Simulation Gaming as an Assessment Instrument for Management Students

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The purpose of this study is to establish an alternative mechanism of evaluating the effectiveness of management education other than the semester end examinations. Typically, any student of management school is broadly categorized as a fresher (without any experience) and an experienced candidate. After two years of rigorous study what measures are available to find out the effectiveness of the education? Generally, the score cards or results in the examination and the job opportunities available at the end of the course are the only two broad measures are available.

Both these measures come with their own deficiencies. Depending upon the nature of examination, the performance in them will have a wide spectrum of meanings and understanding. For example, in a typical "learning by rote" the students who are good in technique of memorizing and reproducing are always known to fare better. The good score card does not necessarily ensure the ability of "application" of knowledge learnt. Secondly, the business schools across India are known to have adapted to different style of examination patterns ranging from 100 percent university based external examination to 100 percent internal assessment. With this variation it is actually difficult to compare the score cards across the various students to effectively measure the element of change they have undergone through the process of education.

The jobs opportunities are purely the function of the economic cycle and do not necessarily represent the strength of students or their ability to apply the learnt knowledge.

Even as an instructor, the author felt the personal necessity to measure the impact of learning in some objective manner. To answer this gray area an experiment was planned.

The purpose therefore, of this paper is to present the findings of a new and innovative method used to find the impact of one year of management education on the students with no experience.

The Experiment

Justice K.S. Hegde Institute of Management is located at Nitte in Udupi district and affiliated to VTU. The management school is recognized by AICTE and allowed to admit 120 students per year. The details of this business school are available at their web site at: http://www.nitte.ac.in.

Every single student who joined in year 2006 and 2007 has no work experience of whatever nature. This provided ideal ground for the experiment. The students of 2006 batch had completed one year of education in Sep 2007 and joined for their specializations. The students of 2007 batch also joined in Sep 2007 for their two year degree course.

A set of 30 students of 2006 specializing in Marketing and 30 fresh students of 2007 batch were invited to take part in this experiment. The experiment comprised of undertaking to "play" a management simulation game called as "Lemonade Stand". It was ensured that none of the students had prior knowledge of this game and

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were not even aware of the existence of the simulation game.

The description of the "Lemonade Stand"

Lemonade Stand is a basic economics game created originally by Bob Jamison of the Minnesota Educational Computing Consortium in 1973 and ported by Charlie Kellner in February of 1979 for use on the Apple II line of computers.

Gameplay

Like most games created for microcomputers in the 1970s, the gameplay is simple. It simulates a child's lemonade stand, where choices made by the player regarding prices, advertising, etc. will determine the success or failure of the enterprise. The game owed its success to offering just enough variables to make a complex challenge for users, but still providing a simply-grasped addictive introduction to the offsetting priorities facing a business. The choice of the right prices and quantities on the day of a heat-wave could instill the intense satisfaction unique to a greatly profitable private enterprise.

The player is first given a weather report for the day (sunny, cloudy or hot and dry, each accompanied by a color drawing) and is prompted for three values: The number of glasses of lemonade to make, the number of advertising signs, and the cost of lemonade per glass. The program then gives a report of the earnings for that day. A thunderstorm, sometimes occurring on cloudy days and accompanied by a color animation, will void any profits and cause the player to lose any investment for the day. The game can be played either single-player or with up to 30 players (each player is independent and the sales of one do not affect another). The Apple II version included music, with bars from "Singin' in the Rain" and "Summertime" played at appropriate moments.

