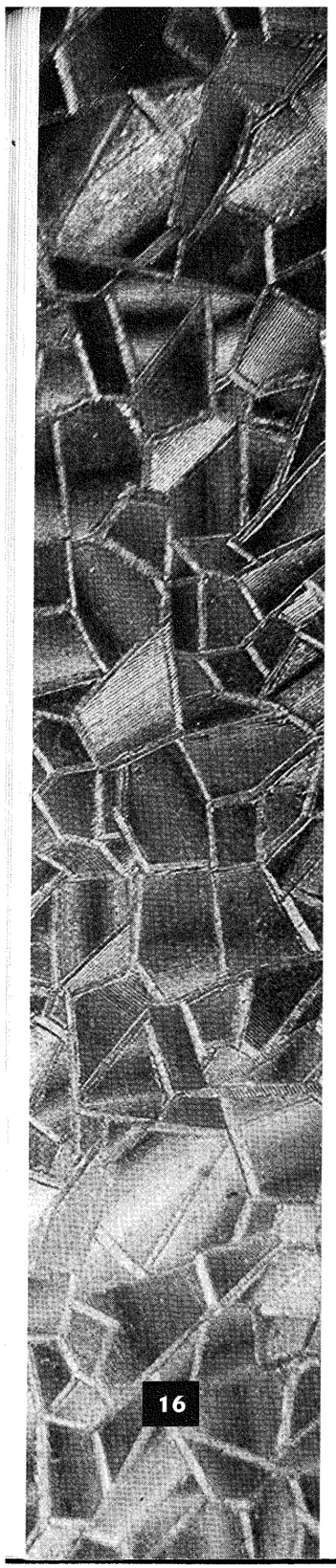

CHAPTER 2

WHAT IS INSTRUCTIONAL DESIGN?

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Editors' Introduction

The previous chapter explained why systematic instructional design (more often simply referred to as instructional design) is one of the key defining elements of the field of instructional design and technology. What is instructional design? As Kent Gustafson and Rob Branch point out in this chapter, it is a systematic process that is employed to develop education and training programs. Although there are many instructional design models (i.e., many versions, or approaches, to the instructional design process), a key set of elements, or phases, are incorporated into most of the models. The authors describe each of these elements and then go on to describe some distinguishing features (characteristics) of the instructional design process. By focusing your attention on the phases and distinguishing features of the process, you should get a clear picture of what is meant by the term instructional design.

Knowledge and Comprehension Questions

1. *Describe the core elements (phases) of the instructional design process.*
2. *Describe the distinguishing features that underline the instructional design process.*
3. *Examine the definition of instructional design that the authors provide in the conclusion section of the chapter. Do you think it is a satisfactory definition? If so, why? If not, either write your own definition, identify another definition of instructional design that you prefer, or indicate how you would revise this one.*

Instructional design is a system of procedures for developing education and training programs in a consistent and reliable fashion. Instructional design is a complex process that is creative, active, and iterative. Although the exact origins of the instructional design (ID) process can be debated, the writings of Silvern (1965) represent an early attempt to apply general systems theory (Bertalanffy, 1968) and systems analysis as an approach to solving problems. Silvern was particularly interested in how general systems theory (GST) could be used to create effective and efficient aerospace and military training and published what might be considered the first ID model.

A *system* is an integrated set of elements that interact with each other (Banathy, 1987). The major characteristics of a system are that it is interdependent, synergistic, dynamic, and cybernetic. *Interdependent* means that no element can be separated from the system, since they depend on each other to accomplish the system's goals. *Synergistic* means that together, all the elements can achieve more than the individual elements alone; the whole is greater than the sum of its parts. *Dynamic* means that the system can adjust to changing conditions and constantly monitors its environment. *Cybernetic* means that the elements efficiently communicate among themselves, an essential condition if the system is to be interdependent, synergistic, and dynamic. These characteristics are essential to understanding the instructional design process and how its elements work together to achieve the system's goals and objectives.

