

## Chapter 88

# The Effects of Fully and Partially In-Game Guidance on Players' Declarative and Procedural Knowledge With a Disaster Preparedness Serious Game

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### ABSTRACT

*Studies suggest that serious games are useful tools for disaster preparedness training, but few have examined if instructional factors differentially affect the learning outcomes. This study investigated the effects of players' gaming frequency, prior knowledge, and in-game guidance received on their declarative and procedural knowledge in a disaster preparedness serious game. Findings showed that gaming frequency was not a significant predictor for learning outcomes. By contrast, players' prior knowledge, the types of in-game guidance received, and the interaction between the two were all significant predictors for the acquisition of declarative knowledge and development of procedural knowledge. The interaction term revealed a moderator effect, indicating that the relationship between a player's prior knowledge and learning outcomes was affected by the type of in-game (full or partial) guidance received.*

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## **INTRODUCTION**

Research in disaster preparation has shown the majority of the populations to be largely unprepared (Heagele, 2016). Government authorities are just as ill-prepared in handling pandemics and disasters (Centers for Disease Control and Prevention, 2017). Moreover, because people do not seem to learn from past disasters (Meyer, 2010), disaster preparation becomes very important in making available sufficient information so that some groups of people may remember what they need to do should disaster strike. It is the hope that after receiving enough practices through simulated scenarios, people can be more prepared when the real disaster strikes.

Some researchers used serious games in disaster preparedness training and viewed it as a solution to compensate for the disadvantages of traditional training methods. For instance, Silva, Almeida, Rossetti, and Coelho (2013) found that serious games are “affordable and easy” (p. 2) for creating different disaster scenarios. Loreto, Simone, and Diviniti (2012) suggested that serious games helps develop important skills for crisis management, such as teamwork and decision making, in a time constrained situation. In Cohen and colleagues’ study (2013), trainees had an overwhelmingly positive feedback on the serious game, and said it simulated realistic, complex, and hard-to-assess scenarios.

While serious games appeared to be a promising method for disaster preparedness training, the abovementioned and other past studies emphasized on the gameplaying features or the comparison between game and conventional methods. Given the increasing popularity of serious games in training and education, it would appear worthwhile to improve the application of serious games than to prove the superiority of games over conventional methods. Therefore, the purpose of this study is two-fold. First, this study aims to explore the factors that might affect learning outcomes of serious games. Second, this study endeavors to clarify the definitions of learning outcomes in serious games from the perspectives of knowledge definition and classification.

## **THEORETICAL BACKGROUND**

### **The Role of Guidance and Prior Knowledge in Serious Games**

To facilitate an effective public awareness training, the learners must assimilate (learn) new *knowledge* through *instruction* that will result in a learning outcome of (semi-)permanent behavioral change. The term knowledge refers to a learner’s previously established skills and know-how, and is more commonly known as *prior knowledge* in literature; whereas instruction refers to the method that delivers the information to the learners. In this study, instruction refers to an in-house created serious game for disaster preparedness training.

The amount of *guidance* available during learning is a useful way of classifying instructional methods, which can range from fully guided, to partially guided, and unguided. Research showed that in-game guidance in the form of feedback could have a greater impact on *novices* (Mayer & Johnson, 2010; Moreno & Mayer, 2005) than experienced players. Educational practitioners likewise prescribed more guidance to new and inexperienced learners, and less guidance to more experienced learners (Kirschner, Sweller, and Clark, 2006).

In the case of serious games, the levels and depths of in-game help, information gleaned from conversations with non-player characters (NPCs), and tutorials all contribute to the amount of in-game

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