



Review

Eliciting teamwork with game attributes: A systematic review and research agenda

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ABSTRACT

The modern workplace has become increasingly complex as a function of numerous factors, including technological and economic growth. Teams are more frequently implemented within organizations to facilitate high performance within these complex, dynamic conditions. Game-based training has become a common method of delivering training to teams, paralleling the recent trend towards gamification, which refers to integrating games into traditionally non-game based settings. However, the extant literature remains nascent as there is a dearth of theory relating independent game attributes to teamwork behaviors. Specifically, it is unknown why or how game-based training may foster desired competencies within teams. To address this gap, the present article conducts a systematic review to identify opportunities for research and potential relationships between game attributes and teamwork behaviors. These proposed relationships are ultimately intended to uncover the manner in which game-based training can be leveraged to facilitate effective teamwork.

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1. Introduction

The structure of organizations has changed over the past several decades, elicited by factors such as technological advances and globalization (Cascio, 1995; Parker, Wall, & Cordery, 2001). As a function of these changes, the nature of jobs has correspondingly altered; jobs are becoming increasingly demanding and complex (Ilgen, 1994). To cope with these changes, organizations are more frequently utilizing teams (Devine, Clayton, Philips, Dunford, & Melner, 1999). To ensure that teams are performing effectively and to minimize errors associated with deficiencies in teamwork behaviors, team training interventions are implemented within organizations (Aguinis & Kraiger, 2009). There has been sufficient evidence supporting the utility of training for teams (e.g., Arthur, Bennett, Edens, & Bell, 2003; Salas et al., 2008) and reviews of the past two decades have converged on the perspective that training “produces clear benefits for individuals and teams, organizations, and society” (Aguinis & Kraiger, 2009, p. 452). Recently, there has been a movement towards incorporating technology into training practices.

Specifically, advances in technology have given rise to a trend referred to as gamification, which is defined as the practice of integrating game dynamics into traditionally non game-based settings (Singh, 2012). The results of a recent survey of business executives indicated that 25% integrated game characteristics into training programs or tasks. Further illustrating this trend, 19% of companies reported utilizing game simulations and this figure is posited to grow as technology becomes even more widespread (Owen, 2004). The term serious game has consequently been coined to refer to games used for purposes other than entertainment, such as for educational or organizational purposes (Van Eck, 2006). Predicated upon this trend, game-based training (GBT) has become a more frequently implemented training format (Fletcher & Tobias, 2006), as PC-based games can provide a low-cost means of fostering desired learning outcomes (Belanich, Sibley, & Orvis, 2004).

Although evidence indicates that both GBT and simulation-based training (SBT) can effectively facilitate learning outcomes in both individuals and teams (Driskell & Dwyer, 1984; Jentsch & Bowers, 1998), it is not comprehensively known *why* or *how* such outcomes can be fostered with these different approaches. Researchers have emphasized the importance of identifying relevant theory and evidence to guide these practices yet science has lagged behind practice (e.g., Bedwell, Pavlas, Heyne, Lazzara, & Salas, 2012; Clark, 2007; Wilson et al., 2009). More systematic research addressing the effect of simulation features on training outcomes is needed to determine why certain results are being achieved. Specifically, researchers note that there is confusion regarding how different game attributes foster specific learning outcomes (Bedwell et al., 2012; Wilson et al., 2009). As such, we seek to contribute to the literature by systematically evaluating the current state of GBT implemented to facilitate teamwork, and more importantly, outlining next steps for researchers. We begin by summarizing current theoretical understanding of games and the literature identifying elements of games posited to influence training outcomes. We leverage the results of this review to identify future research opportunities, beginning with a general overview of needed research and ending with a specific research agenda suggesting how game attributes may be linked to teamwork.

Ultimately, the results of this effort are intended to guide future research such that it will have a focus on uncovering how GBT can be most effectively utilized to train teams.

2. Research methodology

To identify articles studying the impact of GBT on teamwork behaviors, we conducted a computerized search of relevant databases (i.e., PsychInfo and Business Source Premier) using a combination of several relevant search terms (i.e., game, training, and team). Studies were also collected via a relevant reference list (i.e., Wouters, Van Nimwegen, Van Oostendorp, & VanDer Spek, 2013). To be included, studies had to meet the following: (1) include some form of team training, (2) utilize participants at or over the age of 18, (3) use GBT, and (4) use empirical methods. After applying this criteria to all articles, a total of 12 articles and 22 independent samples were deemed suitable for inclusion. A list of all articles included within the review is available from the first author.

3. The literature on games

Although this area of research is nascent, the results of this review suggest that some progress has been made towards theoretically and empirically clarifying different aspects of GBT. Before suggesting future research opportunities, we begin by outlining what is currently understood. Specifically, we review the current conceptual understanding of games and how they differ from related constructs. We also discuss approaches to categorizing games based on critical elements.

3.1. Simulations and games

It is first important to distinguish games from simulations, as both are often utilized for the purposes of training and have a high degree of overlap. A game can be defined as an interactive and competitive activity shaped by a set of rules with a clearly defined goal (Hays, 2005). Conversely, simulations are more purposefully designed to represent a real phenomenon (Crawford, 1984; Wilson et al., 2009), and typically informed by a model or algorithm (Hays, 2005; Randel, Morris, Wetzle, & Whitehead, 1992). Table 1 summarizes relevant definitions, gleaned from the review, to provide further clarity regarding the manner in which these terms are generally utilized.

Both simulations and games are being utilized across a number of domains (Jacobs & Dempsey, 1993). PC-based games often are commercial off-the-shelf (COTS) games that are adapted from the area of computer gaming (Bowers & Jentsch, 2001). This is in contrast to games specifically built with the objective of providing training, tailored to suit the specific training needs of the target population. Such games are often costly to build and run the risk of resulting in products that are too narrow in focus to be utilized across a number of different training scenarios and populations (Bowers & Jentsch, 2001).

Simulations, games, and virtual environments (VEs) can all be distinguished by their level of fidelity. Although sometimes merely categorized as having “low” or “high” fidelity, with the level of fidelity referring to how well the system comprehensively represents reality (Beaubien & Baker, 2004), it has been suggested that

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