By the early 1970s, the use of instructional systems design (ISD) methods had become common in all branches of the military (Branson, 1975) and had started to appear in industrial and commercial training applications. During the 1970s, ISD became accepted as a standard training methodology in many large organizations and is now used throughout the world.

Silvern's model, and practically all other early ID models, were based on behaviorism, which is broadly defined as the philosophy and values associated with the measurement and study of human behavior (Burton, Moore, & Magliaro, 1996). Although many now associate behaviorism with B. F. Skinner and stimulus-response theory, most of the early writers held far more encompassing theoretical and philosophic perspectives. Early behaviorists believed, as many ID practitioners believe today, that a wide variety of behaviors can be observed, measured, planned for, and evaluated in ways that are reasonably reliable and valid. Cognitive psychologists, particularly from the perspective of

information processing (e.g., Gagné, Briggs, & Wager, 1992), have also made major contributions to the underlying theory of instructional design.

Instructional designers believe that the use of systematic design procedures can make instruction more effective, efficient, and relevant than less rigorous approaches to planning instruction. The systems approach implies an analysis of how its components interact with each other and requires coordination of all activities. Imagine the chaos that would result if three teachers who had been assigned to work on different parts of an instructional unit about computers did not coordinate their efforts. Teacher A might design objectives stressing facts about computer hardware and operating systems. Teacher B might design instruction focused on using application software. And teacher C might design a test emphasizing the role of computers in society. Although this example might seem extreme, even a single teacher can create major incongruities among goals, strategies, and evaluation by not using systematic thinking. Many college students have had the experience of thinking that they knew what the teacher was expecting, only to find that the exam focused on individual facts, while they had studied concepts, or vice versa. Many learners in training programs in business, industry, government, and the military experience similar problems.

Although a variety of systematic instructional design processes have been described (e.g., Dick & Carey, 1996; Gagné, Briggs, & Wager, 1992; Kemp, Morrison, & Ross, 1998; Smith & Ragan, 1998), all descriptions include the core elements of analysis, design, development, implementation, and evaluation (ADDIE) to ensure congruence among goals, strategies, and evaluation and the effectiveness of the resulting instruction. Figure 2.1 represents one way to depict the relationship among these core elements.

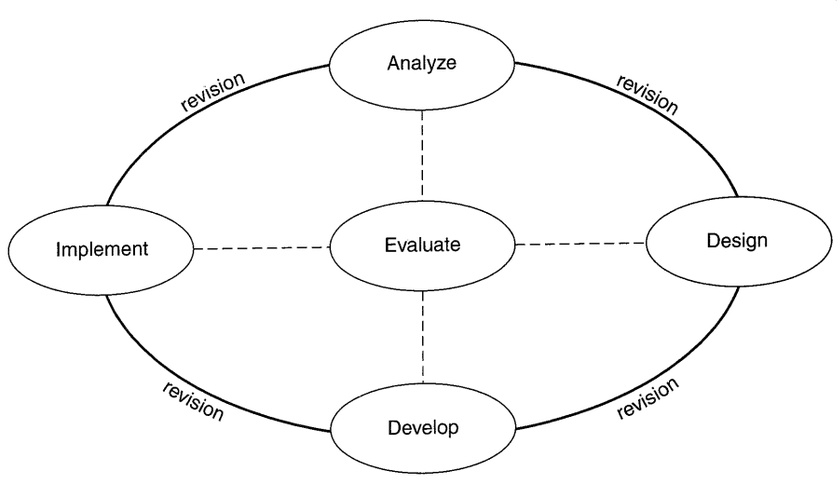

FIGURE 2.1 Core elements of instructional design (ADDIE).

