INTRODUCTION TO INSTRUCTIONAL DESIGN

CHAPTER

1

CHAPTER OBJECTIVES

At the conclusion of this chapter, you should be able to do the following:

- Explain what is meant by instructional design.
- Define instruction, distinguish it from related terms (such as education, training, and teaching), and when given descriptions of educational activities, determine which of these are instruction.
- Identify and describe the three major activities of the instructional design process, and when given descriptions and instructional design activities, identify which activity is being employed.
- Describe advantages of using instructional design: for school curriculum developers, for teachers, for training designers, and trainers.
- Discuss the types of contexts in which instructional designers work and how their activities may differ in these different contexts.

INTRODUCTION

Fourth-grade teacher Dora Brady is sitting at her desk after school, looking at the scores that her class made on the long-division quiz she gave today. She is reviewing the students' performance in her mind and recalling how she taught the students. She is working on new ways to teach the kids next week and next year. She is drawing upon her knowledge of something called *instructional design* in her thinking.

Dick Montiville is in conference with three coworkers at Amalgamated Airlines. Mr. Montiville and his team are figuring out the exact nature of the learning that aircrew members need in order to improve the safety of the company's flights. The areas of required learning have already been established, and now the team is breaking those learning tasks down into the components and prerequisites. Montiville and his team are using some techniques from instructional design to guide their work.

Faye Hartman and William Burke are in charge of evaluating a new textbook series in organic chemistry being developed by MacBurdick Publishers. The series is intended to capture the market in its subject area, and principles of instructional design were used in many phases of the project, including the evaluation work of Hartman and Burke.

WHAT DOES INSTRUCTIONAL DESIGN MEAN?

The term **instructional design** refers to the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation. An instructional designer is somewhat like an engineer. Both plan their work based upon principles that have been successful in the past—the engineer on the laws of physics and the designer on basic principles of instruction and learning. Both try to design solutions that are not only functional but also attractive or appealing to the end-user. Both the engineer and instructional designer have established problem-solving procedures that they use to guide them in making decisions about their designs.

Through this systematic process, both the engineer and the instructional designer plan what the solution—often a finished product—will be like. Both write specifications (plans) for the solutions, but they do not necessarily translate their specifications into an actual product. They often hand their plans to someone who specializes in production (in the case of an engineer, a building contractor; in the case of the instructional designer, a software development or media production specialist). This holds true for many instructional designers. However, some designers, such as those with production skills (computer programming, video production, or development of print materials), may themselves translate their specifications into the final instructional material. Classroom teachers often implement their own plans. In any event, the designer typically begins the production or implementation once the specifications are completed.

Perfection is neither a goal nor an option in design. It is attractive and easy to assume that with sufficient sophistication, designers will develop flawless designs that have no drawbacks. Petroski (2003) has made it clear that all design involves trade-offs, even the most elegant and widely admired designs. Instructional designers, no less than civil engineers or industrial designers, seek to analyze, plan, implement, and evaluate in such a way that their work will do the most good with the least harm and to learn from mistakes to improve.

Careful, systematic planning is important no matter what media of instruction are used in implementation. When the medium of instruction is something other than a teacher, and when it is possible that a teacher may not be available or prepared to compensate for poorly planned instructional materials, careful instructional design is critical. When the instructional medium is not immediately adaptable (as with printed materials, video materials, and computer-based instruction), having a design that is based upon principles of instruction is very important. Any oversights that were made in the design of these instructional materials cannot be easily remedied because the instruction is being delivered via instructional media. When the primary medium of instruction is a teacher/trainer or when a teacher/trainer has a major role as coordinator of instruction, then high-quality instructional design is also highly beneficial. The systematic planning needed prior to implementation and the reflection that should occur afterward are well-informed, guided, and organized by instructional design principles and processes. Teachers'/trainers' careful planning allows them to allocate their mental resources during instruction to adaptations that are necessary because of the differing prior experiences of the learners; motivation, behavior, or administrative problems; or serendipitous events that require instructional planning on the spot.

To understand the term *instructional design* more clearly, we will review the meanings of the words *instruction* and *design*.

What Is Instruction?

Instruction is the intentional facilitation of learning toward identified learning goals. Driscoll (2000) defines **instruction** from a similar perspective: "the deliberate

arrangement of learning conditions to promote the attainment of some intended goal" (p. 345). In both definitions, instruction is the intentional arrangement of experiences, leading to learners acquiring particular capabilities. These capabilities can vary qualitatively in form, from simple recall of knowledge to cognitive strategies that allow a learner to find new problems within a field of study. For example, a teacher or trainer may wish to help learners use a particular kind of computer software to solve a certain set of problems. The instructional designer will develop materials and activities that are intended to prepare the learners to use the software effectively. Every experience that is developed is focused toward one or more goals for learning. In addition to effective instruction, designers also wish to create instruction that is efficient (requiring the least time and cost necessary) and appealing.

Terms such as *education*, *training*, and *teaching* are often used interchangeably with *instruction*. However, in this text we will make some distinctions among these terms. Certainly, these distinctions may not be made in the same way among all individuals in the field of education, or even in the field of instructional design. However, we have found these definitions helpful in laying the framework for this text. Figure 1.1 illustrates the relationships among these terms.

We will use the term **education** very broadly to describe all experiences in which people learn. Many of these experiences are unplanned, incidental, and informal. For example, many people learn to drive a car in city traffic through a trial-and-error process involving many harried morning trips. The driver learns, so these experiences can be considered part of her general education; however, no one has specifically arranged this learning experience so that she can learn well, quickly, and with a minimum of danger and frustration. It would be possible to create a series of particular experiences (perhaps using a simulator or videotapes and city maps) that would be specifically focused on preparing one to navigate city traffic easily. We would call the delivery of these focused educational experiences **instruction.**

