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Making good decisions: Having confidence in simulations in higher education

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ABSTRACT

To achieve the desired learning outcomes it is critical that developers and users of simulations understand human decision-making. How participants will make decisions in the simulation is a function of both the participant's expertise and their interaction with the exercise design. It is an important pedagogical issue to know whether the design of the simulation reinforces and builds a participant's ability to respond in a normative reasoned fashion to a decision situation, or to experience the situation in its complexity and respond in a synthetic intuitive fashion. To comprehend the implications of these two viewpoints I present the debate between promoters of the normative views and the descriptive views on decision-making. By performing a critical analysis of these different perspectives, I offer insight on how the decision-making philosophy used in the design of simulations affects both the use of the simulation and the measurable learning outcomes.

1. Introduction

Are simulation games offering naïve or realistic situations? Are they offering experiences to improve problem-solving or decision-making skills? Are they offering reality experiences or experiences of reality? Are they helping participants think like experts or learn like experts? These are important questions for developers and users of simulation games. If simulation games are to achieve measurable pedagogical results they need to be designed with solid learning objectives in mind (Moizer, Lean, Towler, & Abbey, 2009; Peach & Hornyak, 2003; Teach & Patel, 2007; Tiwari, Nafees, & Krishnan, 2014). Because the intended learning objectives of most simulation games include improving a participant's decision-making capabilities (Gredler, 2004; Larreche, 1987; Piercy & Caldwell, 2011), it seems prudent for game designers to be knowledgeable regarding the relevant human decision-making literature. This knowledge will lead to improved designs, better implementation, and a better understanding of what outcome measurements are appropriate for simulation games.

Given the extensive literature that exists on decision-analysis and decision-making, little attention has been focused on applying that knowledge to developing educational pedagogy (Jonassen, 2012; Martin, 2000). While there are many decision-making approaches described in the literature most fall into two broad categories; normative (prescriptive) models, and descriptive (naturalistic) models. These two decision-making approaches lead to specific strategies for educational pedagogy design.

The traditional approach to education pedagogy is to identify normative models for decision-making and teach these models (G. Klein, 1997). The normative approach assumes that decision makers are rational people and seek the optimal

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decision choice, which maximizes their utility in any situation. The normative decision approach is based on norms and prescribes how rational people should make decisions. A second traditional approach is to identify the heuristics that can interfere with a strictly normative strategy and to teach the people to use these heuristics more carefully (G. Klein, 1997). This approach relies on the decision maker selecting the first reasonable or satisfactory choice among alternatives. Called satisficing, this decision approach assumes a complexity in decision-making that limits people's ability to maximize utility perfectly and therefore encourages the use of recognized norms and patterns that have worked well in the past (Schwartz, Ben-Haim, & Dacso, 2011).

A less traditional strategy in decision-making education is to view decision-making as a type of expertise and to focus on teaching people how to learn like experts (G. Klein, 1997; Van Merriënboer, 2013). Rather than helping people to maximize utility by learning the norms or to avoid the traps associated with the misuse of norms, the naturalistic decision approach targets the process of decision-making and the real-time adaptation of feedback to each unique decision-making situation. This descriptive decision-making approach applied to education pedagogy relies on creating realistic situations with rich feedback that can be used to alter the decision-making process as the situation merits.

I will explore these both the normative and descriptive theories on decision-making to highlight how we can more effectively develop, use, and measure the learning outcomes of simulation games. The literature is clear that designing an educationally valid simulation game is challenging (Jonassen, 2012; Klabbers, 2003). "The designer must have sufficient knowledge and experience to be able to judge the effective level of realism and complexity to achieve the learning objectives accurately and cost effectively" (Stainton, Johnson, & Borodzicz, 2010). Unfortunately, without a clear understanding of the different approaches to decision-making it is difficult for the simulation game designer to establish meaningful learning objectives on which to base the simulation game.

In this paper, I present the normative theory of decision-making as described in the seminal literature, covering both the rational and satisficing views. While significant research has been done since the publication of these seminal papers, the focus of this subsequent research has been primarily on refinement, validation, and application. Because I am interested in the pedagogical implications of these different views for simulation game design, I will attempt to focus on the core of the distinctions and arguments found in these seminal works.

Following these seminal thinkers, I will show that promoters of the normative theory of decision-making will appreciate simulations that offer an environment allowing students to validate prescriptive theories and frameworks, showing for example, how constantly pursuing one of Porter's generic strategies (i.e., a strategic management framework) will result in superior performance (Jonassen, 2012). Thus, following this thinking, designers will create normative simulations to demonstrate that the users of the prescriptive theories are more effective than those who do not follow these theories explicitly (Teach & Murff, 2008). Users of these simulations will then base the outcome measure of success on comparing the performance of individuals utilizing these specific prescriptive theories with those utilizing some alternative method of decision-making (Green & Faria, 1995; Teach & Patel, 2007).

After the presentation of the normative line of decision theory, I briefly survey the alternative descriptive perspective on decision-making. This perspective gives users a methodology for describing and characterizing the decision-making process. The promoters of the descriptive perspective would like to see simulations that are realistic, presenting the user with as much real world complexity as possible (Salas, Wildman, & Piccolo, 2009; Wolfe, 1978, 2005). In descriptive simulations, the normative theoretical models may not be optimal and thus may not produce results consistent with normative theory. Promoters of descriptive simulations recognize that many normative models actually fail to perform as predicted in real world situations, and thus conclude that it is better to give users the experience to learn and explore the situation in all its complexity than to provide a false reality (Cannon, Friesen, Lawrence, & Feinstein, 2009). The goal of these descriptive simulations becomes one of sharpening intuition through feedback rather than validating normative theory (Klassen & Willoughby, 2003). In these simulations, no predefined decision model will produce the optimal results; thus, simulation users will measure learning outcomes by gains in a participant's discernment and adaptive capabilities.

Finally, I offer a practitioner view of decision-making to bring the significance of the normative and descriptive views into perspective. The rationale for creating both normative and descriptive based simulations follows from an understanding of this view. I conclude with a discussion of the implications of the normative and descriptive decision theory for simulation developers and users. I attempt to answer the question; how can we use the understanding of the alternative views of decision making to develop and utilize simulations more effectively? I also show that when evaluating the learning outcomes of a particular simulation it is important to understand the perspectives taken by the developer and user (Jonassen, 2012; Klabbers, 2003). Does the simulation assume that the participants will take a normative or descriptive approach? If the intention is to support prescriptive theories and problem solving analysis then it is important that we design the simulation to provide a simulated reality guaranteeing confirming results. If the goal is to support descriptive theories and the related decision processes then it becomes more important to provide a reality simulation with genuine uncertainty. It is imperative that the simulation developer, user, and learning outcome assessor know the goal.

2. Traditional decision-making (Normative)

Traditional decision-making literature follows the seminal work of Dewey (1933) regarding *How We Think*. Dewey's (1933) theory purported that the human decision-making process follows an orderly sequence of stages. This theory seemingly provided a psychological confirmation of the widely debated socioeconomic belief that human decision-making is rationally