Chapter 7
Conceptual Possibilities and Restraints in Educational Games

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ABSTRACT

In this chapter, the authors explore arcade-style gaming and its limitations for promoting mastery in the conceptual learning domain. Arcade-style game play is primarily a function of presenting concepts to players and continually requiring them to respond with finer responses. The degree to which a concept is malleable determines how large its range is in game play. In other words, the characteristics of a concept determine its role in game play. The primary purpose of this chapter is to distinguish between two types of concepts: one that is appropriate for arcade-style gaming and another that requires a different, more involved style. Designers of games, particularly of educational games, will find guidance for selecting concepts related to their instructional content.

INTRODUCTION

Gaming scholars believe that they can achieve a wide range of learning goals through gaming (Becker & Fraser, 2011; Egenfeldt-Nielsen, 2006; Gee, 2003). Different game paradigms have different potentials with regard to specific learning goals. Designers often use instructional taxonomies to classify learning goals into different learning domains; doing so allows the selection of differential instructional treatments. One prominent learning domain is conceptual learning, which designers us to identify and classify phenomena

A concept has a very specific meaning. The public often uses this term in a manner that is synonymous with terms like notions or ideas. However, instructional designers use the term, specifically, to indicate a particular type of learning domain (Merrill, 1983). Designers define a concept as the mental combination of entities based upon their coalescing attributes (Murphy, 2002). Concepts consist of the rules and procedures for classifying and categorizing instances of phenomena, as well as collections of those instances. These rules make it possible to discriminate and generalize instances into dif-

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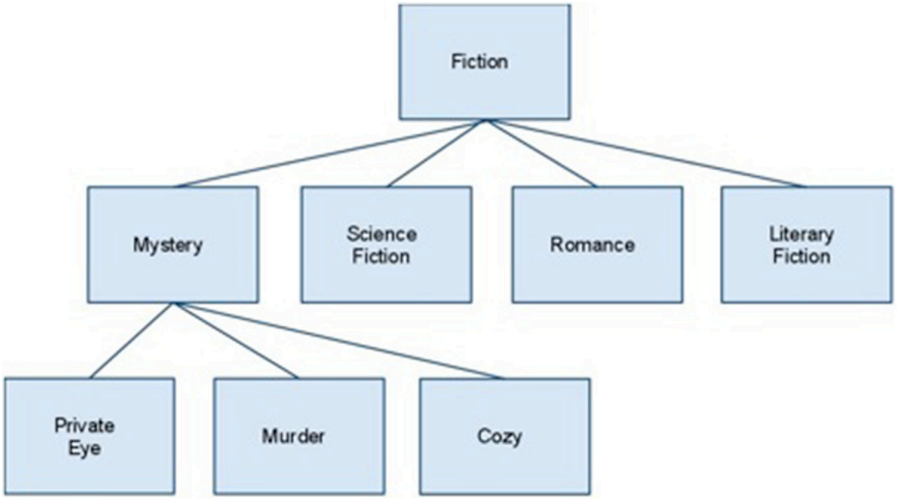
ferent classes. In other words, conceptualization allows undifferentiated phenomena in the world to become mentally differentiated; it allows "things" to be classified, and once classified they can be treated uniformly. Examples of concepts include items and ideas such as, bowl, computer, liberty, and IQ (Intelligent Quotient). In fact, designers consider most terms concepts (Murphy, 2002).

We argue that this conceptualization process (e.g., experience, classification, generalization) accounts for much of the game experience and as such provides specific guidance on how to design and improve gaming interaction.

There are two types of concepts generally acknowledged. Concrete concepts are concepts that refer to entities seen directly in the physical world, while defined concepts are those that require other concepts for definition and reference (Smith & Ragan, 1999). Sky, moon, and sunrise are all concrete concepts while; democracy, health, and security are all examples of defined concepts. Concrete concepts can often be described with an ostensive definition, one that points directly to their referents; a relatively easy instructional task. Designers consider defined concepts more difficult to learn compared to concrete concepts because of their relative abstractness and the number of learning pre-requisites required to classify their instances. This distinction between defined and concrete concepts is an important one because, a concrete concept, is amenable to being displayed visually, while an abstract concept, more often than not, requires a verbal description. One can imagine different games that would have capabilities for one or the other type of conceptualization.

Concepts are generally organized into structures that simultaneously indicate how a concept integrates and subsumes other concepts, as well as how a concept is distinguished from others (Ausubel, 2000; Murphy, 2002). These structures form a hierarchical taxonomy that illustrates how super-ordinate, co-ordinate, and sub-ordinate concepts relate to one another (Merrill, Tennyson, & Posey, 1992). Figure 1 illustrates a hierarchy for the concept "fiction." Notice that as you descend the hierarchy you must make finer distinctions and yet the sub-concepts inherit all of the characteristics from the concepts higher in the hierarchy. Also, notice that the hierarchy is not exhaustive. Conceptual hierarchies will accommodate new entries into the classification endlessly. For example, a writer introduced to the action genre should understand that it is a sub-concept and could add it to the hierarchy under fiction.

Figure 1. Conceptual hierarchy



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