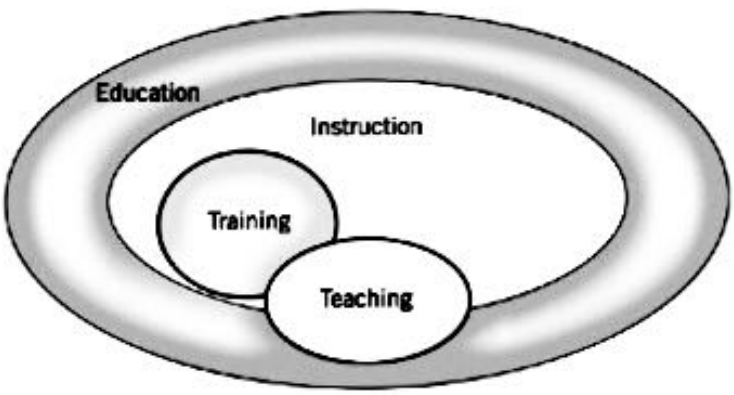

Figure 1.1 Relationships Among Terms Associated with Instruction

So, all instruction is part of education because all instruction consists of experiences leading to learning. But not all education is instruction because many experiences that lead to learning are not specifically developed and implemented to ensure effective, efficient, and appealing experiences leading toward particular learning goals. A common misapprehension of instruction relates instruction to particular strategies—such as expository or didactic ones—and avoids the term when referring to learning environments that employ a more student-centered approach. The tools and principles of instructional design that you will see described in this book are applicable to all forms of experience, as long as the experience in question has facilitation of particular goals for learning as its purpose. However, learning environments that are truly "goal free"—if such exist—would not be examples of instruction.

We generally use the term **training** to refer to those instructional experiences that are focused upon individuals acquiring very specific skills that they will normally apply almost immediately. For example, many instructional experiences in vocational education classes can be considered training. The students learn skills, specifically focused toward job competencies, that they will use almost immediately. Much instruction in business, military, and government settings can be termed *training* because the experiences are directed toward preparing learners with specific on-the-job skills. In addition, the instruction in certain special education classes is "training" because the learning experiences have been developed to provide students with life skills, such as counting change, which we anticipate they will use almost immediately.

Not all instruction can be considered *training*, however. For instance, in military education programs, learners may be provided with some general instruction in math and reading. These learning experiences can be termed *instruction* because the lessons were developed with some specific goals in mind, such as a certain level of proficiency in reading and mathematics. However, these goals are often not directed toward a specific job task, nor is there anticipation of immediate impact upon a specific job task. The influence on job performance is anticipated to be more diffuse throughout job responsibilities and outside job tasks. Therefore, in our terminology, these learning experiences would not be termed *training*. Similar to the misapprehension of the meaning of instruction, training is sometimes mistakenly identified with a particular style or strategy of teaching. Training is conducted using all of the varieties of method and approach seen in any other form of education: Training is distinguished from other forms by *immediacy* of application.

Of all the terms just discussed, *teaching* and *instruction* may be most often used interchangeably. In this text, we will use the term **teaching** to refer to those learning experiences that are facilitated by a human being—not a DVD, textbook, or educational Web site, but a live teacher. Instruction, on the other hand, includes *all* learning experiences in which facilitation and support for learning are conveyed by teaching and other forms of mediation. As you will discover later, one of the primary tenets of instructional design is that a live teacher is not essential to all instruction.

As Figure 1.1 shows, not all teaching is considered to be instruction. There are occasions in an educational environment in which a teacher does not focus learning experiences toward any particular learning goal. On these occasions, teachers may provide many learning activities, and during these activities learning goals may emerge, often from the learners themselves as they encounter the activities. For example, some preschool education falls within this category, such as instances in which learners are provided with a variety of manipulative materials that they can use to pursue many problems. These pursuits might lead to various learning outcomes, many of which have not been specifically anticipated by the teacher.

In summary, this text focuses on the facilitation of learning: instruction. Here, we will consider *instruction* to be a subset of *education*. The term *training* will be considered a subset of *instruction*. In some cases, teaching will be considered instruction, and in others it will fit the more general category of education but will not have the focus that characterizes instruction. We will concentrate on the design and development of activities that are directed toward identified learning goals.

WHAT IS DESIGN?

Design is an activity or process that people engage in that improves the quality of their subsequent creations. Design is related to *planning*, the difference being that once the expertise and care with which planning is conducted reaches a certain point, we begin to refer to the activity as "design." When projects become complex, at some point the term "planning" no longer fits and "design" becomes a better descriptor. Thus, before an earth orbit laboratory is built, it must be designed. To say that the space station will be planned would not make sense if we were referring to the development of actual specifications for its construction and operation. Likewise, a teacher may engage in planning for a class or semester, but if the term "design" is well-applied to the activity, a high level of care and sophistication is implied. The term design comes with an implication that a good amount of specialized knowledge and skill is being brought to bear, regardless of the size of the project. Schön (1987, 1991), a student of effective professional practice, described design as a process of "reflective conversation with the materials of a given situation."

Many fields use the term *design* as part of their title; examples include interior design, architectural design, and industrial design. The term *design* implies a systematic or intensive planning and ideation process prior to the development of something or the execution of some plan in order to solve a problem. Fundamentally, design is a type of problem solving and has much in common with problem solving in other professions. In this text, we classify the capability that designers apply as "domain-specific problem solving," which involves the solution of "ill-structured" or "ill-defined" problems. Such problems cannot be solved by following an algorithm, nor will all designers reach the same solution to a particular learning problem. (Readers might wish to refer to Chapter 12, Strategies for Problem-solving Lessons, to clarify what is meant by "domain-specific problem solving.")

Design is distinguished from other forms of instructional planning by the level of precision, care, and expertise that is employed in the planning, development, and evaluation process. Designers employ a high level of precision, care, and expertise in the systematic development of instruction because they perceive that poor planning can result in serious consequences, such as misuse of time and other resources and even in loss of life. Specifically, instructional designers fear that poor instructional design can result in ineffective encounters, inefficient* activities, and unmotivated learners—a consequence that can have serious long-term effects. Indeed, experienced instructional designers intensify the degree of precision, care, and expertise expended on a design project relative to the impact of the potential consequences of ineffective, inefficient, or unmotivated learning that can result from less carefully designed instruction. (For more detail on the subject of adjusting design intensity to the learning situation, refer to Chapter 20, Conclusions and Future Directions.)