Analysis often includes conducting a needs assessment (Rossett, 1995), identifying a performance problem in a business setting or some other environment (Gilbert, 1978; Harless, 1975), and stating a goal (Mager, 1984a). *Design* includes writing objectives in measurable terms (Dick & Carey, 1996; Mager, 1984b; Smith & Ragan, 1998), classifying learning as to type (Gagné, Briggs, & Wager, 1992; Merrill, 1983), specifying learning activities (Briggs, Gustafson, & Tillman, 1991), and specifying media (Heinich, Molenda, Russell, & Smaldino, 1999; Reiser & Gagné, 1983). *Development* includes preparing student and instructor materials (both print and nonprint) as specified during design (Kemp, Morrison, & Ross, 1998). *Implementation* includes delivering the instruction in the settings(s) for which it was designed (Greer, 1996). *Evaluation* includes both formative and summative evaluation as well as revision (Dick & Carey, 1996). Formative evaluation involves collecting data to identify needed revisions to the instruction; summative evaluation involves collecting data to assess the overall worth of the instruction, in either absolute or relative terms. Revision involves making needed changes based on the formative evaluation data.

It is important to note that the ADDIE activities typically are not completed in a linear, step-by-step manner even though, for convenience, they may be presented that way by various authors. For example, during the life of a project, as data are collected and the development team gains insights, it is often necessary to move back and forth among the activities of analysis, design, and formative evaluation and revision. Thus, the iterative and self-correcting nature of the instructional design process emerges as one of its greatest strengths.

It is important to note that there is some confusion in the literature on instructional design because the term *instructional development* also has been used to describe the entire process. In fact there is a Division of Design and Development within the Association for Educational Communications and Technology (AECT) that has as its focus the process we have been describing as instructional design in this chapter. When instructional development is used to describe the overall process, the term *instructional design* is often used to describe the ADDIE element we have labeled *design* in this chapter. Readers are advised to ask themselves how any given author is using these terms when reading the literature in the field.

ID Models

While ADDIE illustrates the conceptual components of ID, there remains a need to indicate *how to practice* the ID process. Instructional design models serve this purpose by describing how to conduct the various steps that comprise the instructional design process. Such models also allow people to visualize the overall process, establish guidelines for its management, and communicate among team members and with clients. A wide variety of ID models have been created to describe how the ID process might be carried out in different settings (Gustafson & Branch, 1997a, 1997b). One of the most popular and influential ID models was created by Dick and Carey (1996) and is depicted in Figure 2.2.

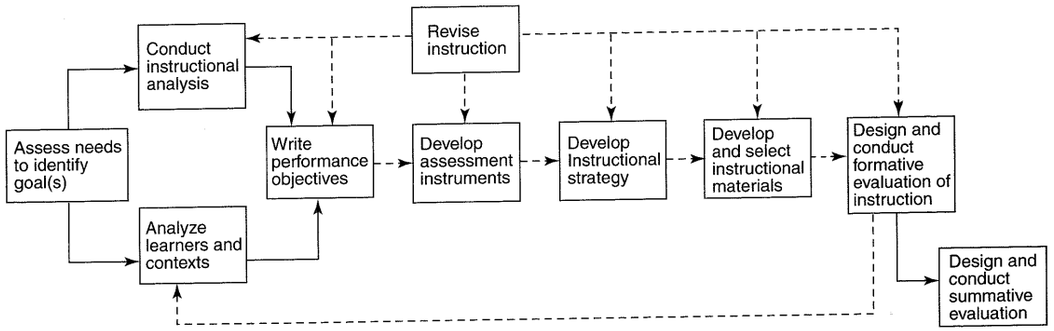

FIGURE 2.2 Dick and Carey's instructional design model.
Reprinted by permission of the publisher, from Dick, W., & Carey, L. (1996). *The systematic design of instruction* (4th ed.). New York: Harper Collins College Publishers.

Although their terminology does not align exactly with ADDIE and the number of elements is different, the five elements of analysis, design, development, implementation, and evaluation are all present. Examination of other ID models will produce a similar finding. Although authors "slice and dice" the five core elements in many different ways and use a wide variety of different terminology, all will contain the core elements in one form or another.

