Chapter 4.12
Methodological Considerations in Educational Research Using Serious Games

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ABSTRACT

The literature on using serious games for learning has been growing exponentially during the last decade. It is time to examine some methodological issues associated with this line of research. There is evidence that research on serious games, if designed with methodological rigor and executed properly, such as the serial studies of prisoners’ dilemma, modality effect in individual interactive learning, and changes in attitude toward mathematics in a computer-based simulation game, can be fruitful and have a profound, positive impact on learning and training. Since adopting serious games as an educational technology tool is by no means cheap, we should ensure that methodological issues are carefully considered before conducting a study on educational games. Whereas there are excellent studies in the existing literature of simulations and games, it is not uncommon for some studies to adopt convenience samples or own-control designs. Studies on serious games tend to be conclusive if they have used true experimentation, well-controlled quasi-experimental design, surveys with representative samples and validated instruments, comprehensive design research, or training programs having a pretest–posttest design with group comparisons. The potential values and informative contributions of using different methodologies for serious game research should be recognized because of the ecological relevance. Future research should pay more attention to randomized sampling, controlled but feasible research design, validity of instruments,
appropriate analytical methods, and interdisciplin- 
ary or cross-disciplinary research to enhance the 
internal/external validity of various approaches. 
In regard to analytical methods, both quantita- 
tive approaches and qualitative evaluations, if 
applied appropriately, are considered as valuable, 
indispensable, and complementary to each other. 
It is hoped that this chapter can be helpful not 
only for future researchers in this field to design 
and execute rigorous projects but also for wider 
readership to understand and evaluate research 
outcomes in the discipline of serious games.

INTRODUCTION

Although game playing has long been used for 
studies on conflict resolution, business training, 
group psychotherapy and children’s experience (e.g., Charness, Fréchette, & Qin, 2007; Graetz, 
1995; Kay, 1997; Kirova, 2006; Pratto, Pearson, 
Lee, & Saguy, 2008; Pruitt & Kimmel, 1977; 
Vinacke, 1969; Wiener, 1999; Zhong, Loewen- 
stein, & Murnighan, 2007; Zizzo & Tan, 2007), 
educational games equipped with advanced in- 
formational technology for the learning of a wide 
range of academic knowledge and skills have at- 
tracted researchers’ attention only during the last 
two decades or so. In line with the proliferation 
of personal computers and internet usage across 
nations and cultures, a number of conceptual 
models as well as guidelines for the design and 
execution of educational computer games have 
been proposed (e.g., Dempsey, Haynes, Lucassen, 
& Casey, 2002; Dipietro, Ferdig, Boyer, & Black, 
2007; Garris, Ahlers, & Driskell, 2002; Jones, 
2007; Karakus, Inal, & Cagiltay, 2008; Kebritchi 
& Hirumi, 2008; Raybourn, 2007; Reese, 2007; 
Spencer-Oatey, 2007; Tahirouglo, Celik, Uzel, 
Ozcan, & Avcı, 2008). In line with Moore’s Law 
predicting periodically remarkable increases in the 
number of transistors economically available on an 
integrated circuit, the advancement of software 
designed for computer games is partially due to 
the rapid expansion of processing capabilities of 
CPUs. Consequently, research activities on both 
games for purely entertainment purposes and seri- 
sous games for educational/training purposes have 
been growing exponentially. While educational 
and technological experts are still debating the 
theoretical bases of gaming and its pedagogical 
implications, methodological concerns in this 
diversified field have also been raised. According 
to de Freitas and Jarvis (2007), many studies on 
digital game-based learning (DGBL) lack firm 
empirical evidence and thus are not conclusive. In 
his assessment of serious games as a field and the 
associated challenges in forthcoming years, Van 
Eck (2007) calls for more rigorous research of both 
a grounded-theory and empirically oriented nature. 
As pointed out by Dipietro and colleagues (2007) 
in their recent effort to promote a framework for 
understanding electronic educational gaming: “We need more research, but this research must 
be structured and rigorous” (p. 241).

In a meta-analytic review on computer gaming 
and interactive simulations for learning conducted 
by Vogel et al. (2006), 248 studies were identified 
from electronic databases (PsycInfo, ERIC, AMC, 
Google Scholars, etc.), dissertation abstracts, and 
the references from main articles. Of these stud- 
ies, only 32 met the criteria for the meta-analysis 
(Vogel et al., 2006). Since educational computer 
gaming is a relatively new research field, both 
theoretical bases and methodological aspects 
(sampling, design, instruments, data analysis, 
etc.) can be further developed and improved. For 
instance, in a review of methodological practices in 
research examining effects of playing violent video 
games on behavior, cognition, affect, and arousal, 
Anderson (2004) was able to classify the studies 
in this area into two categories: “best methodolo-
gies practices” versus “not best methodologies 
practices.” It was found that methodologically 
weaker studies yielded smaller effect sizes than 
methodologically stronger studies. In general, 
methodological weaknesses are demonstrated 
in the lack of adequate manipulation or inclu-