Design involves the consideration of many factors that may affect or be affected by the implementation of an instructional plan. For example, interior designers

*Efficiency is a controversial concept. Many educators and learning scientists are appropriately suspicious of concerns with instructional efficiency. Although efficiency can be worshiped at the expense of meaningful learning, we use the term to reflect the avoidance of unnecessary and unproductive waste, and when meaningful learning is implicit in learning goals, as it often is, the criterion of effectiveness takes it quite seriously.

must consider the purpose and level of use of a facility, the anticipated traffic patterns, and the needs of the people who will be using the facility. Interior designers must consider the engineer's plans, such as the location and strength of walls. They must follow laws and regulations with regard to accessibility and safety. If they do not consider all these factors and how they interrelate, the designers risk creating a work or living space that is unusable or even dangerous. Just as interior designers have critical factors that they must consider to make their solutions usable and effective, instructional designers have a vast number of factors, which often interact, that they must consider as they create instruction. The rest of this text details factors that instructional designers must consider in designing instruction.

Creativity also has a role in design. Novice designers sometimes have the impression that doing design work is a "cut-and-dried" activity. This is not the case. For example, if one were to give several architects the same conditions—site, materials, and purpose—the plans for the structures that they would create would vary radically. Some would be highly imaginative and innovative, while some might be more mundane and standard. All of the designs may "work" in the sense that, when executed, the buildings would remain standing and serve their purposes. However, some imaginative and ingenious structures may inspire awe, while more mundane structures may be totally forgettable.

Just as the design of the architect benefits from creativity and imagination, so do the designs of the instructional designer. A critical need exists for imagination and ingenuity in all instructional design activities. For example, during context analysis designers may have to exert considerable ingenuity in creating ways to ascertain the true nature of the "problem." Sometimes this involves restructuring the problem to redefine it into one that can be solved (Akin, 1994). In addition, designers must make instruction inspiring and memorable. Certainly, evaluation of instruction requires inventiveness. Frequently, assessing the actual goals of an instructional activity seems a practical impossibility. Some designers are ingenious in devising ways of simulating targeted situations, so that learners get to demonstrate activities and cognitive processing that are very near the actual goal behavior.

How can instructional designers become more creative in their work? We have noticed some common characteristics of particularly ingenious design students and practitioners in the field. First, highly creative designers are voracious consumers of examples of learning environments and instructional materials, both those from the instructional design tradition and those from other traditions. Second, although they have conducted a thorough analysis of the component learning requirements (objectives) of the design project, the best designers clearly maintain a sense of the major goal and generalized perception of the content of the materials: They can still see the forest, despite the trees. Third, excellent designers use message design conventions and techniques, such as metaphors, narratives, or visual images to lend a sense of continuity, interest, and wholeness to the instruction.

Another key aspect of instructional design is its extensive and demanding nature. Experienced designers (not to mention novices) frequently express concern about the time and effort that they expend applying what is currently known about designing effective, efficient, and appealing instruction. Clearly, there is enough of a "technology" undergirding the design process that a casual approach to either learning or application of skills in instructional design will not do it justice. However, those who are beginning their study of instructional design should know that once the concepts and principles of instructional design are learned, they can be appropriately applied with a wide range of effort, precision, and formality.

Even classroom teachers in public schools (who by virtue of their teaching loads do not generally have time to engage in instructional design in a full-blown fashion) can significantly improve the effectiveness of their teaching by informally applying instructional design principles (Wiggins, McTighe, & McTighe, 1998). They may choose to apply these principles mentally and document little, if any, of their thinking on paper. Of course, in instructional design classes, learners are asked to document their thought processes so that the instructor can evaluate them and provide remediation where necessary. And, in many contexts—particularly those situations in which teams work together on a design project in which legal liability for the quality of the instruction is an issue—a hard-copy documentation of the design process may be essential.

Recent developments in the field are specifically directed at reducing the time and effort required by the instructional design process. We review a number of these "fast-track" approaches to instructional design in the final chapter of this text.

Rowland (1992, 1993, 1994) has studied the process of design across a number of professions and has examined instructional design specifically. Several of his observations of design in general are particularly salient to the design of instruction (1993):

- Design is a goal-directed process in which the goal is to conceive and realize some new thing.
- The new thing that results from designing has practical utility.
- A basic task of designing is to convert information in the form of requirements into information in the form of specifications.

- Design requires social interaction.
- Designing involves problem solving, but not all problem solving is designing.
- In designing, problem understanding and problem solving may be simultaneous or sequential processes.
- Design may be a science, or a combination of science and art, or neither science nor art.
- Designing involves technical skills and creativity and rational and intuitive thought processes.
- A design process is a learning process. (pp. 80–85)

THE INSTRUCTIONAL DESIGN PROCESS

Another way to define *instructional design* is to describe the process involved in the systematic planning of instruction. At the most basic level, the instructional designer's job is to answer three major questions (Mager, 1984):

1. Where are we going? (What are the goals of the instruction?)
2. How will we get there? (What is the instructional strategy and the instructional medium?)
3. How will we know when we have arrived? (What should our tests look like? How will we evaluate and revise the instructional materials?)

These three questions can be stated as major activities that an instructional designer completes during the design and development process:

1. Perform an *instructional analysis* to determine "where we're going."
2. Develop an *instructional strategy* to determine "how we'll get there."
3. Develop and conduct an *evaluation* to determine "how we'll know when we're there."

These three activities form the foundation of the approach to instructional design* that this book describes. We will expand on these three problem-solving activities throughout the text.

*We use the term *instructional design* to refer to the entire process of design, development, implementation, and revision of instruction. The term *instructional development* is a related term, and if it were not so awkward, we might refer to the process as *instructional design and development*. Some aspects, particularly production, would seem to fit more easily under a term such as *development* rather than *design*. Since the term *instructional design* is currently the most widely used of the choices available, we will use it in this text.

An Overview of the Design Process: Designing Training for Digital-Magic Repair Persons

The following section provides an overview of the entire process of designing instruction. We will describe how designers might prepare a system of instructional materials to train individuals to repair the fictitious Digital-Magic 3-D/HD Hyperspheroid Plasma video system that will soon be marketed throughout the world.

