An Experimental Evaluation of the Effectiveness of Endogenous and Exogenous Fantasy in Computer-Based Simulation Training

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ABSTRACT

The increased use of simulations in training and education has heightened the need among researchers and practitioners to better understand how simulations impact learning. Given the dearth of empirical research in this area, the purpose of this study was to test the effect of fantasy, one of the most popular attributes of simulations, on multiple outcomes of learning. Data were collected using an experimental design in which the type of fantasy was manipulated (endogenous, exogenous, and no fantasy). Participants included 60 undergraduate teams performing an emergency crisis management simulation. The results of the study showed that fantasy, regardless of type, was a significant predictor of affective learning outcomes. On the other hand, fantasy did not significantly predict behavioral learning outcomes. The authors discuss the implications of these findings for the design and implementation of ludic simulations as well as recommendations for future research.

Keywords: Computer-Based Simulation, Endogenous Fantasy, Exogenous Fantasy, Game Design, Learning Outcomes, Ludic Simulation, Team Performance, Training

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INTRODUCTION

Simulations have been used to model complex environments in numerous domains, such as medical (e.g., Nestel, Groom, Eikeland-Husebø, & O’Donnell, 2011; Steadman et al., 2006), military (e.g., Hill et al., 2006; King et al., 2006; Raybourn, Deagle, Mendini, & Heneghan, 2005), emergency response (e.g., Jenvald & Morin, 2004; Reznik et al., 2003), and corporate industries (e.g., Forssén & Haho, 2001; Jana, 2006; Summers, 2004). With this widespread adoption, definitions and labels have often been blurred across researchers, as simulations can be referred to as games, computer-based simulations, or more recently serious games (Schollmeyer, 2006). Research on the effectiveness of simulations from multiple disciplines has enhanced the generalizability of the findings on their effectiveness, but has limited the development of a shared framework and understanding on what simulations are and what makes them effective.

This problem is further compounded by the fact that simulations are typically categorized based on the purpose of play as opposed to the learning components of play, an issue which recent reviews of the literature have tried to address. In particular, Sitzmann (2011) conducted a meta-analysis on 65 independent studies across several domains and noted that the lack of a shared definition of simulations and games was a major barrier in evaluating their effectiveness. In an attempt to consolidate the various definitions of simulations, the author defined computer-based simulation games as “instruction delivered via personal computer that immerses trainees in a decision-making exercise in an artificial environment in order to learn the consequences of their decisions” (p. 492). Another conceptual development in the area of simulations includes work by Wilson and colleagues (2009) who proposed a framework on the attributes of simulations. Wilson et al. (2009) defined eighteen simulation attributes, such as fantasy, representation, sensory stimuli, challenge, mystery assessment, and control. They also offered propositions on how these attributes linked to key cognitive, skill-based, and affective learning outcomes in players. Despite the thoroughness of their review, little empirical research has been conducted in this area.

In an attempt to address some of the propositions described in Wilson and colleagues’ (2009) framework, the purpose of the current study is to operationalize a key simulation attribute in order to understand its impact on learning. More specifically, this study will examine how fantasy impacts affective and skill-based learning outcomes. Fantasy is a very common attribute found in many commercial video games and simulations (Wilson et al., 2009). It has been implemented in early computer games such as SID MIERS CIVILIZATION (MicroProse, 1991), to more modern games such as WORLD OF WARCRAFT (Blizzard, 2004). Evoking fantasy has also been found to be one of the most useful ways to engage and motivate players in a game (Lortz, 1979; Malone, 1980; Myers, 1990).

Through evaluating the effects of fantasy on affective and skill-based learning outcomes, we hope to address two main gaps in the literature. First, little research has linked fantasy or any other simulation attribute to specific learning outcomes (cf. Wilson et al., 2009). In addition, to the authors’ knowledge, no known experimental designs have been conducted in which the type of fantasy incorporated into a game (i.e., endogenous and exogenous fantasy) has been manipulated. This omission in the literature is problematic because the entertainment value provided by fantasy has been theorized to be a driving factor behind the association of computer-based simulation games with learning outcomes (cf. Garris, Ahlers, & Driskell, 2002). This limitation in the empirical research has restricted our ability to determine whether or not one type of fantasy is better in a particular context than the other. In addition, the fact that previous research on fantasy has mostly been correlational (e.g., Ciavarro, Dobson, & Goodman, 2008; Habgood, 2005; Papastergiou, 2009) means that several other simulation attributes could have affected the learning outcomes observed. Wilson and colleagues...
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