Harnessing Computer Games in Education

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ABSTRACT

Besides the ability of making learning more interesting, educators and researchers have been exploring other pedagogical potentials of computer games. How to employ games for constructivist learning and teaching has become an attention in the field of education and game design in recent years. This article gives an introduction to game-based learning. On top of discussing games’ intrinsic educational traits from the motivational, cognitive and socio-cultural perspectives, we also review two recent foci of game-based learning. The first one is “education in games” which is an approach for adopting existing commercial games for educational use. The second is “games in education” in which the games are designed specifically with underlying pedagogy for some curricula.

Keywords: game-based learning, educational games; educational technology; student-centered learning; Web-based learning

INTRODUCTION

The pervasive spread of computer games has made a significant impact on different aspects in our society (Newman, 2004). Sustaining spontaneous players’ engagement (Gee, 2003) and exploiting proactive players’ communities (Prensky, 2006) are substantive features of today’s games. This emerging attention has been one of the main reasons for the increasing number of educators and researchers worldwide (e.g., Chi et al., 2005; Halverson, 2005; Shaffer 2006; Squire, 2005; Egenfeldt-Nielsen, 2007) to treat game-based learning as a topic of serious research in the field of education.

There has been a great promotion of shift in education from a didactic model of instruction to a constructivist model that emphasizes more an active learner role. Learning is believed to be at its best when it is goal-oriented, contextual, interesting, challenging, and interactive (Quinn, 2005). On the other hand, some researchers (e.g., Egenfeldt-Nielsen, 2002; Gee, 2003) also believe that the computer game world is totally learner-centered, and is therefore a possible venue for realizing a constructivist learning paradigm. This article aims at discussing the intrinsic educational traits of computer games.
from different perspectives and reviewing some recent research on game-based learning strategies.

**Intrinsic Educational Traits of Computer Games**

Since the early 1980s, employing human game-playing motives to facilitate learning has been a significant research focus of game-based learning (Squire, 2003; Egenfeldt-Nielsen, 2007). More recently, some researchers (e.g., Gee, 2003; 2005; Squire, 2005; Prensky, 2006; Shaffer, 2006) have also argued that games’ underlying cognitive, social, and cultural features can offer various “educative” opportunities for learners. In the following, we discuss games’ intrinsic traits that promote learning in a constructivist fashion from the motivational, cognitive and socio-cultural perspectives.

**Motivational Perspective**

Research evidence (e.g., Bisson & Lunckner, 1996; Cordova & Lepper, 1996) has shown that fun and enjoyment are important in the process of learning as learners can be more relaxed, motivated and willing to learn. Based empirically on a series of surveys, observations and interviews with game-players, Malone (1980) gave his intrinsic motivation theory, which asserts that challenge, fantasy, control, curiosity, cooperation, recognition and competition are the most significant elements that make game-playing fun and engaging, and sustain players’ continual motives. Malone advocated that schools should try to integrate game elements into curricula so as to arouse students’ intrinsic learning motives.

Bowman (1982) tied his study on game-playing and learning with the psychological conception of flow—a state of optimal experience, whereby a person is so engaged in an activity that self-consciousness disappears, and time becomes distorted (Csikzentmihalyi & Larson, 1980). In the flow state, individuals work on complex, goal-directed task(s) not for external rewards, but for the exhilaration of doing. Bowman believed that learning with games is an effective means to bring students to the flow state of learning.

Computer games are fun, pleasurable, challenging and rewarding (Prensky, 2001). From both empirical and theoretical points of view, learners will be more motivated and engaged in educational activities if these activities take place in a form of game-playing.

**Cognitive Perspective**

The traditional school curricula are often fragmented into small and unconnected pieces (Papert, 1993). The original intention is for making learning easier, but this usually ends up with depriving the rationale behind the knowledge itself, creating unrealistic learning contexts, and making learning boring. Learning should be an active process based upon concrete experience (Piaget, 1964). Without chunking or turning contents into a series of split-screens, a well-designed game can do well in presenting near real-life contexts for individuals to acquire knowledge and skills unintentionally rather than deliberately (Gee, 2003). This is situated learning—a learning paradigm that Lave and Wenger (1991) have been advocating.

When discussing the educational potentials of computer games, we should classify the games into mini-games or complex-games (Prensky, 2006). In general, playing mini-games takes around several minutes to an hour to complete. Usually, these games contain simple challenges and contents, with neither ethical dilemma nor human players’ interactions. On the contrary, complex games require players’ dozens of hours (or even more) of concentrated attention to master with. Players are demanded to acquire new and multiple skills, and communicate (or collaborate) with other players inside and outside the games (Gee, 2003; Quinn, 2006). Most tasks therein are generative and open-ended with neither prescribed strategies nor solutions. Players have to analyze the perceived information and contexts in complex games proactively. They also have to apply their existing knowledge and skills to formulate strategies, make decisions, and then examine results.