ANALYSIS. During the activity the designers will learn as much as they can about the environment in which the learners (repair persons) will be trained, about the learners themselves, and about the repair tasks for which the learners must be prepared. The designer will ask many questions of the managers and supervisors in the Digital-Magic company, the developers of the new television system, those who have provided training for repair persons in the past, and of the learners themselves. They will analyze the learning task itself, asking what learners must know or be able to do to learn to make repairs. The designers will want the answers to questions such as:

1. Will the learners be brought together in a central location, or will they be trained in their own work environments?
2. How much time is available for training?
3. Will it be possible for the learners to have access to the new television systems to work with as they learn about them?
4. How do learners feel about the training? What sorts of incentives to learn will they be given?
5. What kinds of people are the prospective learners? What interests them? What kinds of educational backgrounds do they have?
6. Do all of the learners have to reach the same goals?
7. What do the learners already know that will help them learn the new information or skills?
8. What are the skills and knowledge that the learners must acquire in order to make the repairs on the new system? Do they need to know only the technical procedures of repair, or do they also need to know the conceptual or theoretical *whys* of the procedures?
9. How should the learners' achievement of the goals be assessed? Is a pencil-and-paper test adequate? Should learners be assessed on actually repairing a Digital-Magic 3-D/HD video system? Can this performance be simulated?

SELECTING THE INSTRUCTIONAL STRATEGY. During this activity, the designers determine the way that instructional material relating to repair of the television sets should be presented. They also decide which learning activities the learners can experience. In addition, the designers determine what sequence of instruction should follow. They choose the medium (a single medium) or media (a combination of multiple media) that will support the instruction. This is the stage at which the designers will determine exactly how instruction will take place.

Some of the questions that Digital-Magic's instructional designers would answer in this activity are the following:

1. What kinds of content must be learned by the students? In what size segments should the content be presented? Should information be presented, or should the content be embedded within an activity?
2. In what activities should the learners engage? What role will learners' activities have? Will activities or projects supplement informational presentations, or will they be the primary means of learning? Should activities include learners answering written questions? Should learners practice troubleshooting problems on the actual equipment? For what topics (if any) will reading be an appropriate learning activity? What topics will require viewing demonstrations and visual examples? Are discussions needed?
3. In what sequence should instruction proceed? Should a "discovery" sequence be followed, or should an "expository" approach be used? If expository, what sequence of presentation should be employed?
4. What media are most appropriate for the support of instruction? Should learners see a live demonstration of repair procedures, a videotaped presentation, or an interactive video presentation? Should they read about it in a text or workbook, or should they use both? Should the students have a job performance aid (such as a manual) available to them for reference?
5. What groupings should learners be placed in for learning? Should they study independently, in a small group, or in a large group?

Notice that instructional design in no way implies that the instructional strategy must be "direct instruction" or something "done to" the learner. Instructional strategy decisions are based on many factors that may influence what will best facilitate learning. (We will discuss this particular issue further in Chapter 7, A Framework for Instructional Strategy Design.)

EVALUATION. When designing evaluation, the designers plan an approach for evaluating the instructional materials to determine what kinds of changes need to be made in them. At Digital-Magic some of the questions that may be asked include the following:

1. Is the content accurate? Have there been design changes in the Digital-Magic 3-D/HD video systems since the instruction was originally developed?
2. What learners should use the materials in order to get information to guide revisions? How should we conduct these tryouts? Should the sample be large or small? Should students be observed one at a time or in groups?
3. What questions should be answered in order to determine problems in the instruction?
4. What revisions should be made in the instruction?

When we use the term *evaluation*, it will often be in reference to the broad topic including both assessment of learners and evaluation of the instruction. When we are talking about evaluation of students' learning, we will generally use the term *assessment* instead of the more familiar but often misleading term *tests* (see Chapter 6), and we will generally use the term *evaluation* in the context of evaluating the instruction itself; the terms *formative evaluation* and *summative evaluation* will be used in this fashion (see Chapter 18).

THE DIGITAL-MAGIC STORY: A POSTMORTEM. The instructional designers at Digital-Magic did a good job of instructional design. The training system for repair persons was highly effective and efficient. Not only did the student technicians learn what they needed to learn, but they also enjoyed the process and developed a good attitude about their work. It was a good thing, too, because the new television set was very popular in the market, and the first 10,000 Digital-Magic televisions that were manufactured had a mysterious tendency to fade after six months of use. The well-trained service technicians fixed the problems, and, as time passed, they acquired the reputation of being excellent repair persons, and the video system eventually became a success in the marketplace.

Congruence Among the Activities of Instructional Design

Instructional designers insist on creating instruction in which the goals, the instructional strategy, and the evaluation all match. By "match," we mean that the strategy (instructional method) that is used is appropriate for the learning task (goals) and that the tests

measure how well the learners have achieved the learning task (assessment).

For example, let's say you are an instructional designer now, and you are working on designing instruction in which students will learn to classify objects as either transparent, translucent, or opaque. **Learning tasks** are the things students are to learn, so being able to classify objects as either transparent, translucent, or opaque is the learning task, and this particular learning task involves *concept learning*. The idea of "matching" learning tasks and instructional strategy means that you would select an instructional strategy that is appropriate for learning concepts; you would ensure that students were given several examples and nonexamples of the concepts to be learned. To match evaluation with the learning task and instructional strategy, you would devise your test to determine whether students have learned the concepts by asking them to classify objects as either transparent, translucent, or opaque. In this instruction, the objective, the learning activities, and the assessment are congruent with one another. In other words, they match.

This consistency between intent and action is seen in other approaches to the improvement of education. For example, in the specialties of curriculum development and teaching methods, the idea of "curriculum alignment" is another reflection of congruence between objectives, instruction, and assessment. Examples of faulty congruence are regrettably commonplace. Most of us have had at least one sad experience with a course in which goals, class work, and tests were unrelated to one another, resulting in poor learning and attitude on students' parts.

