Understanding the Relationships Among Various Design Components in a Game-Based Learning Environment

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ABSTRACT

Designing an electronic, game-based learning environment is a multi-disciplinary effort that involves the consideration of various theories and models in multiple domains. Taking these theories and models into consideration adds to the complexity of the development process. Which elements should designers consider first? How do designers reconcile the demands and conflicts of different design components? Game-based learning environments are a relatively new territory for research and development. This paper reports an analysis of the decision making related to the interplay of various design components in developing Conquest of Coastlands (CoC), an electronic, game-based learning environment. The analysis may help designers better understand the intricate relationships among various design components involved in creating game-based learning environments.

Keywords: Educational Games, Game-Based Learning, Game Design Components, Game Development, Learning Environments

Designing an electronic, game-based learning environment is a multi-disciplinary effort that involves the consideration of various theories and models. Supporters of electronic educational games emphasize the potential of electronic games in providing simulated real world experiences. Squire (2006) considers game playing as designed experience that allows students to learn through participating and performing in the game world. Researchers (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; DiPietro, Ferdig, Boyer, & Black, 2007; Rosas et al., 2003) cite the notion of play that originates from the works of Vygotsky (1978) and Dewey (1938) to support the use of games in education. Related theories such as situated learning (Lave & Wenger, 1990) and cognitive apprenticeship (Collins, Brown, & Holm, 1991) also provide support for the “learning by

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“doing” approach enabled by game-based learning. These theories suggest that to facilitate learning, designers should create authentic learning tasks in a rich context supported by mentors and scaffolds.

Motivation theories such as intrinsic motivation (Lepper & Malone, 1987; Malone, 1981) and the theory of flow (Csikszentmihalyi, 1991) should be considered in designing game-based learning environments. These theories suggest that to create engaging learning environments, designers should provide challenges with clear goals and optimal levels of difficulty, unambiguous feedback, easy-to-use game interface, fantasy, as well as choices and personalization opportunities.

Theories related to interactive narrative also provide guidance for the design of game-based learning. Some scholars call games interactive narrative (Crawford, 2004; Mates, 2004; Murray, 1997). Unlike traditional narrative in which audiences are passive observers of the drama and the actions of characters on stage, interactive narrative allows the audience to identify fully with characters in the game, take actions, and experience the consequences of the actions. The literature on interactive narrative suggests that the narrative should be designed so that it provides a sense of immersion and a sense of control and empowerment (Murray, 1997). Narrative structures such as Hero’s Journey (Campbell, 1949) and storytelling devices including character design, creation of conflict and plot twists (Dickey, 2006; Krawczyk & Novak, 2006) may enhance the quality of a narrative.

Gameplay is another important area in the design of game-based learning environments. Gameplay describes “what the player does” in the game. It can be broken down into the constituent game mechanics, including goals, rules, and tools (Stapleton & Hughes, 2006). It describes how the player follows the rules and uses the tools and resources to achieve the goals of the game and how the game responds to the player’s actions based on certain cause-effect-consequence rules. Ideally, the goal of the game should match the goal of the story (Novak, 2005), which in turn should match the instructional goal (Malone, 1981; Squire, 2006). The rules limit player actions and are shared by all players. They should be explicit, fixed, binding, and repeatable (Salen & Zimmerman, 2004). The tools should be easy to use and access (Schuytema, 2007).

These theories and guidelines provide suggestions on how to design effective game-based learning environments. Taking these guidelines into consideration adds to the complexity of the development process. Which elements should designers consider first? How do designers reconcile the demands and conflicts of different design components? Game-based learning environments are a relatively new territory for research and development. This paper reports an analysis of the decision making related to the interplay of various design components in developing Conquest of Coastlands (CoC), an electronic, game-based learning environment. The analysis may help designers better understand the intricate relationships among various design components involved in creating game-based learning environments.

DESIGN MODELS FOR GAME-BASED LEARNING ENVIRONMENTS

In the past several years, game-based learning environment has gained interest from researchers and practitioners. Egenfeldt-Nielsen (2005) warned us that this is not the first time that researchers believed that games had tremendous educational potential. History shows that games are not magic bullet that will automatically solve the problems in education. Without appropriate research and development to guide practice, educational gaming will be like other passing fads, which fail to have significant impact on educational practice (Van Eck, 2007).

Recent research on game-based learning environments such as Civilization III (Squire, Giovanetto, Devane, & Durga, 2005), River City (Ketelhut, Dede, Clarke, & Nelson, 2006; B. Nelson, 2007), and Quest Atlantis (Barab et al., 2007; Barab, Thomas et al., 2005) em-
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