The nature of the experiment

A batch of 30 senior students were administered the game individually on their own laptops. They were given briefing in the beginning and told about the game its controls and other features. This was done using the LCD projector. Care was taken to ensure that the exact briefing was recorded and was also given to the junior batch. After having their questions answered the game was begun and no help was provided after that. The only instruction was provided to those who were bankrupt. They were told to mention that in their record sheet and restart again. Exact same procedure was repeated for the juniors.
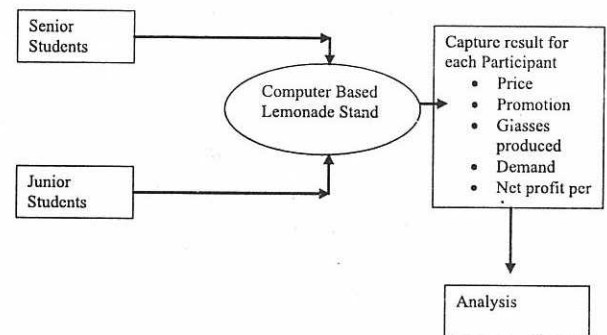
Why Simulation

It is important to answer at this moment as to why it was thought of using Simulation gaming for this experiment. Simulation requires application of known knowledge and ability to take decisions, depending on the dynamic situation. As vast research studies are available on the simulation and gaming, a brief literature survey is made below.

Studies on Simulations and Gaming

In a broad sense, the use of games as part of the educational environment fits into the philosophy of active learning and constructivism. Kohn (1997) suggested that in order to promote a deeper

understanding of material, students ought to be engaged with what they are doing. Passman (2001) reported on the benefits of adopting a more constructivist, student-centered model of teaching (for a detailed discussion of constructivism, see Applefield, Huber, Moallem (2000)). McKeachie (1994) stated that involving students as active participants results in a positive learning experience. More specifically, McKeachie explained that learning is enhanced if students make decisions and then need to respond to the consequences of each decision.

There is widespread use of games and simulations within business school curricula. Faria (1998) reported that in a recent survey of accredited business schools, fully 97.5% of them used simulation games in part of their courses. A majority of these games addressed marketing or strategic policy issues. Bodo (2002) discussed the development of an in-class simulation of the classic prisoner's dilemma game with student-designed strategies. Innovative technologies are also adopted in the operation of games. For instance, Doyle and Brown (2000) implemented a business strategy game using e-mail and videoconferencing It is also apparent in the literature that students support the use of games for educational purposes. Teach (1993) surveyed a number of graduates from a variety of U.S. business schools. Simulations and games rated quite highly. Students reported that these exercises developed their abilities to solve problems systematically, perform forecasts in uncertain environments, and to measure objectives. (Interestingly, respondents rated the traditional "lecture" method quite poorly, overall).

Researchers have analyzed other features of business simulations. Reall, Bailey and Stoll (1998) suggested that during the operation of a game, an individual may behave in a manner inconsistent with non game-situation moral reasoning. In short, an individual may act less ethically in a game situation than they would in real life. The study did not test this, but may suggest further that an individual will take more risks in a game than otherwise. Note, though, that this is the purpose of many games to try new things and to learn in a safe environment.

Neal (1997) indicated that even though most business simulations are conducted in a competitive manner (with the team earning the most profit deemed the winner), this may not be the best performance measure. The earning of significant profit levels may not result in commensurate student learning. However, it should be noted that this drawback is non-consequential if grades are not attached to game performance.

Schwartzman (1997) observed that games cultivate a learning environment. Although the measurement of student learning is by no means a trivial task, there have been some attempts to assess the level of learning experienced by those participating in a game. Gremmen and Potters (1997) divided their macroeconomics students into two sets; those who played the game, and those who had been exposed only to lecture material. Both groups were given the same multiple-choice exam, covering various economic concepts. They found that students who had participated in the game fared much better than the other group. Kraiger and Cannon-Bowers (1995) reported on the development of a training simulation for a naval decision-making task. Students exposed to greater training content performed better in exams. In a game devoted to strategic management learning, Wolfe and Chanin (1993) discovered that all groups, regardless of their initial skill levels, improved their knowledge. Another study (Santos, 2002) discussed an interactive teaching tool to introduce students to overall consequences of monetary policy. This Financial System Simulator permitted students, representing nations, to interact with each other rather than with a computer. Post-game surveys showed that students gained enhanced monetary policy understanding. Westbrook and Braithwaite (2001) designed an educational game focused on the

health care system. Learning outcomes were improved, as shown by pre- and post-game student questionnaires as well as a focus group participant session.