Instructional Design Models

To answer the questions "Where are we going?" "How will we get there?" and "How will we know when we've arrived?" the designer engages in three major activities: analysis, strategy development, and evaluation. These three activities are the essence of most *instructional design models*.* Andrews and Goodson (1980) have described forty such models for systematic design of instruction. Gustafson and Branch (1997) provide a more extensive analysis of fourteen models. In this text, we will recommend a simple model of design (see Figure 1.2). It is similar to the design models suggested by Dick and Carey (1985, 2001) and Davis, Alexander, and Yelon (1974).

We lay no claim of uniqueness to this model. It could be accurately termed "A Common Model of Instructional Design." There are some attributes of it, however, which, though not unique, are not universally seen. These attributes are inclusion of context analysis as a function in the design process, sequencing of test development, and the placement of revision within the formative evaluation phase.

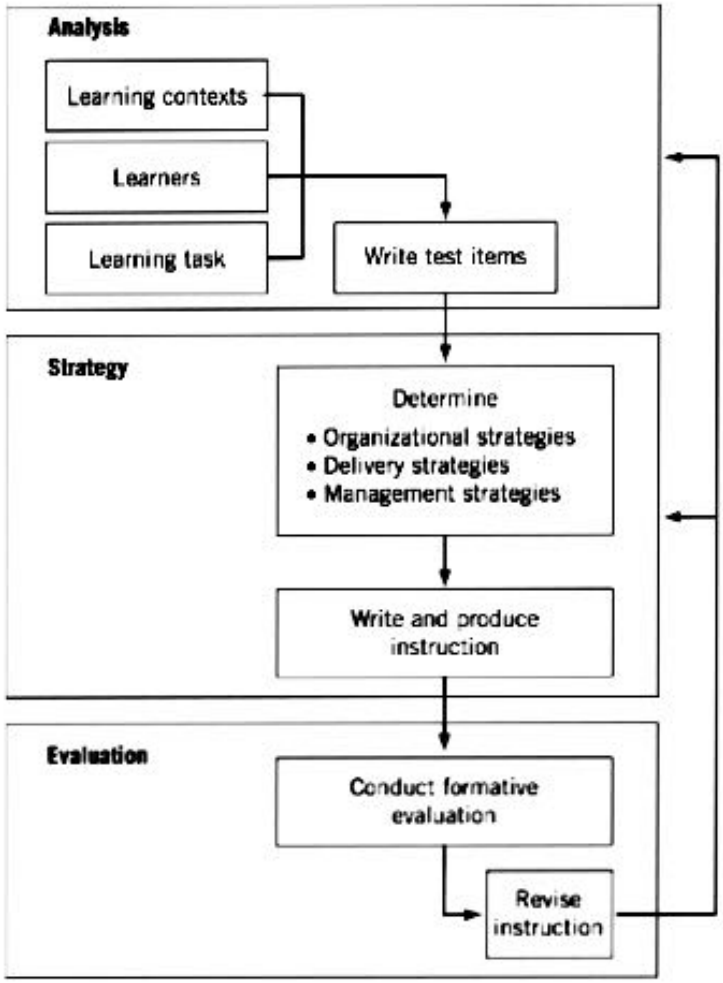

Figure 1.2 An Instructional Design Process Model

One attribute of the model that is more apparent than we intend is sequentiality. Notice in Figure 1.2 that we have listed some more specific activities of design within each major activity in a particular sequence. We have presented the model in what appears to be a linear sequence in order to *simplify* a discussion of the activities of instructional design and to preview the sequence of that discussion. Both inexperienced and experienced designers may occasionally follow this sequence; however, particular circumstances may cause a designer to modify the sequence of design activities. Many times the steps within a particular phase may occur concurrently. Indeed, we might depict the activities of practicing instructional designers—especially their mental activities—to resemble more nearly the representation in Figure 1.3.

Figure 1.3 portrays the interwoven, nonlinear nature of actual design activity. Analysis, strategy development, and evaluation activities may, in some cases,

*Instructional design models may be defined as visualized depictions of instructional design process, emphasizing main elements and their relationships.

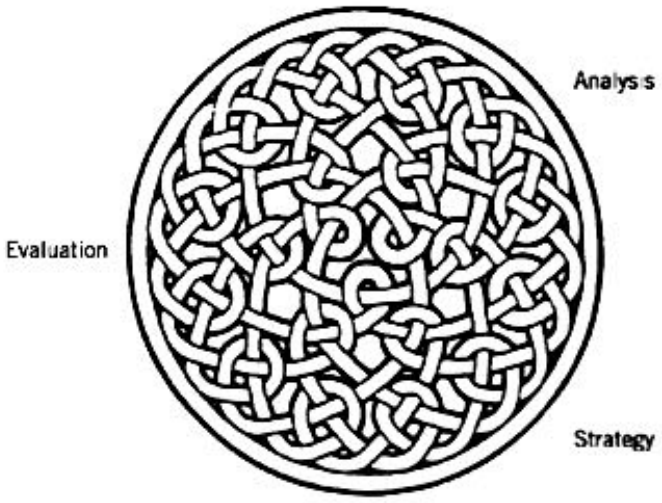

Figure 1.3 A More Realistic Representation of Instructional Design Practice

occur concurrently, especially if one is following a rapid prototyping technique (described in Chapter 20 of this text). During strategy development, new issues may emerge that send the designer back to more analysis of the learners, task, or context. During analysis, designers are often developing plans for evaluation of the instruction. Inevitably, working on one design activity leads to implications or solutions for other design activities. Unlike foundational models of design, such as Gagné-Briggs (see Gagné, Briggs, & Wager, 1992; Dick & Carey, 1985), which might have implied that instructional design is a linearly sequenced process and that the designer should not even entertain thoughts of a subsequent phase until a previous phase is complete, current models, such as the "ball of worms" model in Figure 1.3 acknowledge the interrelatedness and concurrency of all activities of design. Tessmer & Wedman (1995) provide a model that embodies simultaneity within a systematic, reflective approach (we will revisit this model in Chapter 20).

Although representing design in a fundamentally nonlinear manner more accurately reflects relationships among processes in which instructional designers engage and has the potential to promote "fast tracking" of instructional design (see Chapter 20), there are dangers in the concurrency model. For example, moving to strategy development before one has sufficient information regarding the nature of the learners or the characteristics of the learning task may increase the probability that a designer or client fixates on a particular strategy that is inadequate and becomes clearly so when more information about the learners and task becomes available. The concurrency model demands greater flexibility of designer and client so that they do not become dedicated to a solution that is later found to be inappropriate.

