

Chapter I

A Qualitative Meta–Analysis of Computer Games as Learning Tools

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ABSTRACT

Drawing on grounded theory approach and a qualitative meta-analysis, this chapter intends to systematically review and synthesize the theories, methods, and findings of both qualitative and quantitative inquiries on computer-based instructional games. A major purpose of this literature review and meta-analysis is to inform policy and practice based on existing studies. Four major recurring themes concerning the effectiveness of computer-based instructional games have emerged from a comparative analysis with 89 instructional gaming studies and are discussed with the support of exemplar research. The chapter will assist practitioners and policymakers in understanding the “best practices” and key factors of a computer game-based learning program.

INTRODUCTION

Recently computer games have been anticipated as a potential learning tool with great motivational appeal and represent an interesting development in the field of education. The literature surrounding computer games and education is vast. For more than two decades, educationalists (e.g., Betz, 1996; Gee, 2003; Gredler, 1996; Kafai, 1995; Malone, 1981; Prensky, 2001; Rieber, 1996; Squire, 2003) have been investigating the potential that exists for the application of computer games to learning.

Given the broad nature of computer games, a substantial question exists as to what basic insights the literature provides on the design and application of computer-based games for learning.

As a recent search shows, there are currently more than 600 research/report articles within the category of computer games in the literature. These articles fall into generalized categories with a great deal of variance within the categories. These categories include theoretical speculation (e.g., Garriss, Ahlers, & Driskell, 2002; Gee, 2003), experimental or descriptive clinical study (e.g.,

Ke, 2007; Barab, Sadler, Heiselt, Hickey, & Zui-ker, 2007; Squire, 2003), and review of existing research (e.g., Dempsey, Rasmussen, & Lucas- sen, 1996; Randel, Morris, Wetzel, & Whitehill, 1992). Even within the same general category, games studies vary in theoretical framework, research purpose, methodology of data collection and analysis, and game genre adopted. Further, the findings of these games studies are conflict- ing (Dempsey et al., 1996; Emes, 1997; Randel et al., 1992).

Given this multi-vocal data pool, a systematic review with rigorous qualitative meta-analysis is warranted to generate a clearer profile of computer games. The review should indicate what meta conjectures or recurring themes we can form from the huge quantity of often disassociated studies on the learning effectiveness of computer games. It should also illustrate what are the best models or best practices of designing and applying computer games for education.

This proposed chapter is an attempt to sys- tematically review and synthesize the literature on the subject of computer-based instructional games. Specifically, the chapter addresses the following questions: (1) What is the cumulative qualitative and quantitative evidence for using computer games for learning, and (2) What are the factors, if any, that weigh in an effective ap- plication of instructional gaming?

BACKGROUND

Definition of Terms

Computer Game

Scholars (Dempsey et al., 1996; Malone, 1981) defined a game as “usually a contest of physi- cal or mental skills and strengths, requiring the participant(s) to follow a specific set of rules in order to attain a goal” (Hogle, 1996, p. 5). More specifically, Prensky (2001) defined a game as

organized play including six key structural ele- ments: rules, goals and objectives, outcomes and feedback, conflict/competition/challenge/opposi- tion, interaction, and representation or story.

There is a wide category of games under Prensky’s game conceptualization. For the pur- pose of this research, a computer game is:

- Operated on a variety of personal computer platforms
- Developed for formal learning or adapted for informal learning
- Comprising rules, goals and objectives, outcomes and feedback, conflict/competi- tion/challenge/opposition, interaction, and representation or story (Prensky, 2001)

In addition, a game is defined as being separate from a simulation in that a game involves com- petition. According to Dempsey et al. (1996), a competitive format does not necessarily require two or more participants. If a simulation enables a learner to compete against him or herself by comparing scores over successive attempts at the simulation, or has a game structure imposed on the system, it is regarded as a game mode. If the focus of a simulation involves the comple- tion of an event only, the simulation will not be considered a game.

Multiple categories of computer games have been identified in this review, including but not limited to adventure games, simulation games, board games, puzzle games, business simulation games, action games, and strategy games.

Learning

In this study, learning is conceptualized as a multidimensional construct comprising all three components: “skill, metaskill, and will,” or in other terms, cognitive learning achievement, metacognition, and motivation (Mayer, 1998, p. 51). Gagne (1985) defined *cognitive learning achievements* as comprising declarative, proce-

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