Thus, it can be noted that most of the research was concentrating on simulation gaming as a means of pedagogy. Most of the research also concentrated on the effectiveness of the simulations over the other "in-class" methods. This research experiment borrows heavily on the research conducted in this direction, however, focusing more on the use of simulation as a method of assessment of the classroom teaching undergone for a year.

Problem Statement

"Is there any collective significant difference in results of a simulation game, under similar environment, displayed by the senior students who have undergone management training for a period of one year compared to the fresh students?"

The researcher of this study believed that the impact of the education of one year on the set of students would at least have some impact on the performance displayed by them in this simulation game. Reasonable care was taken to ensure that condition for both the teams were identical and wherever possible it was ensured that the use of computer operations were similar in both the groups.

Data Collection :
Seniors

A group of 30 seniors started the simulation exercise. The time allotted was one hour, however, most of the students were able to finish well within the time. The game was played over 30 simulated days and students were asked to update excel sheets with the results and decisions. A total of 25 senior students could complete the simulation. Rest opted out on account of various reasons such as need to catch a transport to go to their native place, religious festival (feast of nativity) and not keeping well.

The excel sheets were collected at the end of experiment.

Juniors

The same computers were used for the juniors. A total of 30 students had shown interest and 28 of them reported for the simulation. They were briefed exactly in the similar basis. Out of 28 only 23 could complete the exercise and the drop outs had similar reasons.

All excel sheets individually saved were collected by the researcher as in the previous case.

Data analysis

Table 1 below shows the consolidated results.

	Av. Price	Av. No. Glasses	Av. Signs/day	Av. End Net Assets	Bankruptcy %
Juniors	11.85	21.52	0.98	12.77	0.00
Seniors	11.30	39.25	2.51	27.16	16.00

As can be noted the price average price in both the cases is similar, the net results however, are not. Some of the interesting trends are:

1. Average end net assets are more than double for seniors compared to juniors

2. Aggressiveness in terms of manufacturing of lemonade is significantly high in seniors than in juniors.

3. Aggressiveness can also be judged by the risks undertaken by seniors

resulting into bankruptcy in the earlier stages of the game.

4. Promotional aggressiveness is also evident from the average spend of 2.5 times more than the juniors.

For the deeper understanding of the data, it was further analyzed using Kurtosis method. The reason why Kurtosis is used, is as follows. Kurtosis measures the "peaked ness" of the distribution. In other words how the individual values are skewed is a measure provided. The significance of the Kurtosis value would tell us the behavior of the group in terms of pricing. For example, average pricing is same in both the groups, however, the table 2 mentions the Kurtosis values and the meaning is very clear in terms of Seniors as a group having less "peaked ness" compared to the juniors.

Table 2

| Kurt-Sen | -0.60874 |
| Kurt-Jun | -1.13935 |

The interpretation:

The value of -0.60874 compared to the -1.13935 shows that the price variation of the seniors group was more centered on the mean price, however, the variation of the juniors pricing had a very wide fluctuation.

This also means that there is conscious tendency amongst the seniors to arrive at the pricing, while the juniors are pricing more randomly.

Fig. 1 represents the data analyzed
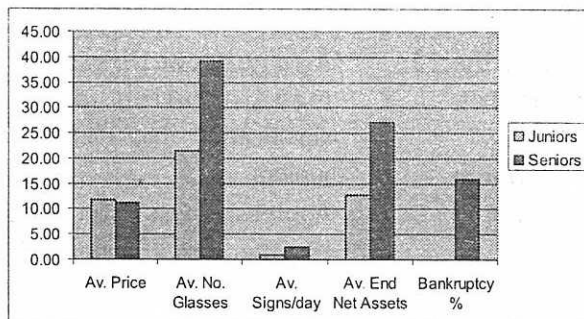
To test the hypothesis it was decided to use the single tailed F-test (ANOVA) on both the distributions. The null hypothesis would therefore, be expressed as:

$$H0 : s_1 = s_2$$

In F-test format therefore, it is essential to find the value as follows:

$$F = s_1^2 / s_2^2$$

where s_1^2 and s_2^2 are the sample variances. The more this ratio deviates from 1, the stronger the evidence for unequal population variances.