A POSITION STATEMENT ON MODELS. For far too long the instructional design literature has placed an inordinate focus on models, particularly their physical attributes. In fact, instructional design models tend only to be modifications and elaborations of a basic problem-solving model tailored to the needs of the instructional design specialty. We do not advocate any particular model but recommend that you select and modify elements based on demands of the situation. This process of building your own model is enabled by a thorough knowledge of the *principles* that guide design. A model, as exemplified by instructional design models, is no more than a way to begin thinking and learning about important principles in a relationship that assists their initial comprehension. The model presented in Figure 1.2 will assist you in building a mental framework, a scaffold, which should help your learning of critical principles, and your mastery of which will make the outlines of the original scaffold unnecessary and open to your modification and change as situations require.

Advantages of Using Systematic Instructional Design

For those involved in developing instruction, there are a number of advantages to using a systematic process. Following is a list of some of the advantages of systematic instructional design:

1. *Encourages advocacy of the learner.* To a very large degree, the learner is the focus of instruction. Designers spend a great deal of effort during the beginning stages of a design project trying to find out about the learner. Information about learners should take precedence over other factors that might drive design decisions, including the content itself. Often the designer is not a content expert. In their constant querying of a subject matter expert for clarification, designers are standing in the place of the learner, trying to obtain information to make the content clearer to the learner.

2. *Supports effective, efficient, and appealing instruction.* All of these factors are considered indicators for success. The process of design itself focuses on effective instruction. Efficiency is particularly facilitated by the process of instructional analysis in which inappropriate content is eliminated. The consideration of the learner and the concentration on designing appropriate strategies promotes the appeal of instruction. The process of formative evaluation provides the opportunity to revise instruction to make it more effective, efficient, and appealing.

3. *Supports coordination among designers, developers, and those who will implement the instruction.* The systematic process and resulting written documentation allow for communication and coordination among individuals involved in designing, producing, and delivering in-

struction. It allows for common language and general procedure. The written plans (goals, description of target audience, and analysis of task) and the written products that are results of instructional design efforts assist the process of review and revision of work in progress in a coordinated team effort.

4. *Facilitates diffusion/dissemination/adoption.* Because the products of systematic instructional design are in fact physical "products," they may be duplicated, distributed, and used in the field. In addition, because design and development have employed information about the learners and setting, products will have a high likelihood of being practical, workable, and acceptable solutions to the instructional problems that they are designed to solve.

5. *Supports development for alternate embodiments or delivery systems.* Much of the work that goes into an instructional design project is independent of the specific form that the finished product takes (such as print, Web, computer, or video). The front-end analysis and consideration of instructional strategies will be valid beginning points for projects that result in embodiments other than those used by the original project.

6. *Facilitates congruence among objectives, activities, and assessment.* The systematic approach to instructional design helps ensure that what is taught is what is needed for learners to achieve stated goals for learning and that evaluation will be accurate and appropriate.

7. *Provides a systematic framework for dealing with learning problems.* Frequently, creative individuals not trained in systematic instructional design will develop ingenious approaches to instruction that are rather like "solutions looking for a problem." Although these approaches may add to the repertoire of possible approaches, they seldom appeal to high-level management in government or business, to school system administrators, or to other funding agencies. The innovations that are generally appealing are those that have clarified the problem into a learning goal, have developed an instructional approach that gives reason to believe that the problem can be solved and the learning goals will be met, and has a well-constructed plan for gathering evidence to determine whether the approach has solved the initial problem and what undesirable effects it might have.

Limitations of Systematic Instructional Design

Instructional design does have limits of applicability; it is not the solution to all the ills and problems of education and training, nor is it the only method for creating education. In particular, instructional design has limited applicability to educational experiences in which (a) learning goals cannot be identified in advance, or (b) no particular goals are ever identified (i.e., non-instructional education). In such cases, because there is no "lead time" to the education, and since reflection and planning are central to instructional design, there is limited opportunity to apply many of its principles and procedures. An example of such a situation might be an advanced graduate class or other educational environment in which the learners have exceptional prior knowledge of the content: these students would have well-developed cognitive strategies and be required to identify the goals of the course, devise the educational strategies, and assess their learning themselves. If a teacher is available in this situation, a skilled instructor might be able to process information rapidly enough so that as learners identify goals and devise strategies, the instructor could make suggestions for better or alternative strategies. In such a case, the teacher's knowledge of instructional design may be very helpful in his consultant role; however, he may not have time to employ much of the instructional design process and principles. In a situation without prespecified learning goals, if a teacher is not available, then the responsibility for structuring the learning experience rests totally on the learners, and their success depends on their own cognitive strategies, prior knowledge, and motivation. The educational process in such an environment rests on an almost completely generative strategy (see Chapter 7 for a discussion of instructional strategies).

In addition to goal-free learning environments, many other problems and situations are not amenable to instructional design. (In Chapter 3, we will discuss solutions, such as management, policy, and incentives, that are not instructional solutions). Finally, instructional design is not intended to take the place of expertise in particular teaching methods for individual subject areas (although instructional design can be a helpful undergirding for such methods).

People Who Do Instructional Design

As you may (or may not) recall from the Preface, the treatment of instructional design in this text is intended for everyone who may benefit from it. Consequently, you will see more or less equal attention given to examples from corporate contexts as from K–12 or higher-education settings. With the variety of application settings in mind, who are the people in those settings who do instructional design?

TRAINING DESIGNERS. Probably the most identifiable group of individuals who practice instructional design are trainers of adults in business, industry, government, and private agencies. Trainers may be part of a human resources department or they may have their own separate department. They may work in a central-

ized location, consulting with any of the divisions of the organization that may request their assistance, or they may be permanently attached to a particular division, providing all of the training that division requires.

Not all trainers are instructional designers. Some trainers are experts in their skill or subject area, who are either permanently or temporarily assigned to conduct training in that area. Other trainers are technical writers, videographers, or other production specialists who have high-skill levels in communication within their medium. Many trainers come from an adult education background that emphasizes adult development. Human resource development (HRD) programs also prepare trainers for employment in this area.

