decision Making (Path 2)	0.106	
	Full Model (S7 DM Construct)	0.396	
Attitude toward Simulation	Playing Game to S7 Simulation (Path 3)	0.560	Large Effect Size of Path 3 and Medium to Large Effect Size of Path 4
	S1 to S7 Attitude toward Simulation (Path 4)	0.216	
	Full Model (S7 Attitude Construct)	0.613	

*Cohen (1988) Effect Size f^2 = .02 small; .15 medium; .35 large effect size

Effect Size (Chin 1998): $f^2 = R^2_{included} - R^2_{excluded} / (1-R^2_{included})$

the participant group believe that they had improved as decision makers.

H2 examines whether over the course of the simulation, participants spent less time on their simulation decisions. It was hypothesized that as the participants gained experience, they would not need to spend as much time or put in as much thought to make their decisions. This hypothesis was supported. As a group, participants reported cutting decision time in half by the end of the competition. This reduction in decision time was statistically significant.

H3 examines if participants became more positive toward the simulation competition by virtue of their gaming experience. The findings reported in Table 2 show that the average attitude towards the simulation did not become more positive from start to finish but, rather, became more negative and the difference was statistically significant. As such, H3 is rejected.

The overall findings from the ANOVA procedure are reported on in Table 3. The findings support the acceptance of H4, H6, H7 and H8 and the rejection of H5.

The ANOVA results in Table 3 and the t-test results in Table 4 are quite clear. The ANOVA results in Table 3 indicate that at the beginning of the simulation there were no significant differences between the high and low simulation performers in terms of perceptions of decision making ability, attitude towards the simulation competition, planned time to be devoted to the simulation decision making, level of thought that would be devoted to the simulation decision making, and simulation performance expectations. However, at the conclusion of the simulation competition, with the exception of reported decision making time, there were significant differences between high and low performers on all of these variables. In addition, high performers had better average scores on both midterm and final examinations than did poor performers. This indicates that the course knowledge of well performing participants was somewhat greater than that of poorer performers. Whether superior knowledge led to superior simulation performance or superior performance led to superior knowledge cannot be determined from this data however.

The results shown in Table 4 indicate that between the beginning and the end of the simulation competition, both high performers and low performer groups changed in terms of their perceptions of decision making ability, attitude towards the simulation competition, actual time devoted to the simulation decision making, level or depth of thought given to the simulation decision making, performance expectations, and actual performance. Importantly, all of these changes were statistically significant.

The results show that the participants' perception of their decision making ability increased for high performers and decreased for poor performers. Similarly, high performers became more positive in their attitudes towards the simulation competition while poor performers became more negative towards the simulation competition. Both high and low performers spent significantly less time making decisions as the simulation progressed and reported putting less thought into the simulation over time. The performance expectations of the high performers (expectation of winning) became greater while the performance expectations of the poor performers declined. The actual performance levels of the high performers became better from the beginning to the end of the simulation while the actual performance levels of the poor performers became worse from the beginning to the end of the simulation.

The overall findings from the partial least squares (PLS) path analysis of the constructs decision making

perceptions and attitude are reported in Figure 1 and Table 5. The PLS findings also support the acceptance of H4 through H6. In the final game survey results (S7), playing the game appears to have had a mediating effect on perception of decision making and attitude toward the simulation experience.

The results of the analysis of impact of the gaming experience on decision making and attitude towards the simulation are illustrated by the effect size (f^2) of the PLS paths in Figure 1. These findings indicate that playing the game had a large effect on attitude toward the game and the participants' perception of their decision making skills. The participants' initial game attitude had a medium to large influence on their final attitude toward the simulation competition. In addition, the initial perception of decision making skills had a medium to large effect on participants' final perception of decision making. The effect size (f^2) analysis appears to indicate that playing the simulation had a mediating effect on the participants' perception of their decision making skills. The analysis also indicates that playing the game has a mediating effect on the participants' attitude toward the simulation.

DISCUSSION AND CONCLUSIONS

The research reported here sought to examine how the attitudes of introductory marketing students towards their decision making ability changed as a result of participating in a simulation competition. The findings show that there is very strong evidence that well performing students perceived their decision making ability to have gotten better over the course of the simulation competition while poor performing students perceived that their decision making ability became worse. The finding that simulation attitudes towards the simulation were affected by the level of performance is consistent with past research and represents a good manipulation check for validating the overall findings from this research. Weissman (1976) indicated that individuals who experience success also experience "a sense of competence, decisiveness" (p.411). The opposite might be expected from poor performance. As shown by the findings from this study, participants who did not perform well in the simulation competition did not like the simulation as much and perceived that their decision making ability actually declined. Clearly simulation game performance has an effect on perceived decision making ability.

Interestingly, as well performing game participants more frequently indicated that they had developed a decision making system or approach over the course of the competition it does seem as if the simulation competition influenced decision making ability, at least among good performers. In addition, in relation to the development of a decision making process, good performers more frequently reported having a better understanding of how the results they achieved were affected by their decisions. In effect, well performing students reported being more competent as managers than poorer performing students.

The expectation that attitude toward the simulation competition at the outset would affect simulation game performance was not supported. However, as expected, by the conclusion of the simulation, attitudes toward the simulation competition did shift to reflect the actual performance of the students in accordance with the findings from past research.

The findings reported from this study clearly indicate that playing the *Merlin* simulation game lead to changes in the perceptions of students who undertook the experience. If one accepts the notion that "cognitive learning is: a relatively permanent change in mental associations due to experience" (Ormrod, 1999) then, based on the results of this study, it can be inferred that the majority of students who played the *Merlin* simulation game learned from their experience.

The PLS results indicate that the level of impact of the simulation experience on influencing the perception of decision making was significant. In addition, as might be expected, the impact on the attitudes towards the experience was also significant. These findings indicate that simulation experiences will lead to changes in participants' perceptions of their decision making skills. Therefore, it might be concluded that simulation games are a unique instructional tool that offers an alternative approach to instruction and provides some unique decision making benefits that other instructional tools may not provide.

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