The single tail F-test showed the value of 0.257999. This means that the null hypothesis is disproved. What it also mentions is that there is significant difference in the performance of those who had one year of education against those who had no education.

Conclusions:

The statistical analysis shows beyond doubt that the seniors have been able to perform better and had a consistent approach to solve the problem under simulation. Overall characteristics of both the groups differed only on one parameter that is one year of education. All other parameters taken care are: average age, education background, demographic background, family background and financial status.
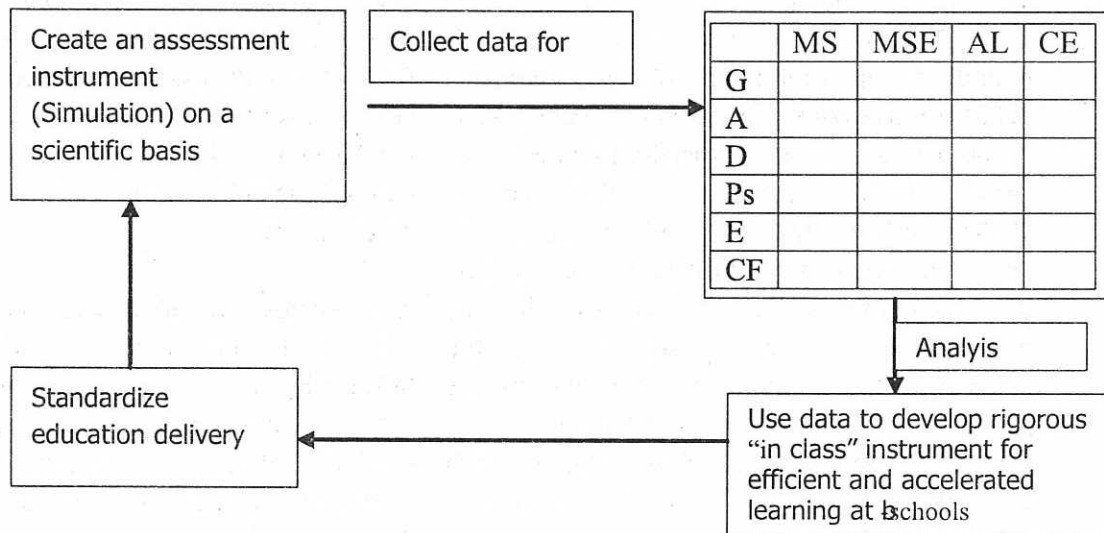
It is therefore, easy to conclude that the one year of management education makes the student apply their concepts in a simulated situation at least and perform better compared to the uneducated similar sample group.

Further research and experiment architecture for the future:

This experiment was just a pilot. More on the dip stick basis to see the validity of the further research design. The lessons learnt point to the further thorough research and the architecture of the research can be as follows:

Legends:

MS: Management students

MSE: Management students with experience

Al: Alumni

CE: Corporate Executive

G: Based on gender

A: based on age

D: Based on demography

PS: Based on psychographic analysis

E: Based on basic education

CF: Based on cross function

Create an assessment instrument (Simulation) on a scientific basis	→	Collect data for	→		MS	MSE	AL	CE
				G				
				A				
				D				
				Ps				
				E				
				CF				

Analyis

| Standardize education delivery | ← | Use data to develop rigorous "in class" instrument for efficient and accelerated learning at schools |

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