Many instructional designers who are involved in training design have developed additional competencies in a more inclusive specialty that is termed "performance technology." These individuals are prepared to develop interventions that address contributors to poor employee performance (other than not knowing how to do the job). These other causes are discussed in Chapter 3 in the section on "needs assessment." The trend toward preparing instructional designers as performance technologists is discussed in Chapter 20.

TEACHERS AS DESIGNERS. Some individuals employed as teachers are directly involved in the design of new instruction (or new "curricula," as is more commonly described in public and private K–12 and postsecondary education). These teachers may be involved in ongoing and long-term projects. Certainly, instructional design procedures and principles can be employed effectively in their curriculum design and development activities. These instructional design practices may be as formal, precise, and well documented as any other instructional design project because of the need for group communication and the development of a record that codifies the decisions that they have made and why they have made them.

Do teachers not involved in curriculum design projects use instructional design principles and procedures? Indeed, they do. Although they may receive goal statements based on statewide initiatives, they do consider these goals and may add goals or identify subgoals (objectives) that will lead to these goals with aid from curriculum guides, textbooks, or their own task analysis reflection. Teachers select or develop activities and information sources that will assist learners in reaching these goals. The development of engaging activities seems to be a particular strength of practicing teachers. Teachers also select or develop ways to assess learners' progress toward reaching goals. These assessment approaches may include written tests, performance tests, observation, oral questioning, and a variety of other techniques for assessing learning. Teachers use information from their testing to revise their instruction, especially for remediation. These design activities are completed both planfully in advance of implementation and spontaneously as circumstances suggest their use.

Both teachers who have taken courses in instructional design and teachers who have not engage in these types of instructional design activities (Martin, 1990). However, those trained in systematic instructional design tend to engage in these activities more consistently, thoroughly, and reflectively than their untrained colleagues (Reiser & Mory, 1991). Most often, these instructional design activities are conducted mentally with little documentation of the decisions made.

OTHER DESIGNERS. Instructional designers are also engaged in developing instruction that is embodied in textbooks, multimedia, instructional software, and videos used in K–12 and postsecondary settings. Such individuals are often employed in settings such as publishing houses and regional educational laboratories. We also see instructional designers as members of development teams of educational videos such as "Sesame Street" and "Reading Rainbow," and of many Web-based education projects both publicly and privately funded.

Instructional designers are sometimes called upon to make contributions in the visual realm. Not only are the form and content of illustrations a critical part of much instruction, but also visualizations and visual meta-phors which may underlie a simulation, microworld, virtual reality, or exploratory learning environment may benefit from the contributions of an instructional designer who possesses a high proficiency in visual literacy skills in addition to core instructional design competencies.

Competencies, Standards, and Ethics of Instructional Designers

COMPETENCIES. Various agencies have compiled sets of competencies for instructional designers. Although your work with this text in a single course will not prepare you for all of the competencies in any set, a substantial proportion of these desired skills is reflected in the learning goals and content of this text. Your review of these competencies can assist you in orienting to the specialty as well as a self-check in the future.

One of the more widely used set of competencies for instructional designers is that developed by IBSTPI (International Board of Standards for Training, Performance, and Instruction). The IBSTPI instructional designer competencies can be found in the organization's website: http://www.ibstpi.org.

Another useful set of competencies is that developed by the American Society for Training and Development

(ASTD). The ASTD competencies are directed toward human resource development and performance improvement in corporate contexts. The ASTD competencies may be found at http://www.astd.org. In addition, Analysis & Technology, Inc. has developed a set of competencies, which is available at http://www.coedu.usf.edu/IT/resources/competen.html

STANDARDS. Fields and his associates (Fields, Foxton, & Richey, 2001) elaborated the IBSTPI competencies with training standards as well as provided a description of common specializations and uses of standards by various subgroups. In addition, the Association for Educational Communications and Technology (AECT) has developed the standards used by the National Council for Accreditation of Teacher Education (NCATE) to support accrediting of both the technology component of undergraduate teacher education programs, and graduate programs in instructional design and technology; more information on the AECT/NCATE standards may be found at http://www.aect.org/standards/index.html.

ETHICS. Like competencies and standards, professional codes of ethics provide guidance for good practice. Ethics provide a different insight from that provided by performance standards: a moral compass. Although ethicists are quick to point out that morals and ethics are not the same thing, it is a sense of right that ethics provide that other codes are missing. Elsewhere in this text, your authors describe themselves, philosophically, as striving to be "pragmatists with a moral compass." To identify what merely works well or what is effective is not always sufficient to recommend what should (or should not) be done. For the broader profession of education, focusing more on K–12 school professionals, the National Education Association (NEA) has developed a short but useful statement of ethics for educators which focuses on commitments to students and to the profession of education (http://www.nea.org/code.html). Closer to our specialty, Welliver (2001) has edited a volume for AECT on ethics for educational communications and technology professionals. Welliver's statement includes relationships to individuals, to society, and to the profession. The Welliver ethics volume is available online at http://www.aect.org and is available in full text online without charge to AECT members.

E X E R C I S E S

1. What activities other than those of an engineer are similar to the role of an instructional designer? Describe these similarities in your own words.

2. Following is a description of the design procedures that an instructional designer is conducting. Identify by writing on the line beside the description which phase—analysis (A), strategy development (SD), or evaluation (E)—the designer is completing.

_____ **a.** The designer determines that the prospective learners are able to read (on the average) at the ninth-grade reading level.

_____ **b.** The designer decides to use a simulation method as part of training a department store's customer service representatives.

_____ **c.** The designer determines what the learners need to know in order to learn to balance chemical equations.

_____ **d.** After a tryout of the prototype of a computer-based instruction (CBI) lesson on writing instructional objectives, the designer adds additional practice items on identifying the "conditions" of an objective.

