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Tracking the behavior of players in a cost accounting simulation and identifying work patterns

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Abstract

This paper summarizes the results of using two Excel-based simulations run on a cost accounting course to instruct about the contribution margin. Students' learning has been assessed using achievement tests and analyzing traces. Conclusions of the research are: students stayed active, focused their work on the key actions, and worked where the instructor wanted them to work; there was knowledge acquisition since the tests provide evidence of learning; and the activity was well-accepted by the students.

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Keywords: Simulations; contribution margin; Excel; achievement tests; traces; R statistical environment; feedback survey

1. Introduction

Some concepts, phenomena, and dynamics are complex and difficult to understand using traditional methods, such as lecturing. Today's professors have to face with a lack of motivation and engagement by the students, and have to think of activities to make students stay active. In contrast, current state of technology allows the existence of a wide range of interactive tools to bring to class. Simulations are used to emphasize the concepts taught in class

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using traditional methods. This paper summarizes the results of using two Excel-based simulations run on a cost accounting course.

The research consists of using three methods to verify: whether the activity incentivizes the students' work (active learning); whether there is a generalized work pattern among students (focused learning); whether the activity increases students' comprehension of the key concepts previously specified (increased knowledge); and whether students' attitude is receptive to these innovative teaching methods (students' attitude). Increased knowledge is measured by comparing the results of the post-tests with the results of the pre-tests and by verifying whether students score higher in the post-tests than in the pre-tests. Student learning perception is measured by a feedback survey. Everything is done with the aim of improving the learning of future cohorts of students.

We should distinguish between game, simulation, and simulation game (Ellington, 1981). Games consist of any activity in which the user competes with others to achieve a goal. Simulations are virtual representations of reality. The player can experiment but is not able to alter reality. The results of the simulation are always the same, and the player can only visualize some fictitious situations. Simulation games refer to a combination of both. They consist of activities that are live representations of reality in which players compete. The activity referred to in this paper falls within the category of simulations, because it is a virtual representation of reality and does not involve interaction among the players.

Listing the benefits of simulations, Ezz, Loureiro-Koechlin, and Stergioulas (2012) remind that there is a need for non-conventional tools in education. They are more effective than lecturing with regards to theoretical concepts, which are difficult to assimilate and retain after some time. Visual examples are easier to understand and assimilate. Simulations allow students to practice *in vivo* the theoretical concepts taught in lectures. Simulations capture the attention of users, make them stay active, and accelerate learning. Learning is based on trial-and-error. Students are able to observe the consequences of their decisions. Simulations promote decision making and allow evaluation of human reaction to given situations. They allow failing without cost and can be stopped at any moment to analyze the effects of any previous decision. They also allow users to face situations rarely encountered in reality and for which they should be prepared. Finally, the authors state that simulations are an appropriate methodology, because today's students are "digital" and therefore completely familiar with these tools.

Randel, Morris, Wetzel, and Whitehill (1992), Terrell and Rendulic (1996), Prensky (2003), and Tao, Cheng, and Sun (2009) remark that simulation games cause an increase in user's motivation to learn.

Salas, Wildman, and Piccolo (2009) argue that the value of a simulation depends on the acceptance of the tool by the students, on quantified results (to what extent they have learnt in line with the expectations of the teacher), and on the students' behavior *a posteriori* (to what extent their knowledge increases). In sum, it depends on whether the user is ready to experience the simulated situation.

2. Activity description

The activity was conducted in the 2013-2014 academic year of the IQS School of Management Degree in Business Administration and Management as part of "Management Control", a third-year course. There were three groups, with 51, 63, and 39 students respectively. 97 students participated in the entire activity (pre-tests, simulations, post-tests), representing 63% of the total number of students.

The activity intends to present the concept of the contribution margin. A first simulation instructs the students that a firm with a negative unit contribution margin must stop selling since the more it sells, the more it loses. In a second simulation, students are required to split a finite manufacturing capacity between two variants of a product on the basis of their total contribution margin, and have to realize that in the short run, when the fixed costs cannot be altered, maximizing the profit consists of maximizing the contribution margin.

The two knowledge components to be taught are: 1) "firms with a negative unit contribution margin must stop selling; any increase in sales reduces profits or increases losses and any reduction in sales increases profits or reduces losses" and 2) "in the short run fixed costs do not vary and should not be taken into consideration when making decisions; hence, maximizing the result involves maximizing the contribution margin."

In simulation 1, Click & Enjoy is an e-commerce firm which faces a challenging situation: the more they sell in units, the more they lose. Students have to classify costs as either variable or fixed, and have to create an income statement for the first year of operations. Screen 1 of the simulation is shown in Figure 1. When the number of