Among the variations in models are the degree to which they make assumptions about the user setting and ultimate implementation of the instruction. Gustafson and Branch (1997a) have suggested that models may be classified according to the primary type of instruction they are designed to produce. The three categories the authors describe are instruction that is likely to be delivered in a *classroom* by an instructor, instructional *products* such as a computer-based modules designed for wide distribution, and large-scale instructional *systems* such as an entire distance learning course or degree program. There also are models specifically to guide the activities of ID project managers (England & Finney, 1999; Greer, 1996).

Unfortunately, there is a relatively small amount of high-quality empirical literature to support the contribution of ID to designing effective and efficient instruction. Descriptions of highly successful ID efforts include reports written by Bowsher (1989), Mager (1977), Markle (1991), and Morgan (1989).

Why have more success stories not been published? It is likely because practitioners do not have the time or motivation to prepare scholarly articles to meet the requirements of research publications, whereas the models are generally designed by academics who have few opportunities to test them in the real world. Proprietary interest may also limit the amount of information made public about exactly how the process is conducted and its benefits to users. Nonetheless, since the process is widely used in business, industry, and military training, it clearly has benefits to instructional designers and their clients.

Characteristics of Instructional Design

Although the ADDIE activities mentioned earlier represent the fundamental concepts of the instructional design process, there are several characteristics that should be present in all instructional design efforts:

1. Instructional design is learner-centered.
2. Instructional design is goal-oriented.
3. Instructional design focuses on real-world performance.
4. Instructional design focuses on outcomes that can be measured in a reliable and valid way.
5. Instructional design is empirical.
6. Instructional design typically is a team effort.

Instructional Design Is Learner-Centered

Learner-centered instruction means that the learner and his or her performance are the focal point of all instruction. Teaching and other forms of instruction are simply means to the end of learner performance. Thus, there may be no initial assumption that a live teacher is even needed for the learner to achieve the stated objectives. Self and group study, technology-based instruction, and teacher-based strategies are all options to be considered, the result often being a mix of all these choices and perhaps other forms. The change in perspective from teaching to learning represents a paradigm shift of immense power in planning for effective educational environments.

Instructional Design Is Goal-Oriented

Establishing well-defined project goals is central to the ID process. Goals should reflect client expectations for the project and, if met, ensure its appropriate implementation. Unfortunately, many well-intended projects fail from lack of agreement on the goals or the decision to put off this important step in the false belief that this issue can be settled later. Identifying and managing client expectations are of particular importance to the project manager, but team members also need to share a common vision of anticipated outcomes of the project. The ultimate question for an instructional system is "Have the goals of the project been attained?"

Instructional Design Focuses on Real-World Performance

Rather than requiring learners to simply recall information or apply some rules on a contrived task, instruction design focuses on preparing learners to perform the behaviors that will be expected of them in the real world. Learner objectives are stated so as to reflect the environment in which students will be expected to apply the acquired knowledge or skill. Thus there should be a high degree of congruence between the learning environment

and the setting in which the actual tasks are performed. While it is usually easier to identify performance settings for training programs (e.g., operating a drill press) than for school-based learning (e.g., college biology), instructional designers strive to identify authentic performance measures for either setting.

Instructional Design Focuses on Outcomes That Can Be Measured in a Reliable and Valid Way

Related to the issue of performance is creating valid and reliable assessment instruments. For example, if the objective is to safely and efficiently operate a drill press, then a valid (authentic) assessment technique would likely involve having an observer with a checklist observe the learner performing selected drilling operations and also examining the quality of the products created. In contrast, a multiple-choice, paper-and-pencil test is not a valid measure. In schools the issue of validity often is more complex, but the instructional designer can still ask how the knowledge and skill might be applied or otherwise used to enhance the validity of the assessment. Reliability concerns the consistency of the assessment across time and individuals. Obviously, if the assessment is not stable, its validity is seriously compromised.

Instructional Design Is Empirical

Data are at the heart of the ID process. Data collection begins during the initial analysis and continues through implementation. For example, during the analysis phase, data are collected so as to compare what learners already know versus what they need to know. Guidance and feedback from subject matter experts ensure the accuracy and relevance of the skills and knowledge to be taught. Results of research and prior experience guide the selection of instructional strategies and media. Data collected during formative tryout identify needed revisions, and data from the field after implementation indicate whether the instruction is effective. Although the data might not always bring good news, they are always friendly in that they provide a rational basis for decision making and a basis for successfully completing the project.