_____ **e.** The designer writes test items to assess whether learners have achieved the objectives of a CBI lesson.

3. Which of the following activities would be education, instruction, training, and/ or teaching? Circle the term or terms that apply.

a. The teacher presents a lesson in which she hopes that the learners will learn the difference between polygons and non-polygons. She has carefully planned activities in which she will present examples and nonexamples of polygons and will help students determine the differences. She will test the students at the end of instruction to confirm that they have learned to identify those geometric figures that are polygons.

education instruction teaching training

b. The instructional designer for a large corporation has developed a print-based instructional package for managers who are involved in hiring to prepare them to follow legal practices during the hiring process. The learning materials inform them of the rules and show them examples and nonexamples of the rules' application. The tests provide a copy of an interview dialog between a manager and a potential employee. The learners must indicate whether all laws were followed. If they were not followed, learners must identify which laws were broken and what should have been said to avoid breaking the law.

education instruction teaching training

c. A television documentary presents information on types of whales, where whales live, what whales do, what whales eat, and the history of whales. Viewers tend to remember and learn different things from the program depending on what they already knew and their interests.

education instruction teaching training

SUMMARY

One of the reasons that the quality of much instructional material is poor is because it is not carefully planned. Instructional design activities offer a process for the systematic planning of instruction that may improve the effectiveness of the materials. The design process includes the activities of analysis, strategy development, evaluation, and revision. Although the instructional design process may often be portrayed as linear, in practice it is frequently iterative, moving back and forth between activities as the project develops. Some implementations of instructional design include rapid prototyping in which a trial version of the completed instructional plans and materials are produced early during the process and are revised and elaborated upon as new information becomes available. The components of instruction—goals, learning activities, and information resources—and assessment tools, which are the products of the design process, should be congruent with each other. Before you begin actually designing and producing your own materials, you will learn in the following chapters a few of the fundamen-

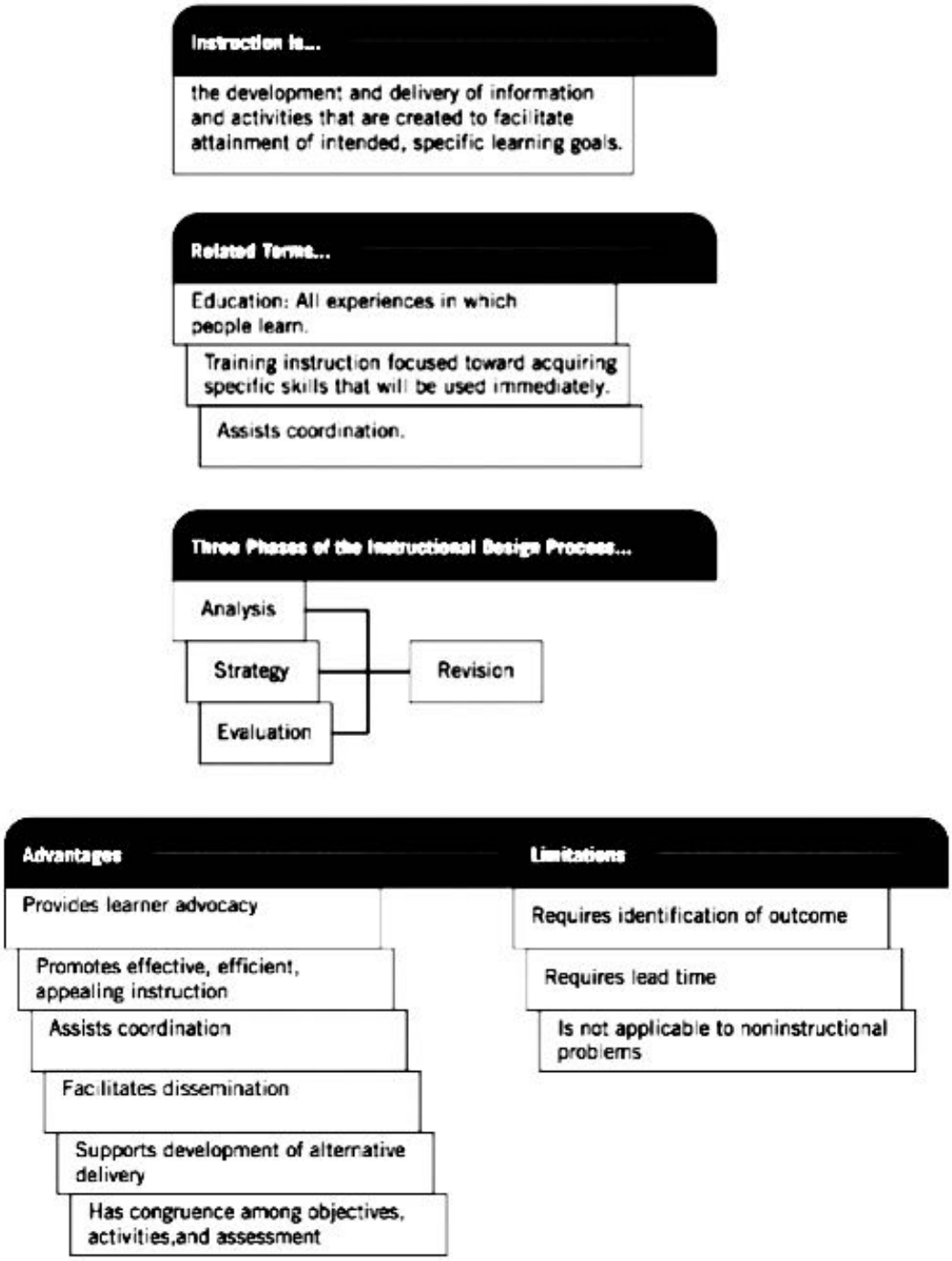

Figure 1.4 Summary Diagram for Chapter 1

tal principles and procedures of instructional design. Figure 1.4 summarizes the major points in this chapter thus far.

EXTENDED EXAMPLE: A PREVIEW

You can see the design process described in this text applied to a single course in the Extended Example, on a chapter-by-chapter basis. If you wish you can overview the Extended Example now at: http://www.wiley.com/college/smith.

Later on, as you read each chapter, you can study application of it in the Extended Example. The Extended Example uses one course, a course in beginning photography, to provide continuity of application. In addition to the Extended Example, examples using a variety of topics and contexts are provided in each chapter.

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