

Chapter 3

Instructional Design for Technology–Based Systems

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ABSTRACT

As technologies continue to evolve and develop, instructional designers are presented with a growing list of possibilities for designing and delivering instruction. It is easy for an instructional designer to be seduced by a new or even older technology and focus on the affordances of the technology resulting in instruction that is both ineffective and inefficient while appearing to appeal to the learner. In this chapter, we show how existing instructional design models are capable of designing instruction for a variety of technologies. We will address the features of design models, analyze instructional interactions, examine technological affordances, and describe the importance of research-based instructional strategies.

INTRODUCTION

Over the past 75 years, we have witnessed the introduction of numerous technologies into higher education classrooms. These innovations range from lantern slide projectors, 16mm films, programmed instruction, video recordings, main frame computers, personal computers, hypertext, the Internet, netbooks, and m-learning to a variety of Internet-based social media. With each

technology, there is a call for new instructional design models that can address the needs of the innovations and produce better instruction that will lead to greater gains in learning. Yet, the research on the effectiveness of these technological innovations during the past 75 years has failed to find any significant learning gains attributable to the technology (Clark, 1983, 1994a; Morrison, 1994). One argument is that existing instructional design models fail to produce designs appropriate for the technology. Another argument is that we have focused too much on the technology rather

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than on the design of the instruction (Morrison, Ross, Kalman, & Kemp, 2011). The focus of this chapter is on designing instruction when employing technology.

What is Instructional Design?

Instructional design has been defined by a number of authors. One recent definition reflects a general consensus, “[a] systematic process that is employed to develop education and training programs in a consistent and reliable fashion” (Reiser & Dempsey, 2007, p. 11). Morrison, et al. (2011) state that instructional design is based on learning theory, information technology, systematic analysis, educational research, and management methods. Instructional design translates learning and perceptual theories and research into instructional applications to address specific objectives. This translation process is what Dewey (1900) describes as a linking science (Snellbecker, 1974). That is, instructional design serves as a link between research and the classroom (or instruction). A design model leads to decisions about instructional strategies that are based on sound research findings. Well-designed instruction is the output of a systematic process that involves analysis of the learner, environment, and content; and the design of appropriate instructional strategies that are tested and revised to produce effective and efficient instruction.

Instructional Design Models

Instructional design models describe a systematic approach to the design of instruction by organizing heuristics and prescriptions for informed decision making. Gropper (1983) identified two characteristics of instructional design models that are relevant for this discussion. First, the analysis of the content and learners allows the instructional designer to create and classify objectives for the instruction. This classification allows the designer to dissect the objective to determine the behaviors

and type of content (e.g., fact, concept, principle) required to achieve the objective. Second, the model specifies the conditions that affect the difficulty of achieving of the objective and it prescribes the treatment that will result in efficient and effective instruction. By distinguishing between conditions and treatment, the instructional design model can prescribe a variety of strategies that address the behavior required to achieve the objective. For example, numerous studies have established the effectiveness of mnemonics for recalling information (Balch, 2005; de Graaff, Verhoeven, Bosman, & Hasselman, 2007; Johnson, 2006; Kuo & Hooper, 2004; Levin, Anglin, & Carney, 1987). According to Gropper, a design model should distinguish between recalling factual information and higher order skills like analysis and problem solving to identify the most appropriate strategies. For example, recent research on problem solving (Hung & Jonassen, 2006; Jonassen & Hung, 2006; Oh & Jonassen, 2007) suggests mnemonics would not be an appropriate strategy for teaching problem solving. Thus, the instructional design model should differentiate between behaviors and prescribe strategies that are appropriate for the behavior the learner is to master. The more finely the model can distinguish between different behaviors, the more effective the resulting instruction. For example, the previous example contrasting factual learning and problem solving ignores many of the behaviors identified in Bloom’s (Bloom, Englehart, Furst, Hill, & Krawthwohl, 1956) taxonomy such as comprehension, application, analysis, and synthesis that fall between recall and problem solving. Of particular importance to this discussion is the ability of the design model to distinguish between different learner performances (i.e., behaviors) and to prescribe specific strategies to develop those performances. An instructional design model and instructional designers should have a variety of instructional strategies that address various behaviors rather than simply relying on more traditional practices such as rehearsal, practice, and role play

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