Instructional Design Typically Is a Team Effort

Although it is possible for a single individual to complete an ID project, it is usually a team effort. Because of their size, scope, and technical complexity, most ID projects require the specialized skills of a variety of individuals. At a minimum, a team will typically consist of a subject matter expert, an instructional designer, one or more production personnel, clerical support, and a project manager. Sometimes a single individual may play more than one role on a team, but larger projects invariably require greater specialization. For example, high-tech projects may require computer programmers, videographers, editors, graphic artists, and interface designers. Demands for logistic support in the form of clerical staff, librarians, business managers, and system support expand as the size and duration of projects increase.

Conclusion

Although in recent years, there have been many advances in learning theory, the technology of development and delivery systems, and the training, skills, and sophistication of instructional designers, the unifying variables contained in most of the original ID models remain the same. These unifying variables are that instructional design is a systematic process; that it is usually conducted by a team of professionals; and that it involves analysis of a performance problem and the design, development, implementation, and evaluation of an instructional solution to the problem. Moreover, instructional design is an empirical process that is learner-centered and goals-oriented, geared toward reliable and valid measurement of the skills and knowledge learners will be required to demonstrate in the real world. We have no doubt that these elements and characteristics of the instructional design process will continue to hold true in the future as further advances in the field occur.

While instructional design is well accepted in business and industry, government, and the military, there is a growing use of instructional design processes in colleges and schools, especially as they become involved in distance learning programs that require high quality instruction without the benefit of live instructors. Proprietary schools and companies providing occupational skills or certification in technical areas also increasingly look to instructional design as the means of ensuring both the effectiveness and relevance of their offerings.

Instructional design as currently practiced has much to offer both now and in the future, but it does not meet all the needs for enhancing human performance in a complex and ever-changing world. Other chapters in this book describe alternative approaches to raising performance that have already assumed, or are likely to assume, important roles in complementing instructional design. Research on these alternatives, and the research and experience of instructional designers, will modify instructional design practice, but its underlying elements and characteristics will remain the basis of its efficacy.

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Application Questions

1. The authors (Gustafson and Branch) contend that most early behaviorist writers held far more encompassing theoretical and philosophic perspectives than B. F. Skinner and stimulus-response theory. Using the library, the Internet, and other outside resources, investigate the theories of a well-known behaviorist other than Skinner (e.g., Thorndike or Tichner). Was Gustafson and Branch's contention correct regarding the theorist you investigated? Explain why or why not.
2. Study the model figure from Dick and Carey (1996) (Figure 2.2). There are ten sequential components to the model as it is presented. Redesign the model in three different ways. You may exclude components if you wish or add others that you think are missing. Do you think any of the models you have constructed are an improvement over the Dick and Carey model? Explain why or why not.
3. Again scrutinize the figure of the Dick and Carey (D&C) model (Figure 2.2). The authors of this chapter contend that the five elements of analysis, design, development, implementation, and evaluation (ADDIE), are all present in the D&C model. Working with a small group, create a table as indicated below and be prepared to defend your work.

   Row one: Below each component of the ADDIE model, list the component or components of the D&C model that correspond to that component.
   Row two: Below each component of the ADDIE model, list components that might also be added to the D&C model to make it more comprehensive.
   Row three: Below each component of the ADDIE model, rate how effectively you think the D&C model addresses that component of the ADDIE model. Use a scale of 1 to 5 (1 5 not effective at all; 5 5 extremely effective). Briefly state the reason for your rating.
4. Gustafson and Branch have suggested that models may be classified according to the primary type of instruction they are designed to produce (in a classroom, instructional products, and large-scale systems). Discuss how each component of the ADDIE model would differ for each of these environments. Support your contention with concrete examples.