

Chapter 4

Elemental Learning and the Pyramid of Fidelity

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ABSTRACT

One of the emerging issues for educators who recognize the importance of digital games and virtual worlds is fidelity to learning outcomes, both intentional and incidental. In this chapter, from the perspective of an educator, the author introduces an integrated framework that emphasizes elemental learning. The model, based on learning analysis and direct measurement of learning is iterative, as opposed to a front-end-only approach, and includes five major cognitive learning outcomes: actual elements, simulated elements, procedural understanding, conceptual understanding, and related knowledge. For each of the learning outcomes, the author provides design propositions and an example.

INTRODUCTION

It is useful to look at digital games and virtual world communities as allowing individuals to have a goal-directed embodied experience (Gee, 2008) and define learning progress along a “trajectory of experience” (Greeno, 1997). How the learning experience is best aided has been argued for at least a century along a loose continuum with one end situated, beginning perhaps with Thorndike’s specific transfer theory of identical elements (Thorndike & Woodworth, 1901), and the other end

of the continuum supporting the transfer of general skills and principles, characterized by Gestalt psychologists such as Wertheimer (1945) and Katona (1940). There is certainly merit in both positions and the dichotomy has been well explored (e.g., by De Corte, 1999).

Amid all these theories and arguments come the practical considerations of educators who must design learning experiences that result in learning outcomes, both intentional and incidental. The traditional approach to doing that is what instructional designers refer to as analysis of learning outcomes using taxonomies. There are many learning taxonomies—notably, Anderson et al. (2001), Bloom

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(1956), and Gagné (1985)—but most educators simply do not overtly consider them in the design of a learning environment, whether that be a serious game or a 3-hour online workshop.

One alternative to using taxonomies can be found in how we consider our outcomes in a more general sense—an integrated framework. By this I mean something more in the nature of a folk taxonomy (no relation to folksonomy tags), like one used in an indigenous culture to classify plants or even ceramics. A folk taxonomy is used as “a taxonomic hierarchy built on a core of naturally useful distinctions” (Hunn, 1982, p. 833).

The *integrated framework* in this chapter consists of a hierarchy of elemental and synthetic learning outcomes. It is less formal than a specialized educational taxonomy but potentially useful for conducting a naturally occurring iterative process of learning analysis. This framework is not specific to the design or analysis of serious games or virtual worlds, but there may be some utility in employing the approach in designing or understanding these learning experiences. Although the framework is intentionally less specific than a learning taxonomy, it lies somewhere along the situated side of the transfer continuum largely because of its emphasis on the elemental learning outcomes described below.

LEARNING OUTCOMES AND FIDELITY

Learning taxonomies such as the classics of Bloom (1956) and Gagné (1985) are important because they give us a structure for learning analysis, i.e., figuring out the rational intended learning outcomes in a particular situation or for a particular learning process. There are many other versions of learning taxonomies useful in specific situations for analyzing learning outcomes. We might want to conduct learning analysis for assessment purposes or to plan or just understand learning. Because learning outcomes are essentially a way

to analyze content, it really does not matter how an individual acquires content or, in the case of intentional learning, how the content is taught. Additionally, taxonomies are important to identify the nature of incidental, or unintended, learning outcomes. Likewise, taxonomies can be very useful in the assessment of learning outcomes. Without defining learning outcomes, it is a difficult task to accurately assess for either formative or summative purposes. As S. J. Gould (1981) famously said, “Taxonomy is always a contentious issue because the world does not come to us in neat little packages” (p. 158). Even so, there is a common sense aspect to using learning taxonomies. Human beings are born classifiers. It helps us think through problems. It helps us analyze content. It helps us understand what content is learned.

Like all conceptual schemes of representation, learning taxonomies are mental representations that for one reason or another are socially agreed upon or at least understood so that they can be used to communicate. Many, such as the Linnaean taxonomy used in biology are hierarchical. The classification of outcomes of learning taxonomies can include simple discriminations, objects, parts of motor skills, events, “isms” of all sorts, classes of processes, principles, actions, attitudes, and situations. The simplest learning taxonomy commonly in use may be the somewhat overly simplified “KSAs” (knowledge, skills, and attitudes). There are a number of more comprehensive and well-established learning taxonomies. In instructional design, the more commonly referenced (and venerable) learning taxonomies would include Bloom’s taxonomy of the cognitive domain (Bloom, 1956), the first of three handbooks of educational objectives, and Gagné’s taxonomy (Gagné, 1985), which was first developed in the 1960s, as well as the more recent revisions such as those by Anderson et al. (2001), Krathwohl (2002), and Marzano (2001). These taxonomies can be viewed as somewhat hierarchical with rational and conceptually understandable components.

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